

**AN INVESTIGATION INTO OCCUPATIONAL SAFETY
AND HEALTH COMPLIANCE ON CONSTRUCTION
SITES IN NAIROBI CITY COUNTY, KENYA**

PHIRES MOKEIRA ABAYA

**MASTER OF SCIENCE
(Construction Project Management)**

**JOMO KENYATTA UNIVERSITY
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**An Investigation into Occupational Safety and Health Compliance on
Construction Sites in Nairobi City County, Kenya**

Phires Mokeira Abaya

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

Signature.....Date.....

Phires Mokeira Abaya

This thesis has been submitted for examination with our approval as the University supervisors.

Signature.....Date.....

Dr. QS. Abednego gwaya, PhD.

JKUAT, Kenya

Signature.....Date.....

Prof. Arch. Stephen Diang'a, PhD

JKUAT, Kenya

DEDICATION

This work is dedicated to my children Brian, Naomi, Diana and Abel for giving me humble time during execution of my thesis.

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ABBREVIATIONS AND ACRONYMS

APEC	Asia-Pacific Economic Cooperation
DOHSS	Directorate of Occupational Health and safety services
FKE	Federation of Kenya Employers
GDP	Gross Domestic Product
ILO	International Labour Organization
KeNHA	Kenya National Highways Authority
MDGs	Millennium Development Goals
OSH	Occupational safety and Health
OSHA	Occupational Safety and Health Administration
SPSS	Statistical Package for Social Sciences.
UN	United Nations
USA	United States of America
WHO	World Health Organization

ABSTRACT

Construction industry plays a significant role in the economic development of a nation. It creates employment to both skilled and unskilled labour which is a source of income to many people. Workforce is a key component in the construction industry and in the implementation of the production process, therefore construction firms should pay attention to maintaining Occupational Safety and Health. This is done to provide comfort whilst working and the resulting sense of safety for the workforce at the time of the production process and when dealing directly with their work environment. The purpose of this study therefore was to explore the possible ways of ensuring that there is occupational safety and health compliance in the construction sites in Kenya. It was guided by the four objectives: To establish the influence of employees' education on safety and health management in construction sites; To determine the influence of contractors competency on safety and health compliance in construction sites; To assess the influence of government policy on safety and health compliance in construction sites; and to trace the extent to which use of technology influence safety and health compliance in construction projects; Secondary information was obtained from related literature of the study which was presented as per the study objectives. Primary data for the study was collected through the use of questionnaires and face to face interviews. This study targeted engineers/ construction managers, contractors, site supervisors/foremen, safety officers and construction workers who are working on construction sites in Embakasi subcounty of Nairobi City County. Contractors and site supervisors involved with construction projects have a responsibility for health and safety none more than the site management. It's the duty of managers and supervisors to ensure that working conditions on site are safe and healthy so that operatives, other stakeholders near to or visiting the site are not placed at risk. Descriptive survey research design was adopted in this study because it enabled the researcher to obtain information that described the existing phenomena through questionnaires. Random sampling was used to select sample size of 261 respondents out of the entire population of 2610. The study revealed that most employees on construction sites do not wear protective clothing when at work whereas it's their obligation to wear them to prevent risks to their safety and health and if they are not provided by the contractor, they have a right of requesting for their provision. Most workers once employed are never trained whereas it's required by the Occupational Safety and Health Act, 2007 that no person shall work on a machine or a process liable to cause ill-health or bodily injury unless they have received sufficient training. The researcher recommended a study to be carried out to further find out the influence of working environment on occupational safety and health compliance in construction projects in order to advance the body of knowledge.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Construction industry plays a significant role in the economic growth and development of all countries. The industry remains one of the most dangerous sectors in the world with the highest fatality cases and it is characterized by intricate operations, high risk conditions with peculiar features (Li et al., 2018). Studies have continued to reveal that, most of the accidents occur on the construction sites due to lack of strict adherence to occupational safety and health standards (Cangan, 2019; Eyiah et al., 2019; Morgado et al., 2019). On the same note, Awang and Kamil (2014) argues that provisions geared towards the enforcement of the occupational safety and health (OSH) compliance rules and regulations at the construction sites, would be instrumental in combating the fatalities significantly.

Globally, construction industry safety and health compliance at the work place remains a great challenge (Cangan, 2019). In Australia, a study by Dumrak et.al. (2013) revealed that in South Australia, construction industry inherently experiences high fatalities, collapsing of structures, destruction of equipment, and rendering systems perplexing. Dumrak et.al. (2013) further argues that there are six severity categories (minor, moderate, serious, severe, critical and fatal) and thirteen factors (age, experience, gender, injured body location, organization size, project size, worksite location, time, season, weekday, type of construction occupation and mechanism of accident) representing characteristics of victims, work activity undertaken at the time of accident, work environment, mechanism of accident and the injured body location were included in the study. In addition, Dumrak et.al. (2013) claims that the worker characteristics such as age, experience, gender and language background and work environment variables that encompasses organization size, project size and location, mechanism of accident, and body location of the injury could be used to discriminate among different severity levels of an accident. As the age of the worker increases the severity of accidents tends to increase. Any

non-compliance to OSH guidelines is detrimental to a sharp increase in fatalities in the construction sites (Kemei et al., 2017).

In India Cangan (2019), revealed that the development of construction industry has been plagued with the accidents or injuries that frequently occur. It is estimated that there are around 60,000 construction fatalities that occur worldwide each year, which equates to one accident happening every nine minutes. Human error is the main reason for up to 80% of all incidents and accidents in high risk industries. According to the occupational safety and health administration (OSHA), the construction industry is responsible for more than 20 % of all worker fatalities. Site managers, supervisors and workers in general ought to be observant to the required OSH standards in order to ensure that their safety is guaranteed, failure to which fatalities will strike(Khodeir & Salahel-Dine, 2018). Falls from elevation, struck by objects, and electrocutions are among leading causes of fatalities on the sites. Also, accidents related to scaffolding account for a large proportion of the causes of the safety hazards. It is desirable that all such potential safety hazards are identified in the early and planning stages and preventive actions taken. Planning for safety typically consists of the identification of all potential hazards, as well as the decision on choosing corresponding safety measures (Cangan, 2019).

In Malaysia, a study by Sarkam et.al. (2018) on Factors Influencing Safety Performance at the Construction Site revealed that the construction industry played a major role in the development of Malaysia. Specifically, the sector made a huge contribution to the Malaysian Gross Domestic Product (GDP). The construction industry grew by 8.2 per cent, or RM140 billion in 2015 and 7.4 per cent, or RM166 billion in 2016. However, Sarkam et.al. (2018) lamented that, despite the fact that the construction industry being a major driver in a Malaysian economy, the industry was still marred with the highest fatalities due to inadequate adherence to the OSH compliance standards. Besides, Sarkam further advised that the management had to conduct proper safety education and training, as these are important tools to inform workers about workplace hazards so that they could work more safely and be more productive and effective. By conducting proper safety education and training, the

construction firms could impart the knowledge and skills needed for the workers to do their work safely.

In Africa, mostly in Sub-Saharan Africa, Mwaruta (2013) indicates that each year, 54,000 workers die and 42 million work-related accidents take place that cause at least three day's absence from work. Moreover, Small and medium-sized enterprises especially in emerging economies are increasingly relying on chemical production and use. In these settings: the access to people with experience in assessing and controlling exposure to chemicals is limited. Therefore, OSH provides a new approach to the control accidents out of chemicals and control banding of which products have been developed. It is a complementary approach to protecting worker health by focusing resources on exposure controls and bands chemicals in different groups according to their dustiness/volatility (ILO, 2018).

Studies have revealed that hundreds of millions of people throughout the world are employed today in conditions that breed ill health and/or are unsafe (Muiruri & Mulinge, 2014). Moreover, each year, work-related injuries and diseases kill an estimated one million people worldwide, which is greater than the global annual number of deaths from malaria (Bhole, 2016; Mwangi, 2016; Nyaruai et al., 2016). Annually, an estimated 160 million new cases of work-related diseases occur worldwide, including respiratory and cardiovascular diseases, cancer, hearing loss, musculoskeletal and reproductive disorders, mental and neurological illnesses(Nghitanwa & Zungu, 2017).

An increasing number of workers in industrialized countries complain about psychological stress and overwork. These psychological factors have been found to be strongly associated with insomnia, depression and fatigue, and burn-out syndromes, as well as with elevated risks of cardiovascular diseases. Only 5-10% of workers in developing countries and 20-50% of workers in industrial countries (with a few exceptions) are estimated to have access to adequate occupational health services (Khodeir & Salahel-Dine, 2018). Besides, even in advanced economies, a large proportion of work sites are not regularly inspected for occupational health and

safety (Widaningsih et al., 2018). The only surviving tactic is to embrace strict compliance to the required OSH standards in order to reduce the level fatalities.

In Egypt, Khodeir and Salahel-Dine (2018) argued that Health and Safety are related to ensuring the welfare of the labourers through protection in their separate work environment. Security of labourers is extremely crucial especially in high risk industries such as the construction industry in light of the fact that the fundamental power behind any site is the labourer. It has been argued that without wellbeing, the dangers and risks at an extremely risky place like construction sites could get individuals harmed, hurt or even executed and appropriately this could cause any development site deferrals and additional consumptions (Morgado et al., 2019). Occupational Safety and Health compliance is exceptionally crucial in construction industry since it is a high danger industry as the primary power behind any construction site is the labourer (Nawaz et al., 2020). Furthermore, the construction industry is a large user of manpower across a range of skills (Nyang'acha, 2008). Moreover, the supply of skilled manpower acts as a constraint to the capacity of the construction industry. A high percentage of construction firms serving a widely distributed market rarely use the same crafts people on successive projects. This high turnover leads to unknowingly hiring a percentage of accident-prone workers who have to be retrained or weeded out (Yoon et al., 2013).

In Namibia, a study by Nghitanwa and Zungu (2017) revealed that, construction workers have poor awareness of OSH provisions. Moreover, the study indicated the lack of OSH training on the construction sites contributed to poor OHS awareness. The lack of OSH policy in many construction sites revealed the absence of occupational health and safety programs in different construction sites. Interventions are needed in order to improve awareness of construction workers on OSH provisions. The study recommended that OSH training among construction workers and development of OSH programs in the construction sites be enhanced so as to improve construction workers awareness.

