Towards The Elimination of Residential Building Structural Failures Through International Best Implementation Practices in Nigeria

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ABSTRACT: *Structural failures and the total collapse of mid-rise residential buildings are common phenomena in Nigeria. The rate at which buildings collapse in Nigeria, the frequency of this occurrence, and the magnitude of the losses which are recorded in terms of lives and properties, are becoming alarming. Such incidents are reaching an unprecedented level and have become a major source of concern, not only to the government at all levels but to all stakeholders involved. This paper identifies and examines structural building regulatory implementation and enforcement practices, focusing on stakeholders' perceptions of building regulatory enforcement and compliance in Nigeria. Quantitative data were captured via a structured questionnaire survey of architects, builders, and engineers, with valid responses received from 378 (63%), and semi-structured face-to-face interviews with industry professionals from different disciplines, such as structural engineers, heads of building departments, site managers, architects, quantity surveyors, builders and project site supervisors, enabled stakeholders' perceptions of building regulatory enforcement and compliance to be obtained. Using the software SPSS for descriptive and inferential statistical analysis and Nvivo 10 for the qualitative analysis, the quantitative findings revealed that stakeholders' perceptions of building regulatory enforcement and compliance are that these are very low and unsatisfactory. The qualitative findings yielded a large amount of multiple-interlocking reasons for the lack of compliance, which were anchored in inadequate project supervision, poverty levels, inadequate regulatory awareness, and inadequate professional experience. The findings emphasise the need for the Nigerian house-building sector to adopt international best regulatory implementation practices in order to eliminate mid-rise residential building structural failures through short-term and long-term initiative measures. The sector should focus on systemic and attitudinal change, implementation through capacity building and team work, double-loop feedback learning, and a continual evaluation of the implementation process with a view towards improving residential building construction regulatory practices in Nigeria.*

KEYWORDS: residential building, improvement, structural collapse, best practice implementation, Nigeria.

INTRODUCTION

Residential buildings (shelters) have been described as the second most basic human need after food (Turner, 2001). Turner (2001) argued that minimum standards of building construction should be established whereby the essential rules and objectives that are to be implemented provide protection for the buildings and the occupants. Research suggests that this will enhance compliance by professionals and other relevant stakeholders responsible for building habitable structural buildings which do not fail. Professionals and other relevant stakeholders in the Nigerian building construction industry have described some of the reasons for the rate at which buildings collapse in Nigeria, the frequency of this occurrence and the magnitude of the losses being recorded in terms of lives and properties. They attribute these occurrences to dilapidated structures, illegal conversion/alteration of structural elements, the addition of extra floors to existing buildings, the use of sub-standard building materials and defective

designs/structures, faulty construction methodology, the use of incompetent contractors, poor workmanship, and inadequate or absent supervision, inspection and monitoring (Yakubu,2017).

Tanko et al. (2013) have described other contributions to residential building structural failures, such as professional negligence in adherence to approval instructions and stop work orders from control officials, a lack of building development approval, inadequate technical staff in the control office for the construction of buildings, dubious practices among contractors and professionals, and inadequate funding for enforcement agencies. The incidents of building failure are becoming unprecedented and have become a major source of concern not only to the government at all levels, but to all well-meaning Nigerians, and in particular professionals and relevant stakeholders in the building construction industry. The 'Nigeria Factor', as described by Ayedun et al. (2012) is an abnormal factor resulting in building collapse in Nigeria and is not present in many other developing nations. This encompasses corruption, lawlessness and the presumption from the populace, even among educated clients, that an architect or any other professional in the building industry can assume all forms of responsibility during building development projects in Nigeria. This paper aims to identify and examine structural building regulatory implementation and enforcement practices, focusing on stakeholders' perceptions of building regulatory enforcement and compliance in Nigeria. This research employs quantitative and qualitative data analysis. This paper emphasises adopting international best regulatory implementation practices, in addition to some element of fitness in the approach which will assist the residential building sector on poor systemic improvement through attitudinal change, capacity building and team work, double-loop feedback learning, and a continual evaluation of the implementation process.

