ACCIDENT PREVENTION MODEL FOR THE BUILDING CONSTRUCTION INDUSTRY

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DEDICATION

This thesis is dedicated to the Lord God Almighty, who marvellously assisted me throughout the PhD journey. Glory be to His holy name.

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ABSTRACT

The construction industry is often associated with accidents, resulting in partial or permanent disability, damage of property, loss of lives and income as well as poor company's image. The previous models of accident prevention developed in other countries could not be utilized on construction sites in Nigeria due to the lack of effective health and safety regulations. Hence, another model that incorporates the duties of construction stakeholders is needed for the construction industry in Nigeria. Therefore, this study was carried out under four objectives; to identify the types and frequencies of accidents occurring at the building construction sites, to determine the appropriate preventive measures at the pre-construction stage against the occurrence of accidents, to determine the appropriate preventive measures at the construction stage against the occurrence of accidents, and to develop a valid and practicable model for the prevention of accidents at the building construction sites in the South-western zone of Nigeria. In order to achieve the objectives of the study, three stages of survey methodology were conducted through administration of questionnaires and interview sessions with selected respondents. Stage one involved the distribution of questionnaire on 310 respondents to survey the types and frequencies of accidents, stage two involved the use of questionnaire on 384 respondents and interview protocol on 14 experts to find out accident preventive measures and health and safety-related regulations, while stage three utilized questionnaire on 24 experts for validation of the model. In addition, mean scores, t-test, Mann-Whitney U test and structural equation modelling tools were used for analysis of the collected quantitative data, while the qualitative data were analysed with the aid of NVivo software using thematic analysis. The findings of the study showed that four categories of major accidents occurred on the building construction sites; contact with objects, vehicle/machine-related accidents, slip and trip, and fall-related accidents. Besides, there was no significant difference between the accidents occurring in low-rise buildings and those occurring in high-rise buildings. Moreover, 40 accident preventive measures were found to be significant, having 17 and 23 preventive measures at the pre-construction stage and during the construction stage respectively. Furthermore, the 40 significant preventive measures were pooled together to develop a model for the prevention of accident. In order to establish the validity of the model, the contacted construction and safety experts supported the validity, appropriateness and easy comprehension of the model. The ability of the model to provide a guide to the construction professionals was also attested to by the experts. In addition, the dual-stage accident prevention model is vital in enabling the stakeholders to possess the cognizance of individuals' safety roles during the pre-construction and the construction stages. The proposed model is also deemed applicable for use not only in Nigeria, but also other parts of the world to decrease on-site accidents.