In Kenya, the construction sector is a key driver to economic prosperity through employment generation and contributes a significant portion of the Gross Domestic

Product (GDP). According to the Kenya National Bureau of Statistics (KNBS, 2020) Economic Survey, the construction industry in Kenya, contributed 4.9%, 5.1%, 5.6%, 5.5% and 5.6% towards the GDP of the country, in the years 2015, 2016, 2017, 2018 and 2019 respectively. This contribution is an average of 5.3%, but is lower than the average contribution found in developed economies, which Hildebrandt (2000) observes to be 10%. Despite recording a slower growth, the gross value added for the construction sector was estimated to have risen by 6.4 per cent in 2019 compared to 6.9 per cent in 2018 and had created job opportunities for employment for a wide range of people skilled and unskilled (KNBS, 2020).

According to Manduku (2015) workforce is a key component in the construction industry and in the implementation of the production process, therefore the construction firm should pay attention to maintaining OSH. Moreover, site operatives were congested more than the required capacity against the required occupational health and safety standard. Congestion on the sites increases the risk of the construction workers safety and health on the construction sites. The observation of the OSH standard on the construction sites will greatly reduce site related accidents. This is done to provide comfort whilst working and the resulting sense of security for the workforce at the time of the production process and when dealing directly with their work environment (Rachmawati, 2013). According to World Health Organization (2018), most of the world's population (58%) spend one third of their adult life at workplace. Work then is an important contributing factor to the well-being of workers but also to that of their families and society. Health at workplace environments are among the most valuable assets of individuals, communities and countries. OSH can be an important vehicle not only to ensuring the health of workers, but also to contributing positively to productivity, quality of products, work motivation, job satisfaction and thereby to the overall quality of life of individuals and society (WHO, 2018).

In Nyamira and Kisii Counties studies have revealed that in the year 2021 two buildings have collapsed, one at Nyamira County Headquarters whereas one at Daraja Mbili in Kisii County (Ongwae & Abuga, 2021). The study further reveals that most of the workers on the site did not put on the safety gears, thus resulting to

severe head injuries and even death. Adherence to safety standards at the construction sites not only promotes safety but also reduces dangers which are detrimental to humans.

Studies by Ogetii et.al. (2019) revealed that, Occupational Safety and Health compliance for the construction projects in Kenya remains a great challenge. The researchers further indicated that, due to lack of compliance and strict adherence to the occupational safety and health standards, fatalities, destruction of equipment and machines, injuries and chemical explosions on the construction sites are still evident. On the same note, Kemei (2016) argued that, lack of proper training for the workforce, inefficient contractor's capacity, and inappropriate use of technology greatly contributed to thriving of the existing phenomena. Therefore, this study seeks to establish the Occupational safety and health compliance measures are followed in the construction sites, through enhancing employee's skills, contractor's competency, legislation of effective government policies regarding construction industry and appropriate use of technology.

1.2 Statement of the Problem

Construction industry is characterized with very scanty records on accidents and ill-health problems. Construction activities on sites are executed by operatives who work in close proximity to each other. Due to the proportionally limited zone on construction sites and many unplanned activities taking place, the industry has a high potential for fatal accidents and unexpected risks (Nasser, 2010). Construction works are hazardous and it involves; climbing high levels above the ground, digging deep trenches, handling large volumes of materials, operating large powered machines and working with hazardous substances which put workers at risk (Frederick & Joyce, 2009; cited in Oluoch, 2012). Everyone involved with construction project has a responsibility for health and safety none more than the site management. It's the solemn duty of construction managers and supervisors to assess that working conditions on site are safe and healthy so that operatives, other participants and persons near to or visiting the site are not placed at risk (Ogetii, 2019).

Studies have revealed that Occupational Safety and Health compliance for the construction sites in Nairobi City County is wanting (Kemei 2016; Nyamboki, 2019). Their studies further revealed that Nairobi remains the most dangerous County in Kenya with high fatality rates, and destruction of equipment properties. This is evident because most of the construction sites rarely adhere to the Occupational Safety and Health standards. Their studies further observed that most of the construction firms do not ensure safety of their workers; workers work without personal protective equipment/gears these expose them to great dangers. It was also noted that a larger number of the workers in the construction sites in Nairobi have very little safety skill due to the economic situation which has compelled them to work in order to earn a living. Therefore, this study assessed the influence of employees' education; contractors' competency; government policy and use of appropriate technology to enhance OSH compliance of the construction sites in Nairobi City County. It was therefore on this valid ground that the researcher found an enormous research gap that this research needed to be addressed.

1.3 Purpose of the Study

The purpose of this study was to investigate on the ways to enhance the effectiveness in compliance of the Occupational Safety and Health Act, 2007 by the Ministry of Labour and Human Resource Development in the construction industry. This would help the Ministry know whether they had been effective or not and hence take the necessary actions.

1.4 Objectives of the Study

The main objective of the study was to investigate the Occupational Safety and Health compliance on construction sites in Kenya.

The study sought to achieve the following specific objectives:

1. To establish the influence of employees' level of education on occupational safety and health compliance on construction sites;
2. To determine the influence of contractor's competency on occupational safety and health compliance on construction sites;

3. To assess the influence of government policy on occupational safety and health compliance on construction sites;
4. To determine the extent to which use of technology influence occupational safety and health compliance on construction sites;
5. To develop a framework which can enhance occupational safety and health compliance on construction sites.

1.5 Research Questions

The study was guided by the following questions:

1. To what extent does employees' education influence occupational safety and health compliance on construction sites?
2. To what extent do contractors' competency influence occupational safety and health compliance on construction sites?
3. How does government policy influence occupational safety and health compliance on construction sites?
4. To what extent does the use of technology influence occupational safety and health compliance on construction sites?

1.6 Research Hypotheses

The study was guided by the following Null (H_0) and Alternative (H_a) hypothesis:

1. **H_0 :** There is no significant relationship between employees' education and occupational safety and health compliance on construction sites;
 H_a : There is a significant relationship between employees' education and occupational safety and health compliance in construction projects;
2. **H_0 :** Contractors competency does not influence occupational safety and health compliance on construction sites;
 H_a : Contractors' competency influences occupational safety and health compliance on construction sites;

3. **H₀**: There is no relationship between government policy and occupational safety and health compliance on construction sites;

H_a: There is a relationship between government policy and occupational safety and health compliance on construction sites;

4. **H₀**: Use of technology does not influence occupational safety and health compliance on construction sites;

H_a: Use of technology influences occupational safety and health compliance on construction sites;

1.7 The Significance of the Study

The findings of this study would be valuable in the construction industry as it would enable other researcher get empirical data to boost the scholarly work. In addition, other researchers would benefit from the study by ensuring that articles related occupational safety and health practices in the construction projects are published in order to advance the body of knowledge.

Construction practitioners will benefit from the study findings by ensuring that occupational safety and health standards are strictly followed in order to reduce fatalities at the construction sites. In nutshell, strict compliance to OSH standards by the practitioners greatly reduces work place accidents and facilitate healthy working environment which translates to productive outcomes.

The study findings would be of a great significance to the policy makers since the study laid a legal foundation strengthening OSH policy in attempt to ensure that every person in the construction site ought to wear protective gears.

1.8 Assumption of the Study

The study was based on a number of assumptions which included; respondents would avail themselves and faithfully respond to the questionnaires, the respondents would respond to the questionnaires by giving the right response without manipulation, and fear of contradicting thoughts.

1.9 Limitation of the Study

The study was limited to time constraints since in the construction sites workers are at all times busy thus the researcher would design a questionnaire in a manner that would take little time possible during administration and responding to the questions thereto. In addition, construction project are very delicate bearing in mind that it is represented by numerous stakeholders who in one way or the other may be distrustful and unwilling to give relevant information for this investigation. However, the researcher prompted confidentiality by showing the research permit and administered a questionnaire tool that was simple, giving the respondents easier time to respond to the questions within the constrained time.

1.10 Delimitation of the Study

The study was designed to investigate the factors that influence occupational safety and health compliance in Embakasi subcounty of Nairobi City County in the Republic of Kenya. The study featured the construction site within the Embakasi subcounty of Nairobi City County thus giving the researcher promenade time to stay focused to the study objectives. The study was limited to the study objectives.

1.11 Layout of the Thesis

The study is organized into five chapters and appendices. Chapter one is the introduction and is composed of background which discusses occupational safety and health in the construction industry globally and conceptualizes the research problems of occupational safety and health of employees on construction sites. Further, the objectives and research questions, significance, assumptions and limitations of the study are highlighted

Chapter two discusses the various occupational safety and health measures considered in the construction industry globally and in the Kenyan context. It discusses the developments in occupational safety and health studies in the construction industry and finally the literature gap is indicated.

Chapter three describes in detail the methodology used in conducting the study. The research design, target population, sampling procedure, data collection, research instruments, pilot study, data analysis and ethical considerations are also discussed.

Chapter 4 presents the data analysis and results obtained from the study on Occupational Safety and Health compliance. The response rate is discussed, the data from the study are analyzed and their implications.

Chapter 5 covers conclusion and recommendations. Finally, recommendations are made on how to enhance OSH construction sites and gives direction for areas for further research.

1.12 Summary

This first chapter introduced the problem area including the knowledge gap left by other researchers in the area of occupational safety and health compliance on the construction sites. It further justifies the existing phenomena by reviewing the related literature and strategically realigning it with the study objectives. The literature reviewed is discussed in the next chapter.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the literature related to the study based on the following thematic areas: Overview of occupation safety and health, employees' education and OSH compliance, contractors' competency and OSH compliance, government policy and OSH compliance, use of technology and OSH compliance, theoretical and conceptual frameworks.

2.2 Overview of Occupational Safety and Health (OSH)

Literature on occupational safety and health in the construction industry is unlimited. Nawaz et.al. (2020) explored health and safety factors affecting the locals and stakeholders in infrastructural projects of the developing nations. The study revealed that environmental degradation, bad conditions, unsafe work practice, lack of material and technical support, project scope constraints, poor emergency systems, and negligence of safety rules were the main factors. It was as well found that the implementation of most of the infrastructural projects was frustrated by poor planning and ineffective communication between the government and the public. Liy et.al. (2016) sought to understand the root cause of fall hazards within the construction industry in Kuching, Malaysia. They specifically investigated the different types of fall hazards common in the industry for the purpose of coming up with the most effective solution. The findings of the study showed that most of the falls in the construction industry are due to scaffolding falls and roof falls. Communication barrier was the major problem causing the falls.