Non-compliance to Building Regulations

Compliance is described as complete obedience to mandatory rules, and it is interesting to note that compliance is more problematic with a higher number of contraventions in developing countries than in developed nations (Sarkheyli et al., 2012). Compliance problems are a function of the socio-economic, cultural and legal environment and the urban quality of the country in question and result from administration failures and a lack of enforcement and monitoring (Sarkheyli et al., 2012; Alnsour & Meaton, 2009). The extent of compliance with residential building standards is attributed to the education level and expected income of the general population, especially in developing countries (Arimah and Adeagbo, 2000; Alnsour & Meaton, 2009). Any violation or deviation from complete obedience to the rules and standards for the target population is classified as non-compliance.

Violations and non-compliance to building regulations in Nigeria resulted in catastrophic structural failure. Yakubu and Agapiou (2016:254) reported the cases of building structural failures and total collapse in Nigeria, "three between 1976 and 1978, 19 cases between 1982 and 1995, and 42 cases between 2000 and 2014, resulting in 742 recorded deaths, 96 injuries and a total of 63 building failures". It was revealed also that the disasters occurred in July 2017 when a four-storey completed building collapsed at Obosi Anambra State and also a mid-rise uncompleted building collapsed at Oke-Odo Lagos, then later that month a three-storey building collapsed in Orlu Imo State, and in August 2017 a four-storey building collapsed in Illorin Kwara State followed by the collapse of a three-storey residential building in Ojo Lagos (Yakubu, 2017:100-101).

Building Regulatory System: Implementation and Enforcement

Any regulatory design targeting certain professionals, practices, and industry for conformity with building rules and regulations in the spirit of fair or standard practices, is a building regulatory system. There are two common approaches to innovative design for regulatory implementation and enforcement in developed and some developing countries, including self-regulation through adequate rewards and incentives, and industry standards and internal management systems (OECD, 2000; Subedi *et al*., 2008 cited in yakubu, 2017; and Surya, 2008). Self-regulation allows an individual or industry to voluntarily comply with the standards expected of them while government or a third-party agent monitors them

with good policies for encouragement (OECD 2000, Jishnu et al., 2008, Surya, 2008). The rewards could be in the following form: simplifying licence and permit applications for building projects, reducing the burden of inspecting/monitoring voluntary compliance work, creating a name tag (label) indicating high compliance to building regulations for everyone to see (OECD, 2000), involving them in regulatory workshops and seminars within their municipality to boost their presence publicly, promoting them as a watchdog over shoddy house building construction within their municipality (Fassin 2009; SBC, 2014, cited in Yakubu, 2017), and reducing penalties for any minor-incidents of non-compliance practices. Adoption of industry standards and internal management system: This is where standards for private industries, suppliers, professionals and manufacturers are incorporated into the government's own standards and certification, which can be through a third-party inspector who monitors both the private sector and government cooperation in the enforcement of the standards (OECD, 2000). For effective control of building works, in developed nations technical practice is increasingly contracted out to independent organisations (Visscher and Meijer, 2003). The USA, China, South Africa, and UK have different models for flexibility in the control of building works, such as third party inspectors, government and their agencies, and the hybrid enforcement approach (Yu et al., 2013, Memeza, 2000, Fairfax County, 2012, all cited in Yakubu, 2017).