ABSTRAK

Industri pembinaan sering dikaitkan dengan kemalangan, mengakibatkan kerosakan separa atau kekal, kerosakan harta benda, kehilangan nyawa dan pendapatan serta imej syarikat yang lemah. Model pencegahan kemalangan sebelum ini yang dibangunkan di negara lain tidak dapat digunakan di tapak pembinaan di Nigeria, kerana kurangnya peraturan kesihatan dan keselamatan yang berkesan. Oleh itu, satu lagi model yang menggabungkan tugas pemegang kepentingan pembinaan diperlukan untuk industri pembinaan di Nigeria. Oleh itu, kajian ini dijalankan di bawah empat objektif; untuk mengenal pasti jenis dan frekuensi kemalangan yang berlaku di tapak pembinaan bangunan, untuk menentukan langkah-langkah pencegahan yang sesuai pada peringkat pra-pembinaan terhadap kejadian kemalangan, untuk menentukan langkah-langkah pencegahan yang sesuai di peringkat pembinaan terhadap kemalangan, dan untuk membangunkan model yang sah dan praktikal untuk pencegahan kemalangan di tapak pembinaan bangunan di zon barat Nigeria. Untuk mencapai matlamat kajian ini, tiga peringkat metodologi tinjauan dijalankan melalui soal selidik dan temu bual dengan responden terpilih. Tahap pertama melibatkan pengagihan soal selidik kepada 310 responden untuk meninjau jenis dan frekuensi kemalangan; tahap kedua melibatkan penggunaan soal selidik kepada 384 responden dan protokol temubual kepada 14 pakar untuk mengetahui langkah-langkah pencegahan kemalangan dan peraturan-peraturan berkaitan kesihatan dan keselamatan; sementara tahap ketiga menggunakan soal selidik kepada 24 pakar untuk pengesahan model. Di samping itu, min skor, ujian t, ujian Mann-Whitney U dan alat pemodelan persamaan struktur digunakan untuk analisis data kuantitatif yang dikumpul, manakala data kualitatif dianalisis dengan bantuan perisian NVivo menggunakan analisis tematik. Hasil kajian menunjukkan bahawa empat kategori kemalangan utama berlaku di tapak pembinaan bangunan: hubungan dengan objek, kemalangan kenderaan / mesin, slip dan perjalanan, dan kemalangan yang berkaitan dengan kejatuhan. Di samping itu, tidak ada perbezaan yang ketara antara kemalangan yang berlaku di bangunan rendah dan yang berlaku di bangunan tinggi. Lebih-lebih lagi, 40 langkah pencegahan kemalangan didapati signifikan, mempunyai 17 dan 23 langkah pencegahan pada peringkat pra-pembinaan dan semasa peringkat pembinaan. Selain itu, 40 langkah pencegahan yang penting telah dikumpulkan bersama untuk membangunkan model untuk pencegahan kemalangan. Untuk menentukan kesahihan model, pakar pembinaan dan keselamatan yang dihubungi menyokong kesahihan, kesesuaian dan pemahaman mudah model itu. Keupayaan model untuk memberi panduan kepada profesional pembinaan juga dibuktikan oleh para pakar. Di samping itu, model pencegahan kemalangan dua peringkat adalah penting bagi membolehkan pihak berkepentingan memiliki pengetahuan tentang peranan keselamatan individu semasa pra-pembinaan dan peringkat pembinaan. Model yang dicadangkan juga dianggap sesuai untuk digunakan bukan sahaja di Nigeria, tetapi juga di bahagian lain di dunia untuk mengurangkan kemalangan di lokasi.

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LIST OF ABBREVIATIONS

ACM	-	Accident Causation Model
ACoP	-	Approved Code of Practice
ANOVA	-	Analysis of Variances
APM		Accident Prevention Model
ASSE	-	American Society of Safety Engineers
AVE	-	Average Variance Extracted
BCI	-	Building Construction Industry
BCS	-	Building Construction Site
BIM	-	Building Information Modelling
BOQ	-	Bill of Quantities
CDM	-	Construction (Design and Management)
CITA	-	Construction Industry Training Authority
CONIAC	-	Construction Industry Advisory Committee
CV	-	Construct Validity
DV	-	Discriminant Validity
FMLE	-	Federal Ministry of Labour and Employment
GDP	-	Gross Domestic Product
HSA	-	Health and Safety Authority
HSE	-	Health and Safety Executive
H&S	-	Health and Safety
KJV	-	King James Version
LSHW	-	Labour, Safety, Health and Welfare
MANOVA	-	Multivariate analysis of Variance
MLE	-	Maximum Likelihood Estimation
MS	-	Method Statement
NBI	-	Nigerian Building Industry
NBS	-	National Bureau of Statistics
NCOSH	-	National Council for Occupational Safety and Health
NIOSH	-	National Institute of Occupational Safety and Health
PPE	-	Personal Protective Equipment

OBJ	-	Objective
PoA	-	Prevention of Accident
QS	-	Quantity Surveyor
SID	-	Safety in Design
SPSS	-	Statistical Package for the Social Science
UK	-	United Kingdom
US	-	United States

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CHAPTER 1

INTRODUCTION

1.1 Introduction

An accident is understood to be an unexpected ill event that happens without any prior notice or signal. It happens indoors (home accident) as well as outdoors (road accident, construction site accident). However, the construction industry is often associated with hazardous work conditions (Misnan, 2009), while the building sites are littered with a plethora of accidents, even on daily basis (Ehi, 2010). It is pertinent to have the cognizance of the fact that when accident happens on the building construction site (BCS), it results in equipment damage, loss of lives and limbs, disrupted work programme, over expenditure and loss of contractors' image.