Yoon et.al.(2013) investigated the status of occupational health and safety management system (OHSMS) in South Korea, and its effect on the rate of accidents in the country's construction industry. From the results of the study, it was found that implementation of OHSMS led to the decrease of accident rate by 67% between 2006 and 2011. The rate of fatal accidents decreased by 10.3%. In Indonesia, Widaningsih et.al. (2018) explored construction workers' attitude towards OSHMS

and their implementation. From the findings of the study, it was established that majority of the construction workers are not aware of the importance of implementing OHS into their work activities. As a result, work-related accidents are only regarded as risks. Some workers consider the accidents as fate that has to be accepted.

Mahmudul et.al. (2017) investigated the main safety and health hazards in a construction site at Patuakhali Science and Technology University (PSTU), in Barisa, Bangladesh. It was established that the main health hazards in the industry included falls from heights, being hit by falling objects, muscular and back pains due to manual work, health problems as a result of dust, chemicals, and noise, and injuries from fire and other types of disasters. In their study of occupational safety and health in Moroccan construction sites, Tarik and Adil (2018) sought to understand the cause of accidents in the sites. It was established that the accidents are majorly caused by working at heights, working at confined places, lifting heavy construction materials, being involved in deep excavations, handling hazardous materials, electrical work accidents, and injuries associated with the use of mobile equipment.

Amfo-Out and Agyemang (2017) assessed the occupational health and safety practices of the auto mechanics of the informal sector in Sekyere East, Ghana. It was established that these workers were exposed to biological hazards, including insect bites, chemical hazards such as fumes, and asbestos, physical hazards, including burns and heat, and psycho-social hazards, such as work that involves pressure. Awodele *et al* (2014) assessed adherence to control initiatives or measures in paint factories of Lagos West Senatorial District, in Nigeria. From the results of the study, 72.5% of the respondents admitted being aware of the hazards of their jobs, while 40% said that they did not use protective devices. A record 90% of the respondents exhibited symptoms relating to exposure to hazards. Most paint factory workers had heavy metal concentrations in their urine samples.

Oginyi (2011) examined how pollution and unprotective behavior in quarry industries of Ebonyi State, in Nigeria, affects employees' conditions. He found that

these factors affect the psychological and physical health of the workers. This in turn lowers their efficiency and productivity. Ezisi *et al* (2017) assessed the use of personal protective eye devices among workers of a stone quarry in Abakaliki, Southeastern Nigeria. It was found that that there is high level of awareness of the importance of using the protective devices yet most of the workers did not utilize them. Martinelli (2018) studied accidents that involve tower cranes in the construction industry. She detailed crane-related hazards that one would likely encounter in the construction industry. These include falling loads due to mechanical failure and operator incompetency, electrical hazards as a result of contact with power sources, and crane overload.

Ertas and Erdogan (2017) examined occupational health and safety statistics in relation to demolition work in the construction industry. They considered occupational accidents associated with demolition activities. From the findings of the study, it was established that about 77.6% of the accidents were due to collapsing buildings, falls from heights, and being hit by flying and falling objects. Khan *et al* (2019) studied the excavation safety of geotechnical construction sites with an aim of proposing a safety rule compliance model. The researchers limited themselves to risks pertaining to cave-ins, prohibited zones, and falls. They suggested that an automated safety rule compliance approach can help decision makers in the construction industry to come up with practical safety plans during the pre-construction stage. Nghitanwa and Zungu (2017) sought to understand the awareness of occupational health and safety provisions among construction workers of a construction industry in Windhoek, Namibia. It was established that most construction workers are not aware of the provisions.

Muui *et.al.* (2016) analyzed the health and safety risks of the building construction industry in Nakuru, Kenya, in order to determine preventive measures. The researchers found that many accidents occurred in the industry as a result of lack of emphasis on the safety and health issues. There was limited use of protective equipment, lack of scaffold, and absence of first aid facilities. It was recommended that the introduction of sector specific policies to the building construction industry by the government can help to improve compliance to the safety and health

measures. In their study, Kibe et.al. (2016) assessed safety and health management practices on the public construction sites located in Nairobi, Kenya. The researchers found that injuries on the sites are mainly caused by tools, over exhaustion, and slips. Other injuries were caused by electricity, fire explosion, and transport accidents.

Kemei et.al. (2016) conducted a study to identify common accidents in the construction project sites in Nairobi County. The study also aimed at evaluating factors that lead to the accidents. From the findings of the research, it was established that 17% of the injuries in the construction sites were caused by falling objects, 15% were as a result of falling from heights, 13% were due to operations on light machines and motor vehicles, while 11% of the injuries were associated with lifting heavy objects. It was found that the main factors that lead to these accidents include reluctance to provide safety resources, lack of safety consciousness among the workers, lack of adequate training, poor enforcement of regulations, and limited adherence to operational procedures.

Muiruri and Mulinge (2014) examined various challenges that are encountered in health and safety management in construction sites of Nairobi. It was established that inadequate protective equipment, lack of maintenance of protective gear, limited support from the top management, lack of welfare facilities, unawareness of safety and health matters, and absence of first aid kits were some of the main challenges. The researcher further noted that these challenges arose due to inadequate funds, lack of protective equipment implementation measures, and lack of effective monitoring and evaluation programs. On his part, Mwangi (2016) investigated factors that cause accidents and health hazards, and their extent within the construction projects in Nairobi City County. The main factors that were identified include unusable materials, workers' false actions, supervisory faults, infringement of safety procedures, and lack of adequate safety programs. The researcher found that these factors contributed to nail injuries, cuts and fractures, falls, motor accidents, and other health hazards.

Mwangi (2016) connotes that total safety against a given risk can only be achieved when the source of risk eliminated. This was, however, not possible and safety

measures should therefore concentrate on the reduction of sources of risk as much as possible to attain an acceptable level of safety.

Razuri et al. (2007) in their study on effectiveness of safety management practices and strategies in construction projects showed that the following factors have a positive impact on construction safety performance:

- a. Orientation and specialized training for management- The study concluded that safety training is a basic requirement for management commitment and leadership to organizational safety;
- b. Project planning- The analysis of the findings showed that there was a direct relationship between planning best practices and safety. Those companies that made a constructability review before initiating the construction of the project and which included safety in the planning process improved its safety performance;
- c. Behavior based safety programme- Few projects implemented the behavior-based safety programme and of the few firms that implemented it, there were marked improvements in the state of occupational safety with the firm;
- d. Drug and alcohol testing- It was found that construction firms that conducted a drug and alcohol testing had better safety records especially where the testing was done randomly, and the tests included administrative personnel;
- e. Orientation and specialized training for workers- Training for workers was either formal or informal. The average amount of time invested in the training of workers per week was an important consideration as it influenced the quality of training, hence the impact on safety;
- f. Safety committee- Most projects had a safety committee which evaluated and controlled the conditions of work by means of safety inspections. To ensure effectiveness of the safety committees, inspection reports should be given to the safety manager;
- g. Pre-task planning- When gangs analysed the risks prior to performing their work, there was a positive impact on safety performance of the projects. Gangs should prepare and analyze or plan before each new task. It was

observed that where the gangs were involved in the analysis of the risks, there were better results; and

- h. Safety incentive programme- It was observed that those projects which had a formal safety incentive programme had better safety records than those that did not have it.

Building construction is a more hazardous occupation than those that take place under more sheltered and static conditions like factories (Nyagah, 1989). In furtherance to Nyagah's research, Muui et.al. (2016) expounded that a worker on the building site is potentially in danger of injury, which in some instances may be fatal. This, therefore, calls for more efficient and effective safety measures. The main purpose of safety measures on construction sites is to remove the fear of injury from the employees during productive operations. Many methods would be sufficient but each must be assessed individually in light of the operations and the dangers associated with it. To succeed in creating a level of safety confidence in each labourer, Muui et.al. (2016) further recommended a system of training which showed each man the correct approach and the sequence of operations he would be required to carry out. Emphasis should be placed on the correctness of the training procedure, increasing the workers awareness of the dangers in mishandling the equipment and stressing the importance of the timing of his activities in relation to others working with him. There must be a measure of co-ordination and his overconfidence should not be allowed to diminish his concentration.

2.3 Employees' education and OSH compliance

Occupational safety and health compliance purely relies on the level of sensitization, training on safety gears and strong and fair enforcement is an essential part of the mission. In the United States of America, OSH has been increasing its enforcement efforts since 2002, with more inspections, particularly health inspections, and targeting the most dangerous workplaces. It has intensified plans to conduct 36,400 inspections every year and will focus more enforcement on workplaces such as construction and other high-hazard industries (OSHA, 2018). Approximately 3,000 of the inspections ought to be done in workplaces with the highest injury/illness rates

in order to mitigate any potential injuries. In addition, employers with fourteen or more injuries or illnesses per 100 workers that result in lost workdays can anticipate an inspection. Employers who experience a rate of between eight and fourteen injuries or illnesses are on a secondary list for possible inspection (OSHA, 2018).

According to Ondieki (2016), Employee Education on OSH procedure greatly reduces workplace accidents. In addition, effective and credible enforcement depends upon the skills, training, and education of OSH's compliance officers. To accomplish their mission, compliance officers must be experts in workplace conditions and the industrial practices in the workplaces they visit. To ensure that compliance, officers have the right educational level, DOSH ought to increase the number of compliance officers who are certified by professional associations of industrial hygienists and safety engineers. Besides, certification would improve respect for compliance officers and increase employer and employee trust of OSH enforcement staff. Also, considering recruitment of more compliance officers from the private sector and allowing staff to complete relevant internships. These steps would strengthen the effectiveness of the compliance officers and enable them to become more familiar with the workplaces and industries that they inspect.