Enforcement Design for Compliance

Figure 1 displays a summary of a pyramid design which guides the enforcement of standards of civil sanctions within the regulatory compliance process. This model has been successfully used by the Office of Fair Trading in 2008 through a mixture of various powers for penalties for failure to comply, including written documents to guide people into compliance, warnings of possible dangers due to failure, dialogue to find an easy way to achieve compliance, and permission to self-implement regulations while guided by implementing officers through coaching and advice during site visits (self-regulation) (Greenstreet, 2010).
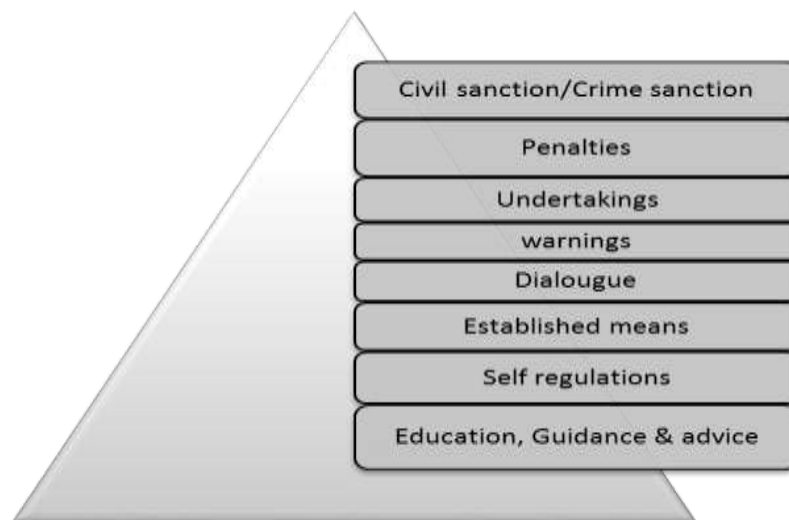

Figure 1: Enforcement pyramid used by the Office of Fair Trading in 2008 (Source: Greenstreet, 2010, cited in Yakubu, 2017)

Another innovative design to ensure compliance, as argued by OECD (2000), is a responsive enforcement approach with punitive sanctions, which is employed when persuasion or restoration of failed compliance strategies have not been complied with. This school of thought was supported by Greenstreet (2010) via a pyramid that guides the responsive enforcement of standards of civil sanctions, as shown in Figure 2. Compliance could be achieved by the revocation of a practice licence, suspension of a licence, bringing a criminal case against a person or organisation, penalties, warnings and

persuasion for the implementation of the regulations. The innovative pyramid design can be creatively and deliberately applied to any of the regulatory sanctions because of its flexibility.
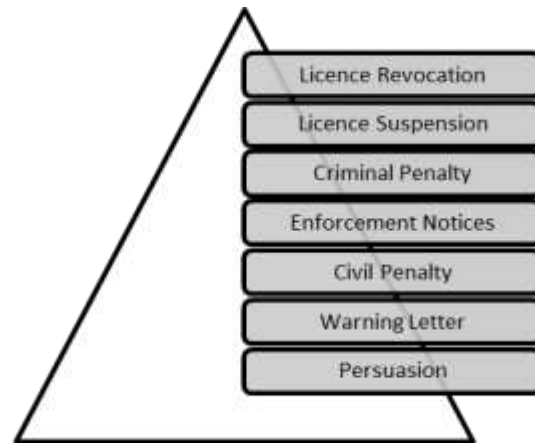

Figure 2: Responsive regulatory pyramid for non-compliant organisations (Source: Greenstreet, 2010, cited in Yakubu, 2017)