Moreover, the occurrence of accident is a major challenge that poses concern to humanity. It is a global occurrence, which adversely affects all industries of the world (Mohammadi et al., 2018), while the manufacturing (Deros, 2014), marine (Akyuz & Celik, 2014), agriculture (Azmi & Misnan, 2013), fishing (Antao et al., 2008), oil and gas (Tang et al., 2018), quarrying and transportation (Said et al., 2012) and mining sectors (Liang, Liu & Wang, 2011) are within the scope of this scenario. In addition, the construction industry (Shao et al., 2019; HSE, 2015), which is the major focus of this research, is not left out of this circle.

It is important to know that past researches have explored the root causes of accident (Gibb et al., 2014), in an attempt to put up preventive measures (Fung & Tam, 2013) to mitigate the occurrence of accident. Moreover, many countries of the world, who were bedevilled with rampart construction site accidents, and having taken into cognizance the magnitude of the consequential effects of accident, have developed preventive measures in averting the occurrence of accident at the BCS. Among these countries are Malaysia, United Kingdom and the United States of America.

Consequently, Malaysian government set up a department (Department of Occupational Safety and Health-DOSH) under the Ministry of Human Resources. Equally, in the United Kingdom (UK), the Health and Safety Executive (HSE) is saddled with such responsibility, with an attendant formulation of health and safety (H&S) regulations; that is, Construction (Design and Management), which is commonly referred to as CDM regulations. Moreover, the United States of America is undoubtedly included in this scenario, of which the driving force against the occurrence of accident is the strict enforcement and observance of Occupational Safety and Health Administration (OSHA) laws and regulations.

Consequent upon all these global developments, it becomes imperative to consider, with all passion, the situation of the Nigerian building industry (NBI) and fashion out preventive measures in mitigating the occurrence of accident on the BCS. Hence, the researcher deems it fit to develop a valid and practicable model for the prevention of accident (PoA) on the BCS, both at the preconstruction stage and during construction stage, with emphasis on the duties of the construction stakeholders in the South-western geopolitical zone of Nigeria.

1.2 Background of the Study

The construction industry is considered as one of the recognised industries with existence of hazardous activities, therefore, the issue of safety of operatives on the site of operations is a vital aspect in consideration of the overall safety in construction (Hassan et al., 2007). According to Aniekwu (2007), a large proportion of the Nigerian working population is employed in construction and a great majority of them is exposed to varying levels of risk in relation to their health and lives. This is not farfetched from the fact that construction works take place in the open, and activities are carried out for limited periods as compared to other industries. Moreover, accidents are likely to occur because of the nature of the activities and tasks performed at construction sites (Al-Tabtabai, 2002), as the industry is viewed as a hazardous profession.

It is noted that construction industry is held to be one of the most dangerous industries, ranking 3rd after mining and fishing industries in terms of fatal accidents, and each of these fatal or non-fatal accidents cause suffering to the victim(s) and a waste of money and time to the industry (Udo et al., 2016). However, it is good to understand that some large construction companies operate for millions of man-hours without a lost-time accident (EHS Today, 2000). It is further reported by EHS Today (2000) that a company was rewarded for operating for one million hours without the record of lost-time accident, while it is believed that there is possibility of the achievement of such unblemished records through education, training and enduring commitment to the building of safety culture by contractors. Nevertheless, almost all accidents at construction sites can be prevented if zero-accident culture is imbibed. Following this, Sejas (2014) asserts that each individual member of the industry should ensure that accidents do not occur.