Omulo (2016) established that the construction industry is one of the most dangerous industries to work in. By being aware of the common injuries suffered on construction sites, workers could help in preventing the incidences from taking place as well as through emphasis put concerning site safety. The causes of the injuries on construction sites are numerous and diverse. Therefore, avoiding injuries and identifying any potential injury is only possible through familiarizing with the injury types (Peckar et al., 2015). Expert knowledge based on the OSH is paramount to every employee thus reducing accidents and hazards at the work place. Construction industry is considered as being risky and dangerous, despite its importance in contribution gross domestic product (GDP), gross domestic capital formation (GDCF), production of capital facilities and assets required for production in other sectors and creation of employment.

In most of under developed countries, health and safety in construction project delivery is not given proper considerations or prioritized, and during construction, employment of safety measures is considered a burden by most organizations. Actually, almost every day in almost every construction site there is either accident, injuries, incidents or near misses occurring to the workers. The occurrences ranges from near misses, minor injuries to fatal accidents which are not all reported for remedial actions to be taken (Omulo & Ondieki, 2016). Basic expert training based on machine operation safety, workplace hygiene, safety precautions and gears, accident evasion strategies and occupational diseases ought to be impacted to the workforce on sites so that they can be acquainted with relevant OSH information and reduce carnage at all costs. It is therefore on this premise that the researcher found employees' education a relevant and crucial factor in the phenomena under study.

2.4 contractors' competency and OSH compliance

Contractors should show their competency on site by putting the safety gears and precaution measures and also respect the rights of workers. Moreover, most of the site workers are ignorant about their rights concerning health and safety in construction sites and therefore do not bother to report any injury that occurs to them while working. On the other hand, construction sites have different kinds of people ranging from skilled to non-skilled. Some of the non-skilled do not have even basic education and this poses them with a great challenge in expressing themselves and hence opt not to report less or not to report at all any site occurrence. There is lack of awareness of the safety and health regulations stipulated in various legislations such as the Public Health Act Cap. 269 (1965) and the Workers' Compensation Act (2000). Enforcement of these acts is still a big problem in the construction industry (Omulo, 2016).

Jaafar et. al. (2018) observed that overall safety in the construction industry could be improved through effective communication. Communicating effectively with the workforce on accident prevention is often the key to a successful approach to safety improvement and record keeping. Keeping records occurrence of the types of accidents puts the construction firm in a better position to: prevent them happening,

motivate the workforce; measures safety bonus for workers or gangs with least accident record; use safety equipment and making sure that they are available when and where they are needed and taking disciplinary action against workers who refuse to or frequently forget to observe safety requirements.

In Kenya, construction firms in most cases do not provide all the required safety manuals and protective gears to the work force thus leading to unreliable data on accident cases on construction sites. Most of the construction firms do not report all the accidents that occur on construction sites (DOHSS Annual Report, 2011). Many workers have met their deaths in construction sites while others have become permanently crippled from construction related injuries. Furthermore, laws on occupational safety and health are not strictly enforced; Safety rules in most construction sites do not exist and if they exist, the regulatory authority is weak in implementing each rule effectively. When accidents occur, they result on both direct and indirect cost; Direct cost includes, medical bills, premium for compensation benefits, liability and property loss. Indirect cost includes, time lost while attending burial ceremonies, time lost in investigation, down time on damaged equipment and losses arising from site closure. Competency of the contractors ranges from the ability to provide safe equipment, give safety operation manuals to the workforce, ensure that the project implementers are doing their work in accordance to the OSH regulations, failure to which will result to OSH problems (Kemei et al., 2017).

2.5 Government policy and OSH compliance

There is need for an effective government policy in the construction industry. This will help in ensuring compliance to law and order, hence promoting harmony. Government policy in a nutshell strengthens the ability to champion the employee rights with regards to occupational safety and health (Maano & Lindiwe, 2017). In addition, organizations must develop an appropriate human resource response that enables their organizations to not only be prepared for any eventuality but also instill a safe culture and political stability. It is important for organizations to have a safety policy in place that clearly states the organization's safety concerns and how it

intends to deal with them and implement the same (Umar et al., 2018). The employer has certain obligations to undertake and incorporate in the workplace to minimize chances of accidents and diseases occurring. OSHA (2018) requires employers to register their premises with the Director of Occupational Health and Safety. OSHA requires employers to carry out a risk assessment of the workplace after which preventive and control measures are supposed to be implemented as per the findings of the said assessment.

A safety and health audit should be conducted after every twelve months by an external auditor approved and certified by the Director of Occupational Health and Safety (Gatithi, 2012). Embracing safety measures on construction sites is to drive away the fear of injury from the employees during productive operations. The removal of fear raises the production of labour (Williams et al., 2018). This is because the workers feel secure and thus work at ease. It is thus clear that the level of safety within a firm will affect its productivity. ILO (2018) report on improving safety notes that apart from the humanitarian aim of ensuring the wellbeing of all concerned, it is obvious that accidents and illness mean additional costs and perhaps disruption of the contract. Mwangi (2016) noted that an improvement in occupational safety and health would raise morale and productivity due to the fact that employees' political standpoint could emphasize more on their work without fear of personal injury. Mwangi further added that it was clear that economic development was not feasible without the total improvement of the quality of life of all people. This shift in emphasis towards a balanced social economic development reinforces the importance of occupational safety. It can therefore be said that poor safety management practices on construction sites will lower productivity of the construction industry.

According to OSHA (2018), OSH Act 2007 regulations aim to ensure the safety, health, and welfare of workers in the workplace. They typically outline the responsibilities of employers, employees, and regulatory bodies in creating and maintaining a safe working environment. Some common areas covered by OSH regulations include:

1. Workplace Hazards: Identification and management of workplace hazards, including physical, chemical, biological, and ergonomic hazards.
2. Risk Assessments: Conducting risk assessments to identify potential hazards and implementing appropriate controls to mitigate those risks.
3. Safety Policies and Procedures: Establishing safety policies and procedures that outline the responsibilities of employers and employees in maintaining a safe work environment.
4. Training and Education: Providing training and education to employees on OSH practices, hazard recognition, and emergency procedures.
5. Personal Protective Equipment (PPE): Specifying requirements for the use of personal protective equipment to minimize exposure to workplace hazards.
6. Accident Reporting and Investigation: Establishing procedures for reporting and investigating workplace accidents, injuries, and near misses to identify causes and prevent future incidents.
7. Inspections and Compliance: Outlining mechanisms for regulatory bodies to conduct workplace inspections, enforce compliance with OSH regulations, and impose penalties for non-compliance.

According to Musyoki (2014), government policy as a whole greatly influences the implementation of OSH. Occupational health and safety is concerned with protecting the safety, health and welfare of people engaged in work and employment. The goals of occupational health and safety and health programs include, fostering a safe and healthy work environment which may also protect co-workers, family members, customers and many other who might be affected by the workplace environment. International Labour Organization and World Health Organization hold that occupational health aims to promote and maintain the highest degree of physical, mental and social well-being of workers in all occupations, prevention amongst workers of departures from health caused by their work conditions, protection of workers in their employment from risks resulting from factors adverse to health (ILO & WHO, 2018). Therefore, health and safety reduces the number of accidents at work, it reduces the level of sickness and absence and this results in healthy employees and high productivity, good performance and productivity, therefore high profits. Safety is developing the right safety culture in reducing workplace accidents

and incidents. The existence of government policy can affect positively or negatively the execution of OSH regulations thus affecting compliance thereto.

For the construction industry to thrive on well, safe and free from occupational health problems, government policy should be cultured positively. Negative aspect of government policy such as conflict of interest, peer pressure, bribery and corruption should be mitigated with well-structured government policy of championing health and safety precautions, sensitization of employees rights according to OSH regulations thus motivating the workforce to promote performance and maintaining OSH standards henceforth reducing workplace accidents and deaths.

2.6 Use of technology and OSH compliance

Occupational safety and health at the workplace is important and mostly when the right technology is in place to ensure awareness of any hazard, monitoring and control system signals is part of the technology that when installed at the workplace will reduce accidents and occupational diseases greatly (Ondieki, 2016). Furthermore, Ondieki continues to allude that, without relevant technology OSH compliance will not be achieved because provision of automated control systems sends quick signals and reduce workplace accidents greatly.

Research done by Kemei et.al. (2017) identified a number of relevant causes influencing safety performance in the construction industry namely: Poor safety awareness from top management, lack of training, poor safety awareness of project managers, reluctance to input resource on safety, reckless operation of machines, lack of certified skilled labour, poor maintenance of equipment, lack of first aid measures, lack of rigorous enforcement of safety regulation, lack of organizational commitment, low level of education of workers, poor safety consciousness of workers, lack of personal protective equipment, ineffective operation of safety regulation, lack of technical guidance, lack of strict operational procedures, lack of experienced project managers, shortfall of safety personnel on site, lack of protection of material during transportation, lack of protection of material during storage, lack of teamwork, fatigue by workers, shortage of safety management manuals, lack of innovative technology on safety and, poor information flow problems.

Matters relating to technology and OSH touches various aspects, including accident monitoring, workforce OSH supervision, site operations instruction manuals, compensation policies and many more. In the same vein, Eyiah et.al. (2019) postulated that the cost of safety was an economic incentive to ensure safety. For material losses in which no injury occurs, the accounting of loss could easily be assessed; where human loss was concerned, the costing becomes difficult and burdened with ethical pitfalls. Use of digital accident detection sensors anticipates to provide a safe environment at the onstruction sites.

Eyiah et.al. (2019) further alluded that in construction, the costs of accidents would fall as safety measures increase. When there is reduction in risk, the accident cost would also be reduced and in order to reduce risk, we must spend money on accident prevention. The approach does not take into account the subjective nature of many accidents. Accident costs could also be quantified by breaking accidents down into three parts; fatalities, serious injuries and other injuries. Cangan (2019) notes that the cost of an accident could then be expressed as:

$$C_a = R_d (A_{0d}) + R_s (A_{s_s} + A_{0s}) + R_o (A_{s_o} + A_{0o})$$

Where;

C_a = annual cost of accident per worker

R_d = annual risk of death per worker

R_s = annual risk of serious injury per worker

R_o = annual risk of other injury per worker

A_s = subjective element of cost

A_o = objective element of cost.