Building Regulatory System: Legal Requirements in Nigeria

Nigerian development planning policies and law ratification were established in two physical planning and development laws: Land Use Decree No. 6 in 1978 (Land Reform Act 1978) and the Act No. 88 in 1992, (Nigeria Urban & Regional Planning Act 1992). A third law is the embattled Nigerian Building Code Standards and Regulations (NBC, 2006) which is still pending ratification by the National Assembly. The land is classified by zoning into residential, commercial, institutional, religious, recreational, and mixed-used in Abuja, Lagos, and Port-Harcourt. Plots sizes vary within cities, for example in Port-Harcourt the plot size is 450m2, in Lokoja and Lagos the plot size is between 450-900m2, while in Abuja plots are allocated by the government with a minimum size of 450m2. Land zoning does not apply to all Nigerian land developments and physical planning processes because standards and regulations are enforced through societal class and individual personalities, which tend to be more influential than institutions, standards and regulations, and the law, while approaching a politically well-placed individual within society can guarantee the swapping of land use from one form to another (Gbebru et al., 2014; Okpala 1984 cited in yakubu, 2017). Under the Nigerian Urban and Regional Planning Act 1992, the responsibilities outlined are to provide a legal framework for the implementation of planning policies, provide urban settlement guides and the classification of development parameters, facilitate the preparation of development plans and planning schemes, assign development planning and control roles to federal, state and local government levels, and to introduce strategies for effectively monitoring the enforcement of planning laws at all levels of government. Development buildings are setbacks from main access roads by a minimum distance requirement of 6.0m on both sides and the back at 3.0m in Abuja, while in Port-Harcourt this is 3.0m, with both sides at 2.5m, and the back at 3.0m. Lagos has a minimum distance requirement of 6.0m for access road setback, 3.0m for street setback, with 2.5m on both sides set back, and 3.0m at the back, while Lokoja has a 3.0m main access setback requirement, with1.5-2.0m on both sides and 2.5m at the back. The NBC (2006) stipulates the minimum requirements for the regulation of activities during building construction, including during the design, pre-construction, construction, and post construction stages. The requirements include: foundation excavation depth of 930-1500mm for mid-rise buildings and 600-900mm for bungalows; blinding thickness of 75mm, footings on soil 150mm, footings on poles 300mm; footings 50-100mm, foundation walls sandcrete blocks 225×225×450mm, hollow masonry 200×250×300mm, solid masonry 200×250mm, plain concrete 300×200mm, cavity walls 250mm; oversite concrete 12-20mm DPM, hard core minimum size requirements of 20, 40 and 75mm laid at

150mm, thickness of concrete with a mix ratio of 1:2:4, and many others. The building development approval process involves the submission of building plans and supporting documents, initial scrutiny of the basic design requirements (room sizes, toilet provision and placement, land purpose requirements, setbacks, and types of foundation), registration of the plans for approval and inspection with a receipt, inspection of the site by development control for technical report writing, payment of approval processing fees, charting of the development plans into relevant plots for layout plans for government information data, processing and endorsement of the amended plans, collection of the plans with a receipt, monitoring post-approval, and penalties for any contravention of the approved plans. Despite these efforts to create laws and supporting agencies, the implementation, enforcement and compliance of these policies and laws remains a re-occurring problem in Nigeria (Aluko, 2011).

DATA COLLECTION AND METHODOLOGY

This study used both questionnaires and interviews in order to collect data for the purpose of data triangulation, including respondents' demographic data such as their age, sex, educational qualifications, professional discipline, and the number of years they have worked in the building construction industry in Nigeria, and measured the implementation, control, and compliance rate of professionals and development officials via a five-point frequency scale ranging from 1 (strongly disagree) to 5 (strongly agree), and 1 (very unsatisfactory) to 5 (very satisfactory). The choice of the 2 research questions; the implementation and enforcement (control) rate of the residential building development projects and the degree of compliance to the approval process, building production, and inspections of mid-rise residential building development projects in Nigeria was an intentional approach to limit respondent to compliance and enforcement issues of this research for a very intense opinion among 378 valid respondents in Nigeria. The questionnaire approach was adopted, and 600 questionnaires were distributed via drop and pick method, resulting in a 63% valid response rate for the analysis. The dataset of respondents included architects, engineers, builders, and professionals in the built environment, together with other relevant stakeholders. The participants were reassured regarding the confidentiality of their information and their voluntary agreement through written consent was obtained from all the participants. The data were processed into numerical codes and entered into a pre-designed data entry spreadsheet, in SPSS23. Missing values were managed by excluding these from the cases pairwise. The data analysis was also carried out using SPSS23 and generated descriptive and inferential statistics, from which the percentage and cumulative percentage values were used as the basic summary for the analysis. Nine building construction companies who voluntarily indicated interest with their contact details from the questionnaire survey were selected by researchers from others who also indicated interest. Of which well-known companies with high number of construction contracts across the countries were contacted through phone to book an appointed in their offices for the interview. In which the companies were categories from A to I in conducting the semi-structured interview face-to-face interview with company's representatives which numbers were between 1, 2, 3, and 4 at most with 17 company stakeholders in all. Key staff members from the companies that participated encompassed different professional disciplines, including structural engineers, heads of building departments, site managers, architects, quantity surveyors, builders and project site supervisors. This include, 1 representative for company A, 3 for company B, 2 for C, 1 for D, 1 for E, 3 for F, 2 for G, 4 for H, and 1 for I. A purposive sampling (selection of few building construction companies from many others who voluntarily indicated interest to participate in the interview) technique targeting construction companies was used in the selection of companies for data collection in Abuja, Port-Harcourt, Lagos, and Lokoja in order to tap into their wealth of experience. The interview process gathered large amounts of multiple interlocking data which was collected via notes taken during the interviews and recordings of the conversations using an 8GB stereo recorder and mobile phones, before transcriptions as quotes using Nvivo 10 software. Contents analysis of the interview data through the coding of the quotes (raw data) and the creation of sub-themes from the major theme were used for the analysis. Throughout, there was constant comparison to reduce the chunks of data to sub-themes and major themes or key words in line