In addition, the statistics produced by Edwards and Nicholas (2002) on H&S consistently reveal that accidents in respect of construction equipment are responsible for a high magnitude of serious and fatal injuries on site, while in the comparative research of the authors accident rates occurring within United Kingdom (UK) construction industry is higher than other identified industries like agricultural sector, fishery, hunting, forestry, extractive and utility supply industries, and the manufacturing industry. It is further put on observation that the rate of accident in the construction industry has remained permanently high, as against the rates of an accident in other industrial sectors, which have been on a decline (Edwards and Nicholas, 2002). Although, such alarming rate is attributed to inadequate H&S management within the sector, both in terms of implementation and training, while in Nigeria the lack of concerns of the stakeholders (Idoro, 2008) are responsible for the occurrence of accidents on the BCS. Hence, the ongoing research is holistically considering the positive responses of the construction stakeholders (client, consultant, contractor, H&S agency) in mitigating the occurrence of accident, in order to achieve accident-free site.

Further reasons are attributable to the prevailing occurrence of an accident on site. It is worthy of note that the degree of compliance with Occupational Safety and

Health (OSH) regulations in Nigeria sounds clear. Hence, such compliance is rated as very low (Umeokafor et al., 2014), as clients, consultants and contractors give little or no attention to OSH in Nigeria (Udo et al., 2016). The determinants of this level of compliance are given as wrong beliefs, type of tendering process, the reputation of firms, higher profit margin, inadequate funding, the perception of stakeholders in the industry, inadequate staff and workplace issues, management commitment, fear of legal sanctions, bribery and corruption, neglect of human rights, etc (Umeokafor et al., 2014).

In addition, accident occurrence has led to the unexpected death of a reasonable number of workers on construction sites in Nigeria, while many have permanently been made crippled because of construction-related injuries (Nkem et al., 2015). Fatalities are brought about by unplanned and uncontrolled events, with attendant effect on direct and indirect costs. However, the medical bills, premiums for compensation benefits, liability and property loss from the direct cost of accident, while the indirect costs are time lost in attending burial ceremonies, time lost in fatality investigation, downtime of damaged equipment, and losses arising from the closure of site.

In spite of the important role playable by the construction industry in the improvement of countries' economic growth, it is equally being always blamed for the high rate of accidents and fatalities, which result in delay of project completion, increased expenses, and ruined reputation and reliability of constructors (Hosseinian & Torghabeh, 2012). With regards to the vulnerability of workers to hazards, description of the situation of developing countries, like Nigeria, is given as being worse than what prevails in developed countries (Idoro, 2008). The reasons adduced to it are given as: lack of concern, non-availability of accurate records and lack of statutory regulations on H&S. Moreover, Okoye & Okolie (2014) who corroborates Idoro (2008), express that unsafe conditions exist on many sites (both large and small), and labourers are subjected to numerous hazards, for reasons which include; lack of training programs for the staff and workers, lack of medical facilities, lack of orientation for new staff and workers, inability to point out hazards, and failure to hold safety meeting.

Moreover, Okoye & Okolie (2014) further points out a copious number of hazards that the construction workers are exposed to. Such accidents relating to cave-ins often occur while excavating in deep trenches (because of lack of proper shoring or bracing). Equally, cement burns due to the unavailability of protective gloves and boots (these are common since concreting is done mainly by labourers), workers falling from heights due to weak scaffolding and the unavailability of safety belts, workers sustaining injuries on the head, fingers, eyes, feet, and face due to absence of personal protection equipment (PPE) are inclusive.

Furthermore, Aniekwu (2007) carries out a research where he unearths various causes of accident, which include the use of faulty tools and equipment, non-compliance to standard safety rules and regulations, lack of experience (of workers), improper supervision, natural causes, faulty construction techniques, workers physical condition, and the likes. Additionally, Hosseinian & Torghabeh (2012) point out the causation of an accident on construction sites to be unsafe working conditions, while Gibb et al. (2014) usurp the construction accident causality framework in identifying occupational accident causes in different industry contexts, though restricted to Australia and the USA only. Moreover, Jaffar et al. (2015) join the research train to exhume the accident contributing factors in the housing construction industry, the possibility which may be consequent upon the availability of accident data.