Subscripts d, s or o for death, serious injury or other injury

Construction processes in developing countries share similar characteristics in terms of the adoption of technology, construction methods, cultural environments and regulations. Therefore, inadequate information and lack of education and training

workplace safety and health is a great concern in the construction industry. Manu et.al. (2019), provides that culture and attitudes of construction workers, and supervisors about health and safety often condone risk taking and unsafe and unhealthy work practices, passing bad habits from one generation of workers to the next. Inadequate enforcement of traffic regulations was also cited as a challenge at 57%, 45% and 59% respectively according to KeNHA, APEC and the contractors. There was also lack of modern technology which could have assisted the police in tracking down traffic offenders for example CCTV surveillance cameras. Roy (2018) also noted that inadequate enforcement of traffic regulations is a challenge in the management of road safety.

2.7 Theoretical Framework

Merrill (2018) holds that a theory is a generalizing viewpoint of a certain phenomenon. Theories guided in findings facts rather than reaching goals and are neutral concerning alternatives among values. This study was guided by the two factor theory by Herzberg and the systems theory by Ludwig von Bertalanffy.

2.7.1 The Two Factor Theory

The founding father, Frederick Herzberg is the proponent of this theory in 1959 whose opinion was that there are some job factors that result in satisfaction while there are other job factors that prevent dissatisfaction and dissatisfaction at the workplace may be due to non-compliance of OSH regulations, thus leading to accidents and low outcome. Herzberg in his research based on the interviews of 200 engineers and accountants working in eleven different firms in Pittsburg, USA and provided us with the Two Factor Theory of motivation. This theory is anchored on Maslows hierarchy of needs but he distinguishes needs based on their influence on employees satisfaction and dissatisfaction. These are hygiene factors and motivation factors in OSH regulations it implies of safety and health procedures at the workplace. Hygiene factors were described as factors required to support the mental health of employees; their absence demotivates employees but their presence does not motivate employees in a strong way thus leading to non-compliance of the occupational safety and health regulations at the workplace (Ondieki, 2016). These

factors include job satisfaction, job security, working conditions, training, availability of funds, technical supervision and infrastructural enhancement, political issues, use of technology, contractors competency, employees education interpersonal relations and workplace culture and status as implied by (Ondieki, 2016).

Motivation factors on the other hand are job conditions that operate primarily to build strong motivation and strict compliance to OSH but their absence does not create strong dissatisfaction. These factors include; good physical infrastructure, access to funds, stakeholder engagement and favourable cultural practices. The theory helps employers in understanding the influence occupational safety and health compliance in construction industry. The main contribution of this theory is that it highlights the importance of OSH in work motivation and reduction of accidents thus bringing out OSH compliance in the construction industry (Ayuka, 2017).

Therefore, Herzberg's proponent is so instrumental with an articulation on the principles of occupational safety and health compliance clearly inhibited in hygiene and motivation factors at the workplace.

2.7.2 The Systems Theory

Ludwig von Bertalanffy, an Austrian biologist who introduced the concept of systems theory in the mid-20th century. He is widely recognized as one of the key figures in the development of systems theory.

Bertalanffy argued that there are common principles and patterns of organization that apply to diverse systems across different disciplines. His work emphasized the need for a unified and interdisciplinary approach to studying complex systems and understanding their behavior. Bertalanffy's ideas on general systems theory laid the foundation for exploring the interrelationships, interactions, and dynamics within systems, and how they influence the behavior and outcomes of those systems.

According to Ondieki (2016) applying systems theory to occupational safety and health (OSH) involves understanding workplace safety as a complex system with

interconnected components. It recognizes that OSH is influenced by various factors, including the work environment, technology adopted, organizational structure, individual behavior, and regulatory frameworks. Ondieki (2016) further discusses how systems theory can be applied to OSH:

- i. **System Boundaries:** OSH systems have boundaries that define the scope of the system, such as a specific workplace, industry, or occupational sector. Understanding these boundaries helps identify the stakeholders, processes, and interactions relevant to OSH within that context.
- ii. **Inputs and Outputs:** OSH systems receive inputs from both internal and external sources. Inputs can include factors such as equipment, technologies, work processes, organizational policies, human resources, regulatory requirements, and external influences like societal expectations. The system processes these inputs to generate outputs, such as safe working conditions, reduced injuries and illnesses, improved safety culture, and compliance with OSH regulations.
- iii. **Interdependencies:** Systems theory recognizes that OSH is influenced by interdependencies and interactions among various elements. For example, workplace hazards can be influenced by equipment design, work processes, training programs, and employee behaviors. Changes in one component of the system can have ripple effects on others, highlighting the need for a comprehensive understanding of the interactions and feedback loops within the system.
- iv. **Subsystems:** OSH systems can be viewed as consisting of several interconnected subsystems, such as management systems, hazard identification and risk assessment processes, training and education programs, incident reporting and investigation systems, and regulatory frameworks. Each subsystem plays a role in contributing to overall OSH performance, and understanding their interactions and dynamics is crucial for effective OSH management.
- v. **Emergence:** OSH systems exhibit emergent properties that arise from the interactions and interdependencies of the system components. These emergent properties can include safety culture, employee engagement, and

the overall effectiveness of safety programs. Focusing solely on individual components or subsystems may not capture the full complexity and outcomes of the OSH system.

- vi. **Feedback Loops:** Feedback loops are essential in OSH systems. They enable the system to gather information on OSH performance, identify areas for improvement, and make necessary adjustments. Feedback can come from various sources, such as incident reports, near-miss reporting, safety inspections, employee suggestions, and data analysis. The feedback loop informs decision-making and drives continuous improvement in OSH performance.
- vii. **Systems Thinking:** Applying systems thinking to OSH involves considering the entire OSH system as a whole, rather than focusing solely on specific components or isolated incidents. It involves analyzing the relationships, patterns, and dynamics within the system and understanding how changes in one area can impact the overall OSH performance.

Application of systems theory to OSH compliance, organizations and OSH professionals can develop a more comprehensive and holistic understanding of the factors influencing workplace safety. This can lead to better identification and management of hazards, improved safety programs, enhanced safety culture, and ultimately a safer and healthier work environment (Morgado et al., 2019).

2.8 Conceptual Framework

A conceptual framework shows the interrelationship which exist between variables. It is a diagrammatic representation of how variables relate in the study (Mugenda and Mugenda, 2012).

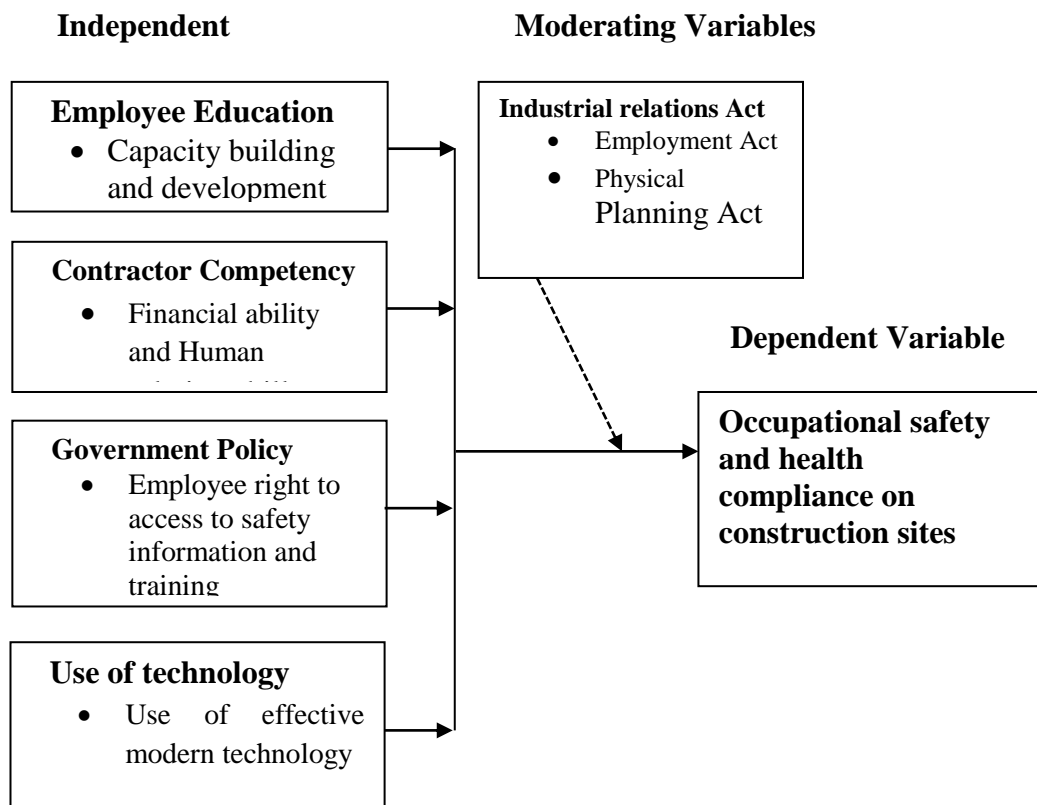


Figure 2.1: Conceptual framework derived from theoretical and empirical reviews

Employees’ education: Induction of employees, employees’ level of education, capacity building and development was evaluated to explore its influence on occupational safety and health compliance on the construction sites.

Contractors’ competency: Financial ability of the contractor, contractor’ capacity to provide safe work environment and human relation skills for the contractor were assessed to establish whether it influences the occupational safety and health compliance on the construction sites.

Political Factors: Employee Rights at the workplace, workplace unions, and employee integration and motivation were assessed to establish the its influence on occupational safety and health compliance on the construction sites.

Use of Technology: Technological supervision, digital emergency alert systems, and the use of effective modern equipment and machines were assessed to establish its influence on occupational safety and health compliance on the construction sites.

Industrial Relations Acts, also known as Labour or Employment Relations Acts, are legislative frameworks that govern the relationship between employers, employees, and labor unions or employee representatives. These acts establish the rights, responsibilities, and obligations of all parties involved and provide a legal framework for resolving labour disputes, negotiating collective agreements, and ensuring fair and equitable working conditions at the workplace. Employment Act is a piece of legislation that governs the employment relationship between employers and employees within a specific jurisdiction. It outlines the rights and obligations of both employers and employees, sets minimum employment standards, and provides a legal framework for various aspects of employment. Physical Planning Act is a legislative framework that governs land use planning and development in a particular country or jurisdiction. The Physical Planning Act typically outlines the enforcement mechanisms, including penalties for non-compliance with planning regulations, unauthorized development, or violation of zoning restrictions. Industrial Relations Act, Employment Act and Physical Planning Act moderated the effect of the independent variables on the dependent variable.