with the research questions (Creswell, 2003; Gary, 2013). First, a set of themes derived from the theoretical concept was created manually in line with the research and semi-structured interview questions. The researcher then imported the interview transcripts into Nvivo 10 as internal sources, and nodes were created for coding using the manual research-based themes created as guides for the nodes. This involved using an inductive approach to break up the interview data into useful chunks of data, such as words, phrases, sentences or paragraph, as proposed by Cresswell (2003) and Gary (2013). The researcher then made lists of all codes, looking for similar codes in order to reduce the initial long list of regulatory implementation, enforcement and compliance issues raised, to a more manageable number through close coding, or code the code, to reduce the codes to just four or five clustered nodes. Constant comparisons were made to match all the codes into a single cluster which was tested by making observations of possible acceptance or determining grounds for rejection. This is more of an exploratory perspective analysis through thematic network analysis as the coding of data allowed for new themes to emerge (Gary, 2013). The data were also cleaned during this process to delete all information that was not relevant.

RESULTS

Demographic Characteristics of the Respondents
The descriptive statistics of dispersion for the variable indicates a cumulative Percentage of 43.1% for the age 21-40, 97.4% for age 41-60 with the age mean value of 0.98. Years of experience provides 36.8% cumulative % for 4-10, 52.9% for 11-16years, and 95.8% for 17-60 years' experience with the mean value of 3.3. Educational qualification has 30% cumulative for associate degrees, 67% cumulative for Bachelor degree to Master degree, and 3% cumulative for Doctorate degree with mean value of 4.5

Implementation and Enforcement (Control) Rate of Residential Buildings within Nigeria
The implementation and enforcement (control) rate of residential building development projects in Nigeria as indicated by the respondents using a five-point Likert scale is summarised in Table 1 and Figure 4.

Table1: Summary of responses concerning implementation and enforcement (control) rates for residential building developments

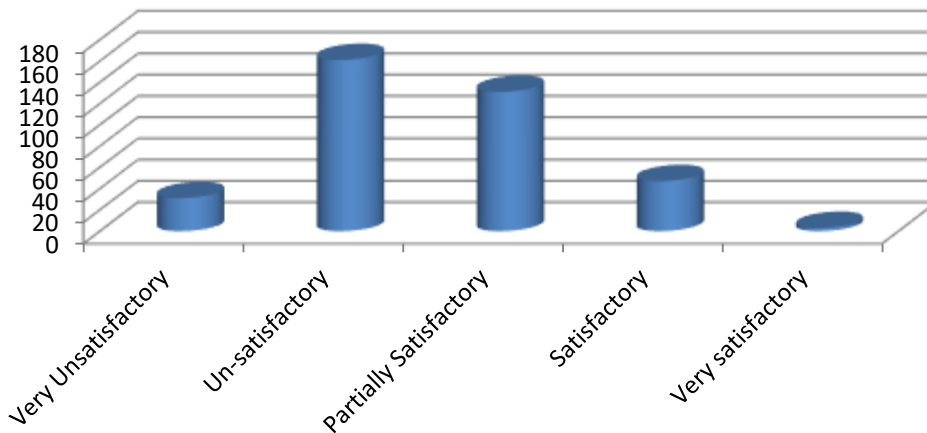|	Frequency	%	Valid %	Cumulative Percent
Very unsatisfactory	33	8.7	8.7	8.7
Unsatisfactory	188	49.7	49.7	58.5
Partially satisfactory	112	29.6	29.6	88.1
Satisfactory	42	11.1	11.1	99.2
Very satisfactory	3	0.8	0.8	100.0
Total	378	100.0	100.0	

Figure 4: Implementation and enforcement levels of building development projects

Degree of Compliance to Structural Building Regulations
The degree of compliance to the approval process, building production, and inspections of mid-rise residential building development projects is summarised in Table 2.