It is necessary to note that, Nigeria has no reliable data on accident. This is because most contractors do not report accidents at appropriate ministry nor keep proper records on accidents (Agwu & Olele, 2014). Nevertheless, this situation is not peculiar to the Nigerian construction industry alone, but affects other developing countries. It is, therefore, impossible to give an accurate statistic of fatalities (that is, fatal accidents) in the Nigerian construction industry following the dearth of data. In relation to Agwu & Olele (2014), the following analyses in respect to the contributions of construction industry to fatalities are given; the European Union (30%), United States of America (22%), Japan (30-40%), Ireland (50%), United Kingdom (25%), while there is no much data to justify that of Nigeria.

Sequel upon the scarcity of data on accident occurrence in Nigeria, as supported by Orji et al. (2016), Umeokafor et al. (2014), Agwu & Olele (2014), Ehi (2010) and Idoro (2008), a well-structured questionnaire was drawn and administered to experienced construction stakeholders (clients/project managers, consultants, contractors, H&S practitioners and artisans) in order to seek their opinions on the types and frequencies of the accident happening at the Nigerian BCS. However, through extensive literature review, multifarious types of accident are identified, with an inclusion of: fall-related accident; vehicle/machine-related accident; explosions; contact with objects; collapse accident; lifting and handling objects accident; drown/asphyxiation accident; animal behaviour accident; victim of human aggression; welding accident; equipment/tools-related accident; slip and trip accident; and electrocution accident.

In addition, it should be taken into cognizance that past researchers (Orji et al., 2016; Nkem et al., 2015; Ezenwa, 2001) have documented much insights on H&S, and consequently recommended preventive measures to abate the occurrence of an accident on site, yet there is a dearth of research on a model for accident prevention in Nigeria. Following the comprehensive literature review carried out by the researcher, it is observed that little emphasis is placed on accident prevention model (APM) for the Nigerian building construction industry, and thereby giving a clearer indication of the necessity of model on PoA. It becomes imperative to develop a model, which will be useful to prevent accident on BCS in Nigeria, which can equally be applied to other developing countries globally. Hence, the development and implementation of this model will make the site free of accident, with an attendant safety of lives and properties.

1.3 Problem Statement

The Nigerian building construction sites are littered with accidents. The major problem facing the Nigerian construction industry, like other developing countries, is inadequate availability of data on occurrence of site accidents (Agwu & Olele, 2014; Idoro, 2008). This has made it impossible to have the knowledge of the frequently

occurring types of accident on building sites. Moreover, it has been observed that accident statistics are not available in Nigeria (Orji et al., 2014), accident and injuries are not reported (Udo et al., 2016), Nigeria rarely keeps, reports, or releases accurate records of accidents (Muhammad et al., 2015), occupational safety and health databanks are hard to come by in Nigeria (Abubakar, 2015), injuries generally are unreported (Okoye & Okolie, 2014), Nigeria has no reliable data on accident cases (Agwu & Olele, 2014), there are no accurate data in Nigeria (Idubor & Oisamoje, 2013), the system of reporting is weak and ineffective (Adeogun & Okafor, 2013), contractors hardly keep, report, or release accurate records of accidents (Diugwu et al., 2012), contractors are not likely reporting all accidents and injuries (Idoro, 2011), there are neither injuries reports nor statistics in Nigeria (Ehi, 2010). Ezenwa (2001) also added that, in Nigeria, the statistics on injury and death experiences probably represent only the tip of the iceberg when compared to the real situation.

Besides, past studies have not developed any accident prevention model in the context of Nigerian building construction industry. For instance, Oladiran et al. (2008) and Aniekwu (2007) could identify types and causes of an accident through survey, but none of the authors concluded with the development of any model that can prevent the occurrence of an accident on the Nigerian BCS. However, taking a cursory look at the multifarious scholars around the world that developed models for accident causations (Bellamy et al., 2007; Mitropoulos et al., 2005; Suraji et al., 2001; Abdelhamid & Everett, 2000), most of the models were developed through content analysis of the accident information available in their countries, but none of these existing studies was done to suit the peculiar situation in the Nigerian construction industry.