2.9 Knowledge Gaps

Most of the available international and local literature on safety and health in the construction industry is dominated by information on causes of accidents and negative health outcomes among workers. However, knowledge on compliance to occupational safety and health rules and regulations in the construction industry is not well documented. Research work in Kenya has not addressed on the issue of challenges in the implementation of the regulations on the construction sites. Studies done in Nairobi such as that of Kibe et.al. (2016) only concentrate on the management of health and safety in the construction industry. Therefore, this study aims to bridge this knowledge gap by investigating ways to promote compliance to the Occupational Safety and Health in the construction sites of Nairobi City County, Kenya.

2.10 Definition of operational terms and concepts

2.10.1 Project

In this study, project refers to a unique set of inter-related activities, with a definite starting point and time to finish, it is usually undertaken by an individual or organization in order to to meet specific objectives within the required timeline. For example, a house construction project, road construction project and railway construction project (Ondieki, 2016).

2.10.2 Compliance

Refers to abiding by the stipulated rules and regulations of a given authority in order to ensure that the conformed standards are achieved (Nghitanwa & Zungu, 2017).

2.10.3 Construction

It refers to establishment of new structures or renovation of existing structures such as roads, bridges, dams, railway lines, and airport (Nyamboki, 2019).

2.10.4 Contractor

Refers to a person or an entity which has a role of implementing the construction of structures (WHO, 2018).

2.10.5 Occupational Safety and Health

Refers to principles and procedures followed to ensure safety is guaranteed at the workplace and by maintaining the health standards thus promoting employees' efficiency, reduction of accidents and enhancing employees' performance thereto (Manu et al., 2019).

2.10.6 Safety

Refers to protection against any cause danger, risk, or injury in the construction sites. Safety is two-way: an employer has an obligation to ensure that safety is guaranteed at the workplace; on the other hand the workers have an obligation to ensure for their own duty at their workplace (Kemei et al., 2017).

2.10.7 Standards

Refers to a desirable and acceptance level of quality laid down by an entity in order to be strictly followed (ILO, 2018).

2.11 Summary

Poor or lack of compliance to safety and health rules and regulations is the major cause of accidents and health problems in the construction industry. Although most studies have tried to address the issue of managing health risks and safety issues in the industry, there is need to understand what can be done in order to enforce compliance. The current study examines compliance to occupational safety and health guidelines with an aim of recommending how to enhancement could be effected.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodological approach used to conduct the research. This includes: research paradigm, research design, target population, sample size, sampling procedure, research instruments, data collection methods, data analysis techniques, ethical issues and operationalization of the variables.

3.2 Research Design

Kothari (2004) defined research design as the arrangement of conditions for collection and analysis of data; in a manner that aims to combine relevance to the research purpose with economy in procedure. It is the conceptual structure in which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. Research design can be classified by the approach used to gather primary data into two broad categories; observation and communication approaches. The observation approach includes the full range of monitoring behavioural and non-behavioural activities and conditions such as listening, reading, visual data collection, smelling and touching. In other words, information is sought by way of the researcher's own direct observation without asking it from the respondent.

According to Cooper and Schindler (2003), the communication approach involves surveying people and recording their responses for analysis. It is the most reliable method of learning about opinions, attitudes, motivations, intentions and expectations. These attributes can be effectively harnessed using the questionnaire being the most effective instrument for collecting survey data. The communication approach is the most effective method for collecting the survey data. The communication approach is also an effective method for eliciting issues that are exclusively internal to the respondent, who is the most qualified person to provide such information (Cooper & Schindler, 2003).

3.3 Study area

The study was carried out in Nairobi City County featuring Embakasi sub-county's construction sites. This Embakasi Sub-County was purposely selected by the researcher due to its cosmopolitan nature and being the source with an existing adoption of a rapid number of construction projects, hence respondents provided the required information when filling the questionnaire and during interviewing by the researcher.

3.4 Target Population

According to Nairobi City County Integrated Development Plan (2018), there are 15,090 personnel on construction sites and who are distributed in the eight sub-counties as follows: Dagoretti (1990), Westlands (1090), Kamukunji (2088), Starehe (1900), Kasarani (2200), Makadara (1203), Njiru (2009) and Embakasi (2,610). From the data provided, it is evident that Embakasi sub-county has the highest number (2,610) of construction personnel within Nairobi City County. A simple random sampling was used to select a non-biased sample size of 261 respondent from the entire population of 2610. According to Mugenda and Mugenda (2012) a target population of 10-20% was useful when the population is high. The sample for the study consisted of 261 construction personnel from the area of study which took a 10% proportion of the target population. Therefore, the following respondents were targeted for the study, 32 Engineers/Construction managers, 30 Site Administrators (included: Supply chain administrators, inventory clerks, stores personnel), 55 Supervisors/foremen, 114 Craftsmen/Artisans (included: electricians, plumbers, plant operators, drivers, carpenters,), 30 Safety officers.

The 261 respondents were carefully selected from 30(10%) approved construction sites out of a total of 304(100%) approved construction sites in Nairobi City County. The sample size of the construction sites which were sampled to be part of the area under investigation was strictly compliant with Mugenda and Mugenda sampling model which provides that 10-30% of the sample size is enough to represent the entire population

Using Mugenda and Mugenda (2013) sample size determination, a sample size of 261 respondents was determined from an entire population of 2610 at 5.866% level of significance as described in the in the following formulae of substitution

$$n = N / [1 + N (e)^2]$$

Where;

n – sample size

N – Population size

e – Level of significance

$$n = 2610 / 1 + 2610(0.05866)^2 = 261$$

On the construction sites the researcher assessed the level of compliance by the contractors and the construction workers to the provisions of the Occupational Safety and Health Act, 2007. The target population and sample size described in table 3.1 below

Table 3.1: Target Population and sample size

Category	Population size (N)	Sample Size (n)
Engineers/Construction Managers	320	32
Site Administrators	300	30
Supervisors/Foremen	550	55
Craftsmen/Artisans	1140	114
Safety Officers	300	30
Total	2610	261

Source: Researcher (2021)

3.5 Research Instruments

The research instruments that was used for the survey was a structured questionnaire and interview schedule. The data for the study was collected from the selected sample, and thus, a structured questionnaire was considered as the most effective instruments. Mellenbergh (2008) stated that a questionnaire was useful in obtaining

objective data because participants are not manipulated in any way by the study. The questionnaire was considered in this study because it was useful in obtaining detailed information about personal feelings, perceptions and opinions, detailed questions were asked and achieved a high response rate.

3.5.1 Questionnaire

The questionnaire comprised of both open and close-ended questions. The questionnaire collected both qualitative and quantitative data from the construction site workers. The questionnaire tool was administered to the respondents in view of getting their responses regarding the subject matter.

3.5.2 Interview schedule

Semi structured interview guide was the second instrument used to collect in-depth information from 15 respondents from the category of engineers/construction managers, safety officers and contractor 5 from each category. This category was included in the study because they had relevant information (Mugenda & Mugenda, 2012) on OSH. This allowed flexibility of the researcher and provided an opportunity to restructure questions. The interview guide consisted of open-ended questions to allow researcher to collect ample information. Accordingly, during interview the researcher was noting down important information relating to the study. The face-to-face interview enabled the interviewer to note nonverbal communication that could add meaning by triangulating the findings of the study.

3.5.3 Pilot Testing of Instruments

The pilot study involved 26 conveniently selected respondents. According to Connelly (2008) existing literature suggested that a pilot study sample was 10% of the sample projected for the larger parent study, thus 26 participants were justified in this study. In the current study, the pretest was done among 26 conveniently selected construction work force from Embakasi sub-County of Nairobi City County. The pretesting of the instrument sought information from respondents to determine the degree of clarity of questions and to identify problem areas that needed attention. The pilot study gave an opportunity to detect and remedy any potential problems

with the instrument including questions that were not understood by the respondents. Interviews was also conducted on 26 construction site workforce. The responses from the piloting exercise enabled the review and refinement of the questionnaire. The respondents who participated in the pilot testing were not to be involved in the main study so as to eliminate bias.

3.5.4 Reliability Testing of Instruments

According to Sekaran and Bougie (2009), a Cronbach's alpha coefficient equal to or greater than 0.7 is adequate to confirm that the variables and the overall instrument are reliable. Reliability of the various scales in the questionnaires is presented in Table 3.2.

Table 3.2: Reliability output results

Scale	No. of Items	Alpha
Employee's level of education	6	0.784
Contractor's capacity	7	0.766
Government policy	6	0.790
Use of technology	7	0.769
Overall	26	0.778

The researcher employed Test re-test method by issuing the questionnaire to the 26 piloted respondents on two occasions. After one week, the instruments were re-tested with the same group from Embakasi subcounty; in this case, respondents were issued with the questionnaires that had been fine-tuned to ensure there was uniformity in responses as compared to earlier tests. The re-test feedbacks were found to be the similar and the instruments were readily used for the actual study. Creswell (1994) points out that a reliable research instrument should have a composite Cronbach Alpha Reliability Coefficient of at least 0.7 for all items under study and where $\text{Alpha} < 0.7$, then the research instruments were revised before field work to acceptable level. In the pilot test (Test Re-Test), the Cronbach Alpha Reliability Coefficient was overall 0.778. this Coefficient was considered reliable enough for this study.

3.6 Data Collection Procedure

The researcher visited each of the sites selected ongoing construction sites in Embakasi Sub-County of the Nairobi City County. The contractors' and workers' survey were all allowed to take part in the study. The questionnaires were self-administered although the researcher would come in to assist the respondents whenever required to do so. Where the respondents were absent from site particularly the contractors, the researcher returned to the site at a later time or date. An adjacent active site were included in the sample in cases where the respondents for the second time running would not be found on site. This was also the case where either access to the site was denied or the respondents failed to co-operate. The questionnaires were filled and collected immediately by the researcher on site.