Table 2: Degree of Compliance

	Frequency	%	Valid %	Cumulative %
Strongly disagree	27	7.1	7.1	7.1
Disagree	230	60.8	60.8	68.0
Partially agree	89	23.5	23.5	91.5
Agree	31	8.2	8.2	99.7
Strongly Agree	1	0.3	0.3	100.0
Total	378	100.0	100.0	

3.4

Qualitative results

The interviews asked the company representatives to rate the level of enforcement and compliance, the adequacy of monitoring for control in Nigeria construction industry, and to identify the main causes of non-compliance and violations and yielded the cluster results shown in Figure 6.
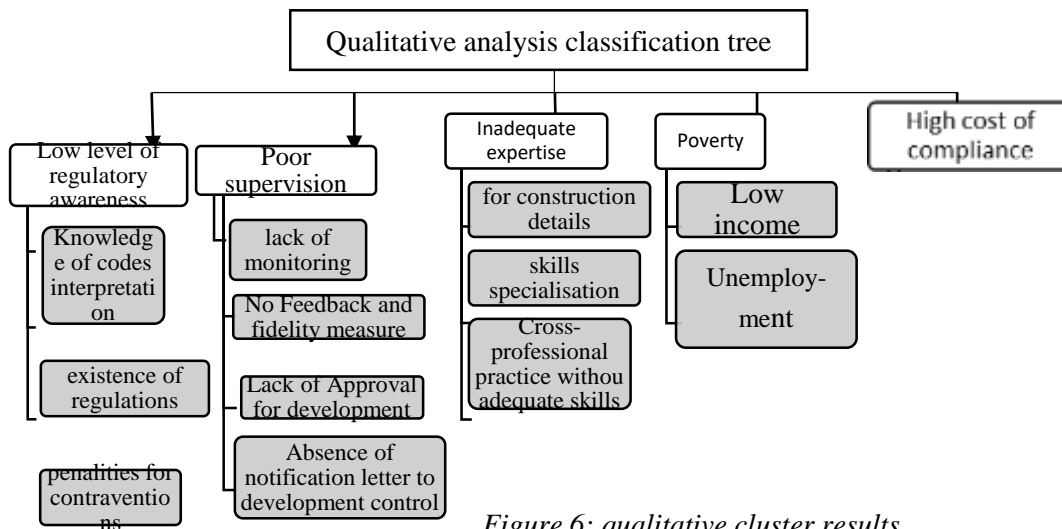
Figure 6: qualitative cluster results

FINDINGS

The rate of implementation and control of building regulations indicates unsatisfactory responses. This is as a result of inadequate monitoring for enforcements of building regulatory requirements in the areas of excavation depths, quality of concrete, foundation footings and thickness, concrete mixing ratio among others. In summary, the stakeholders' perception of building regulatory implementation and enforcement is unsatisfactory and reported disagreement concerning any progress towards building regulatory compliance during approval, construction, and inspection processes. Figure 6 is a summary of the findings from the qualitative analysis, and indicates low levels of regulatory awareness, poor supervision, inadequate expertise, poverty, and the high cost of regulatory compliance as the major reasons for the low level of compliance and unsatisfactory enforcement observed in the stakeholders' responses. The perception of the stakeholders revealed during the interviews is that the majority of people are not aware of building regulations, which is adversely affecting compliance during project development. In summary, they cannot interpret the code, and are unaware of the existence of the regulations, and the penalties for violations. Poor supervision also contributes to the unsatisfactory rating of the professionals and relevant stakeholders, which indicates a lack of monitoring, lack of feedback and fidelity measurements, and notification of projects to development control. Inadequate expertise in construction details, poor skills specialisation, and cross-professional practices without adequate skills were also clustered and classified as affecting implementation, compliance, and enforcement of building regulations. Poverty as a result of low incomes and unemployment was also part of the unsatisfactory rating for compliance and enforcement of building regulations. The high cost of compliance is a factor requiring consideration as this affects implementation, compliance, and enforcement in Nigeria. The qualitative results agree with the questionnaire results concerning supervision and construction by professionals with inadequate expertise.