Moreover, Orji et al. (2016), Agwu & Olele (2014), Dodo (2014), Umeokafor et al. (2014) and Oladiran et al. (2008), recommend multifarious safety measures that can be taken to have the safety culture improved and consequently reduce the rate of accidents on site. It is worthy of note that less attention is placed by these Nigerian scholars on the development of an accident prevention model that incorporates the holistic involvement of construction stakeholders in the prevention of accident at the preconstruction and the construction stages. Against this backdrop, it can be presumed

that absence of reliable accident data has prevented the development of accident prevention model for the Nigerian construction industry by these great scholars, of which the absence of such data made the researcher to embark on exploratory survey to establish the rate of occurrence of accident on the BCS in Nigeria. However, looking at another dimension of some scholars across the globe, who have developed models in addressing the calamities confronting site workers through accidents, a good number of these models were developed to address construction accidents in developed countries (Bellamy et al., 2007; Suraji et al., 2001) unlike Nigeria. The fact remains that reports of accidents were analysed by these researchers to fashion out the appropriate model for their countries, thereby creating a missing gap, while at same time the dual-stage (preconstruction and construction stages) of accident prevention is not emphasized in those models. Consequently, a new model is needed for the Nigerian construction industry.

This research, in an attempt to quench the longing thirst of the bothering concern on how accidents can be prevented on BCS in Nigeria, embarks on exploration to identify the types of accident, determine the rate of occurrence and develop a valid and practicable model for the prevention of accident on BCS in Nigeria. In the ongoing research, determination of this fundamental issue of putting up preventive measures at both the preconstruction and the construction stages forms an existing gap to be levelled up. The research, therefore, contributes to the sound and effective management of safety in the Nigerian building construction industry (BCI). However, the developed model will be implemented to establish guides on preventing site accidents. Hence, the findings are of paramount importance to the participants on project construction management, such as project managers, designers, project supervisors, project investors, institutional and regulatory bodies, in relation to the practice of H&S management.

Consequent upon this, it becomes necessary to identify the various accidents happening on the BCS and put up practicable preventive measures in mitigating the occurrence of accident, with the statement captured as:

"How can the accident happening on the BCS be identified, how frequent are these identified accidents, what are the preventive measures that can be put up by the construction stakeholders in mitigating the occurrence of accident at the preconstruction and the construction stages, and what is the appropriate model can be developed for the prevention of accidents on the building construction sites in Nigeria?"

Sequel upon the development and implementation of the proposed model, safety on the construction site will be achieved, thereby resulting in reduction of loss of man-hours, improved productivity, contractors' image building, less prosecution, less financial losses and less additional costs.

1.4 Research Questions

Consequent upon the focus of this research, which is the development of an accident prevention model in mitigating the occurrence of accident, it is pertinent to address the following questions:

i. What are the types and frequencies of accident happening on the building construction site (BCS) in the South-Western States of Nigeria?
ii. What are the construction stakeholders-related preventive measures at the preconstruction stage in mitigating against the occurrence of accident?
iii. What are the construction stakeholders-related preventive measures during the construction stage in mitigating against the occurrence of accident?
iv. What is the appropriate and valid model that can be developed for the prevention of accident on the BCS?

1.5 Aim and Objectives of the Study

The study is aimed at developing a model for the prevention of accidents at the building construction site (BCS) in South-Western States of Nigeria. The specific

objectives of the research in order to address the issue of the prevalent accident occurrence are to:

i. Identify the types and frequencies of accidents occurring at the BCS.
ii. Determine the appropriate preventive measures against the occurrence of accident at the preconstruction stage in relation to the duties of the client, consultant, contractor, and the H&S agency.
iii. Determine the appropriate preventive measures against the occurrence of accident during the construction stage in relation to the duties of the client, consultant, contractor, and the H&S agency.
iv. Develop a valid and practicable model for the prevention of accident on the BCS.

1.6 Research Hypothesis

H_1 There is a significant relationship among the constructs that make up the accident prevention model.

H_2 Accident prevention is dependent on the preventive measures that make up the constructs.