3.7 Data Analysis Techniques

Before processing the responses, the completed questionnaires were edited for the purpose of ensuring clarity and consistency. Qualitative data and quantitative data, and hence two types of statistical evaluation (descriptive and correlation) had been used. Quantitative data was once analysed using descriptive statistics, which included frequencies and percentages the usage of Statistical Package for Social Sciences (SPSS), which is a dependable device for quantitative records analysis. Descriptive statistics helped to compute measures of central inclinations and measures of variability to determine how independent variables affect the established variable. While inferential information (correlation) was used to find out the relationship between the established variables and the unbiased variables. Both descriptive and inferential facts were used to address the targets of the study. Qualitative information transcribed and analysed the use of content material evaluation based on analysis of meanings and implications emanating from respondents' information. Content evaluation entail analysing qualitative responses from people to establish go reducing topics and attributes that are not dependent on absolute numbers, responses with common themes grouped collectively into coherent categories to establish a framework of thematic ideas. Thematic analysis was done examining and recording themes/patterns across statistics units that are essential and associated to a specific research question. The quantitative data used the closed ended objects of the questionnaire assigned ordinal values and

analysed using statistics of frequency tables, percentages and mean. The data was then used to check out hypotheses of the study. Hypotheses testing was done using Chi-square model. Finally, aggregation of the precis issues into most important qualitative findings to corroborate quantitative findings done.

3.8 Ethical Considerations

Consent was obtained from individual participants before commissioned for the interview. The researcher reassured them of use and confidentiality of the information given by carrying an introduction letter from the university indicating the data is only for academic purpose. The nature of the research was explained to them and after several questions on anonymity and confidentiality answered and the participants reassured that their identities as well as the information remained confidential, they agreed to take part in the study.

3.9 Operationalization of Variables

Table 3.3: Operational definition of variables

	Objective	Variable	Indicators	Scale	Statistics
1.	To establish the influence of employees' education on occupational safety and health compliance on construction sites;	Independent: Employees education	<ul style="list-style-type: none"> • Induction • Employees' level of education • Capacity building and development 	Nominal Ordinal Interval	Descriptive Regression And Chi-square
2.	To determine the influence of contractor's competency on occupational safety and health compliance on construction sites;	Independent: Contractor's competency	<ul style="list-style-type: none"> • Financial ability • Provision of Safe work environment • Human relation skills 	Nominal Ordinal Interval	Descriptive Regression And Chi-square
3..	To assess the influence of government policy on occupational safety and health compliance on construction sites;	Independent: Government Policy	<ul style="list-style-type: none"> • Employee Rights to be trained • Right to report any accidents • Right to safety information by labelling chemicals 	Nominal Ordinal Interval	Descriptive Regression And Chi-square

	Objective	Variable	Indicators	Scale	Statistics
4.	To determine the extent to which use of technology influence occupational safety and health compliance on construction sites;	Independent: Use of technology	<ul style="list-style-type: none"> • Technological supervision • Emergency alert systems and reporting • Use of effective modern equipment and machines 	Nominal Ordinal Interval	Descriptive Regression And Chi-square
		Dependent Variable: Occupational Safety and Health Compliance on Construction Sites.	<ul style="list-style-type: none"> • Increase in number of professionals in OSH in construction industries • Increase in number of knowledgeable contractors • Reducing the number of political cases that affect construction industry • Increase in number of firms using technology in the construction industry. 	Nominal	Descriptive

CHAPTER FOUR

DATA ANALYSIS, INTERPRETATION AND PRESENTATION

4.1 Introduction

This chapter focuses on the analysis of data, interpretation and presentation of information analyzed. Data analysis was based on the influence of the independent variables on depend variables.

4.2 Questionnaire return rate

The researcher issued 261 questionnaires to the respondents. 230 questionnaire copies were returned to the researcher giving an instrument return rate of 88%. The questionnaire return rate was as illustrated in the table 4.1

Table 4.1: Questionnaire return rate.

Target Populatio	Sample	Returned	Total
2610	261	230	230

Table 4.1 revealed all the copies of questionnaire were administered to the respondents, 145 of the questionnaires were received back, giving the questionnaire response rate of 88%.

A response rate refers to the percentage subjects that respond to the questionnaire. A response rate of 50% was deemed adequate for analysis and reporting, a response rate of 60% was good and a response rate of 70% and over is considered very good, Mugenda and Mugenda (2012). In this respect, the study was perceived to have an excellent questionnaire response. This was because copies of the questionnaire were administered and collected back by a well-trained and motivated research assistant while closely being supervised by the researcher.

4.3 Demographic characteristics of the respondents.

The researcher found that demographic characteristics of the respondents was great significance to the study.

4.3.1 Characteristic of the respondents by age

The researcher found that the age characteristics of the respondents were of great significance to the study underlying the investigation into occupational safety and health compliance on the construction sites in Nairobi City County. The respondents responded to this item and the responses was drawn as shown in the figure 4.1.

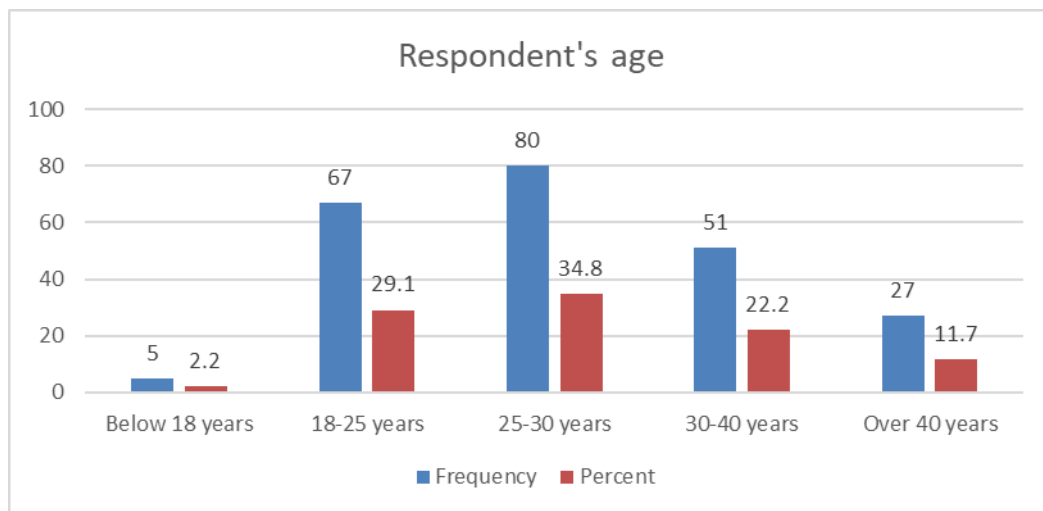


Figure 4.1: Age of the respondents

The figure 4.1 indicated that out of the 230 respondents who filled the questionnaire Below 18 years (2.2%), the age bracket of 18-25 years (29.1%), 23-30 years (34.8%), 30-40 years (22.2%), and over 40 years (11.7%)

In the table 4.2 implied the respondents have optimum age of (18-40) which was the reflection of the period in life. The age bracket below 18 years, participation was low since, most of the people at this age were still school going people and some in colleges.

4.3.2 The respondent's role at the construction site.

This dimension of the respondent's demographics was considered important of the study. The respondents completed the questionnaires stating their trade that they are in and their response were as shown in the figure 4.2.

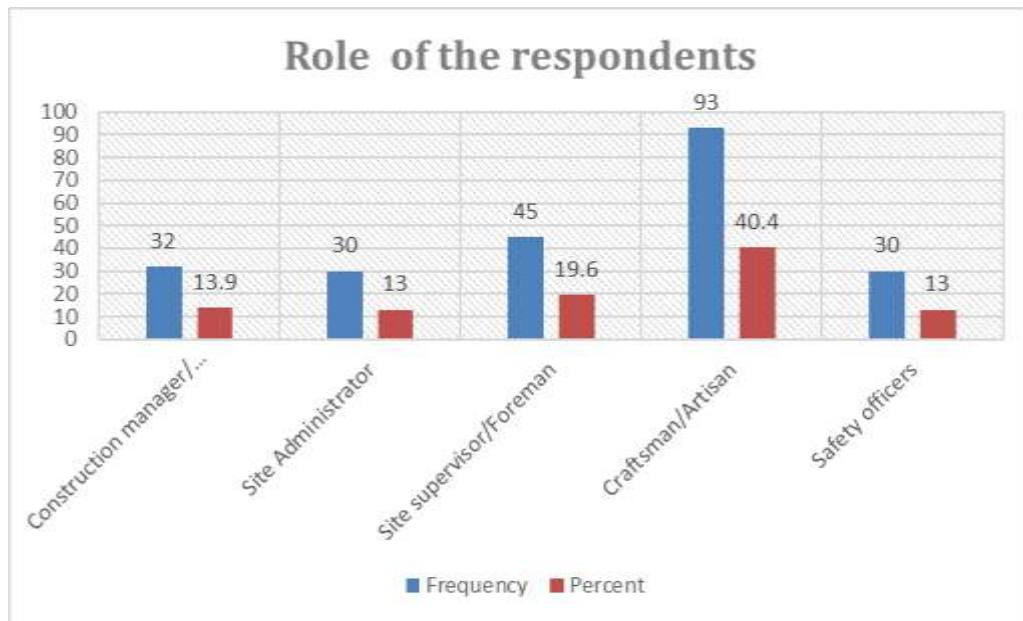


Figure 4. 2: The respondent's role at the construction site

Figure 4.2 indicated that 93(40.4%) of the respondents were Craftsmen /Artisans, 54(19.6%) were supervisors/Foremen, 32(13.9%) were construction managers/Engineers whereas Site Administrators and Safety officers had 30(13.0%) respectfully. This implied that the majority of the respondents were professionals.

4.4 Influence of employee's education on OSH compliance

This variable of the employee's education among the construction workers was believed to be of great significance to the study. This was because majority of the respondents indicated that indeed the employee's education has a greater influence on occupational safety and health compliance on the construction sites.

4.4.1 Response on employee education and OSH compliance.

The respondents filled the questionnaire on this item and their responses are illustrated in the table below.

Table 4.2: Respondents views on Employee’s education influence OSH compliance.