DISCUSSION

The reasons why residential building collapse in Nigeria have been determined to result from poverty due to low incomes that hardly meet people's needs, poor supervision, professional specialist inexperience, cross-professional practices, and the high cost of compliance which deters individuals from undertaking the compliance process and means they can become discourage and quit the compliance process. This paper aimed to identify and examine the structural residential building regulatory implementation and enforcement practices by focusing on stakeholders' perceptions of

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building regulations, enforcement and compliance in Nigeria. The findings have revealed deep-rooted problems in terms of expert skills, supervision, regulatory awareness, high poverty levels, and the high cost of regulatory compliance within the building sector in Nigeria. Similar conclusions were reached by Yakubu and Agapiou (2016), Yakubu (2017) and Sarkheyli et al. (2012). Despite the economic, cultural and social advancements that have occurred since the 1980s, the level of policy and/or regulatory enforcement control has remained relatively unchanged in Nigeria (Okpala, 1984 cited in Yakubu, 2017). Any sector with a cumulative percentage of 68% which strongly disagree and disagree with compliance to regulatory standards in developmental projects approval, construction, and inspection processes, and a 60% cumulative percentage of very unsatisfactory and unsatisfactory with regards to enforcement control is a disaster waiting to happen, with the reverberating effects of a structural collapse being felt by the people and the economy, meaning it is in urgent need of best international and fitness for purpose improvement practices.

For the policy towards compliance improvement, Ejler et al (2017) described using evidence from result to make purposeful changes that can improve the system, and in dealing with resistance to implementation from the human side, which normally include management resistance, cultural resistance, technical, competence, and barriers to change. A leader or executive involved in implementation should try and understand the behaviour wished to be changed through an assessment of the intended innovation, using acceptable assessment tools, such as CFIC (consolidated framework for advancing implementation science), PARIS (promoting action on research implementation system), ORCA (organisation readiness to change assessment), using the behaviour change wheel, and EBPAS (evidence based practice attitude scale) (NIRN2015). Another best practice in getting implementation throughout the four phases is for the implementation to be dynamic with logical processes which change people's behaviour via the behaviour change wheel, team work and the involvement of all practitioners. Developing countries' fitness approach when involving people, agencies and contexts, includes designing a programme that is based on a sound theory relating to changes in target group behaviour, and policy decisions have to contain unambiguous directives and structure the implementation process in a way that increases the chances of a good performance by the target groups and their leaders (OECD, 2013).

The starting point for the Nigeria building construction industry in the policy implication is that there should be an initiative towards regulatory awareness of stakeholders, there should be an initiative towards enhancing regulatory education within building construction sector, and the strict enforcement of regulations. The structural failures cannot be eliminated where there is no regulatory awareness, lack of capacity building through training to enhance knowledge base, no competency in project supervision and monitoring by development control, and when professionals operate in all practice areas across the building industry without adequate skills.

CONCLUSIONS

To eliminate residential structural failures, regulatory jingles for awareness, regulatory education, and strict enforcement among stakeholders should be encouraged as a short-term plan. And the adoption of international implementation principles for best practice is required which focus on attitudinal change, capacity building and team work, monitoring and feedback, and continual process evaluation, together with a policy implementation conditions approach, such as designing a sound programme based on a target group, a clear description of the directives, and the participation and involvement of the target group and legislators in both practice and decision-making processes. Managerial and political commitment, together with socio-economic and cultural norms should be the priority on a long-term planning when working towards the improvement of enforcement and compliance practices in the Nigerian residential building industry.

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