1.7 Significance of the Study

Safety of life is of paramount importance to human beings, as accident hurts and kills. It is equally the responsibility of every entity. The BCS being prone to hazards has led to varying degree of incidents; death, deformation, blindness, time loss of project execution, loss of reputation of firms, cost of medical expenses and the likes. The Nigerian BCS is characterized with hazardous activities, thereby posing unsafe environment to workers, and invariably making the site unsafe. Daily occurrence of accident is perceived, as lives are lost on daily basis (Ehi, 2010). It is, therefore, necessary for the construction site to be equipped with preventive equipment to maintain zero level of accident on site. Globally, a closer look at the developed models

exclude the PoA in relation to the duties of the construction stakeholders at the preconstruction and the construction phases, of which Nigeria is involved.

Consequently, the need to prevent the occurrence of accident on the site necessitated the development of a model. Thus, the model will depict the construction stakeholder preventive measures at both the preconstruction stage and the construction stage. The safety of workers on the site is a factor of the commitment of the stakeholders to H&S issues. Where the stakeholders are aware of their H&S roles, and being backed up with adequate regulations, the construction activities will experience uninterrupted H&S programme.

Nevertheless, the findings of this research will enable the building construction industry (BCI) to experience, report and record less accident on the construction sites, regain the lost image or reputation and avoid cost and time overruns. In addition, the outcome of the study will attract investors to invest in construction works, as the financial institutions would be ready to give loans to investors, consequent upon the fact that the processes of work on site will be made a safer one, and construction sites being a healthy environment. Likewise, the outcome will be of great significance to the Federal, State and the Local Governments of Nigeria as well as all other building industry stakeholders. Finally, the conceptual model to be developed would give a guide to the management of BCS in putting in place the appropriate and workable measures to prevent the occurrence of accident on the BCS.

1.8 Scope of the Study

The focus of this research is to determine the measures to be taken both at the preconstruction and construction stages in the prevention of accidents in the Nigerian building construction industry. The study addresses the client organisations, the consultants (Architects, Engineers, Builders, and Quantity Surveyors), the safety professionals, the contractors, the subcontractors and the artisans, whose scope of operation is within the six states (Lagos, Ogun, Oyo, Osun, Ondo and Ekiti) of the South-western zone of Nigeria. The study is delimited to identifying the different types

of accident, the rate of occurrence and formulating preventive measures both at the preconstruction and construction stages in the prevention of accident on the BCS. Consequently, a model for prevention of building construction accidents is developed.

1.9 Structure of Thesis

The study discusses and presents seven chapters consisting of:

Chapter One: This chapter is made up of the background of the research, with a brief discourse on issues relating to H&S and accident occurrence in the Nigerian BCI. The development of problem statement, research questions, the aim and objectives, research significance, gap and structure of the thesis are presented here.

Chapter Two: This second chapter gives the definition of some important terms used in the study. The theoretical framework of the study with the underlining concept of the study is equally presented. It also contains the overview discussion on the occupational H&S regulations. Besides, it comprises the strengths and weaknesses of past accident causation models. Moreover, various building construction accident are detailed, with the frequencies of its occurrence exhibited, which rounds off the chapter.

Chapter Three: This chapter discusses the multifarious preventive measures for PoA. This comprises of the construction stakeholders' duties in accident prevention at the contract stage (preconstruction) and the post-contract stage (construction phase). In addition, brief information is given in relation to the strategies employed in PoA in allied industries.

Chapter Four: Research methodology, being an important aspect of the study, is presented here. Descriptions of the research philosophy, design, method and procedure for data collection are explicitly given. Conclusion of the chapter is drawn via the inclusion of the data collection instruments, together with the validity and

reliability of the instruments as well as the statistical tools used for the research analysis.

Chapter Five: Detailed reports of the data analysis processes are given here, consisting of the field survey results, analysis and discussion on the basis of well-structured administered questionnaire and interview protocol. However, the problem, objectives and the research questions of the study underpin the generated data. In addition, the accident prevention model is equally presented.

Chapter Six: The development and the validation process of the proposed model is presented in the chapter.

Chapter Seven: This chapter contains reassessment of the research questions and the objectives. The conclusions and recommendations are drawn from the whole study and future areas for research are presented.

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