Response	Frequency	Percent
Strongly disagree	5	2.2
Disagree	6	2.6
Neutral	4	1.7
Agree	25	10.9
Strongly agree	190	82.6
Total	230	100

The table 4.2 indicated that out of the 230 respondents who completed the questionnaire, 215(93.5%) agreed that indeed employee’s education influenced Occupational Safety and Health compliance on the construction sites, while 15(6.5 %) were on contrary opinion that as they expressed their views that employee’s education did not influence Occupational Safety and Health compliance on the construction sites respectively.

4.4.2 Employee education as a major OSH compliance influencing factor.

The respondents filled the questionnaire illustrated in figure 4.3.

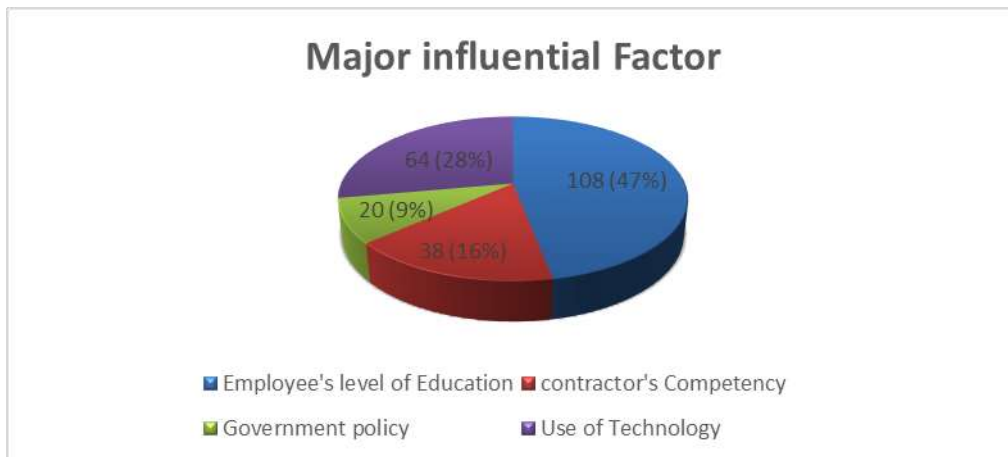


Figure 4.2: Responses to ascertain the major factor influencing OSH compliance.

Figure 4.3 indicated that out of 230 respondents who filled the questionnaire 108(47.0%) agreed that indeed the employee's education was rated the most influential factor as far as Occupational Safety and Health is concerned; Use of technology had a response rate of 64(27.8%) rated as the second influential, 38(16.5%) rated the contractors' competency as the third influential factor, finally the fourth on the list as rated by the respondents was government policy regarding work place which received the least number of respondents 20(8.7%) . These findings indicate further that the majority of the respondents concurred that the employee education significantly influenced OSH compliance on the construction sites.

4.4.3 Employee education and OSH compliance on construction sites.

This was the first objective that the study sought to establish the extent to which employees' education influence OSH compliance; therefore, the participants were requested to give their opinions on their level of agreements or disagreements with the statements of employees' education on a Likert scale of 1-5 where Strongly agree (SA)=5, Agree(A)=4 Neutral(N)=3, Disagree(D)=2and Strongly disagree. (SD)=1. The item means as well as the standard deviation were computed and presented alongside as provided in Table 4.3.

Table 4.3: Statements on influence of employee’s education and OSH compliance

Statement	Mean	Std. Dev
The employee’s level of education influences OSH compliance	4.6913	.723
Adequate employee induction influences OSH compliance	4.3391	.941
Employee capacity building influences OSH compliance	4.4917	.743
Composite mean and composite standard deviation	4.484	.869

Three statements were developed to measure the extent to which employee’s education influence OSH Compliance

Statement (1) that ‘*The employee’s level of education influences OSH compliance*’ had a mean of 4.691 and a standard deviation of 0.723. This results shows that the line statement mean score of 4.691 was above the composite mean score of 4.484; The implication of this result to the study is that employees’ education positively influence OSH compliance on the construction sites. The lower standard deviation of 0.723 than the composite standard deviation of 0.869 indicated that there was a convergent opinion in the views of the respondents. The study results support finding by Omulo (2016) who found out that the level of education of an employee greatly motivates them thus promoting compliance on the construction sites. During the interview session with the safety officers had this to say;

Employees’ education has really enabled construction workers to apply the day to day skills taught by the safety team thereby making them carry out their work with confidence thus reducing non-compliance (Safety officers).

Statement (2) that ‘*Adequate employee induction influences OSH compliance*’ had a mean of 4.339 and a standard deviation of 0.941. This results shows that the line statement mean score of 4.339 was below the composite mean score of 4.484; The implication of this result to the study is that employee induction had a positive influence on OSH compliance. The higher standard deviation of 0.941 than the

composite standard deviation of 0.869 indicated that there was a divergent opinion in the views of the respondents on the OSH compliance on the construction sites.

Statement (3) that ‘*Employee capacity building influences OSH compliance*’ had a mean of 4.421 and a standard deviation of 0.743. This results shows that the line statement mean score of 4.491 was above the composite mean score of 4.484; The implication of this result to the study is that capacity building influence OSH compliance on the construction sites positively. The lower standard deviation of 0.743 than the composite standard deviation of 0.869 indicated that there was a divergent opinion in the views of the respondents. The study results support finding by Nyaruai (2019) who found out that capacity building influence OSH compliance positively.

4.4.3 ANOVA of employee education and OSH compliance on construction sites.

The research sought to assess if the regression for ANOVA model was best fit for predicting OSH compliance after the use of employee of education variable. The regression ANOVA findings are presented in Table 4.4

Table 4.4: An ANOVA of the Regression of employee education and OSH compliance on construction sites

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	3.076	3	1.025	2.457	.064 ^b
Residual	94.289	226	.417		
Total	97.365	229			

a. Dependent Variable: OSH compliance on the construction sites

b. Predictors: (Constant), The employee education

The ANOVA results indicated that (F-statistics =2.457 is significant at P value $0.000 < 0.05$ implying that the predictor co-efficient is at least not equal to zero. and hence the regression model results in significantly better prediction of Occupational Safety and Health compliance on the construction sites.

4.5 Influence of Contractor’s competency on OSH compliance.

Contractor’s competency is an integral process for any project undertaking. Provision of induction training, provision of safe working environment, equipment holding, human relation skills, provision of safe water, and labeling of the chemicals is crucial for ensuring occupational safety and health compliance on the construction sites. The second objective that the study sought to establish the extent to which contractors’ competency influence OSH compliance; therefore, the participants were requested to give their opinions on their level of agreements or disagreements with the statements of contractors’ competency on a Likert scale of 1-5 where Strongly agree(SA)=5, Agree(A)=4 Neutral(N)=3, Disagree(D)=2 and Strongly disagree. (SD)=1. The item mean as well as the standard deviation were computed and presented alongside as provided in Table 4.5.

Table 4.5: Statements on influence of contractor’s competency and OSH compliance

Statement	Mean	Std. Dev
Contractors’ financial ability influences OS Compliance	4.691	0.733
Provision of safe working environment of worke influences OSH compliance	4.304	0.683
Human relations skills practiced by contracto influences OSH compliance	4.478	0.791
Composite mean and composite standard deviation	4.491	0.736

Three statements were developed to measure the extent to which contractors’ competency influence OSH Compliance

Statement (1) that ‘*Contractors’ financial ability influences OSH Compliance*’ had a mean of 4.691 and a standard deviation of 0.733. This results shows that the line statement mean score of 4.691 was above the composite mean score of 4.491; The implication of this result to the study is that contractors’ competency positively influence OSH compliance on the construction sites. The lower standard deviation of 0.733 than the composite standard deviation of 0.736 indicated that there was a convergent opinion in the views of the respondents. The study results support finding by Nyamboki (2019) who found out that the contractors financial ability promoting

compliance on the construction sites. During the interview session with the contractors had this to say;

Contractors' Financial muscles has really enabled construction sites to be facilitated well by the acquisition of the relevant machines and equipment. Financial stability also enables the contractors to purchase safety gears thus ensuring compliance at the sites (Contractors).

Statement (2) that '*Provision of safe working environment of workers influences OSH compliance*' had a mean of 4.304 and a standard deviation of 0.683. This result shows that the line statement mean score of 4.304 was below the composite mean score of 4.491; The implication of this result to the study is that provision of safe working environment had a positive influence on OSH compliance. The lower standard deviation of 0.683 than the composite standard deviation of 0.736 indicated that there was a convergent opinion in the views of the respondents on the OSH compliance on the construction sites.

Statement (3) that '*Human relations skills practiced by contractors influences OSH compliance*' had a mean of 4.478 and a standard deviation of 0.791. This result shows that the line statement mean score of 4.478 was below the composite mean score of 4.491; The implication of this result to the study is that human relation skills practiced by contractors' influence OSH compliance on the construction sites positively. The higher standard deviation of 0.791 than the composite standard deviation of 0.736 indicated that there was a divergent opinion in the views of the respondent. The study results support finding by Mwangi (2016) who found out that human relation skills exhibited by the contractors promote contractor's competency which in return influence OSH compliance positively.

4.5.1 Contractors competence in providing safe working environment

As part of contractor's competency, it is important to note that it is the duty of the contractor to provide a safe working environment in relevant construction sites. The respondents based their observations on the safety at workplace as one of the contractors' mandates as described below.

The respondents filled the questionnaire and table 4.6 illustrated their responses.

Table 4.6: Response to ascertain whether the contractor provided safety gears.

Response	Frequency	Percentage
Yes	215	93.5
No	15	6.5
Total	230	100.0

From the findings, majority 215(93.5%) of the respondents indicated that they were provided with protective gears. Only 15(6.5%) of the respondents had no received protective gears. This depicts that majority of the respondents were provided with the protective gears at their workplace by the contractor. This helped the respondents to better manage any accident occurrence at workplace hence promoting adherence to occupational safety and health provisions.

4.5.2 Wearing protective gears

The contract is mandated to ensure that the workforce wears the protective gears in due course discharging their mandate in the construction sites. The researcher asked the respondents whether the persons at the site always put on the protective gears while they are on the construction sites. The respondents filled the following response as shown table 4.7 below.

Table 4.7: Response based on whether protective gears are worn all the time on site

Response	Frequency	Percent
Yes	181	78.7
No	49	21.3
Total	230	100.0

Findings on table 4.7 indicated that out of all respondents who filled the questionnaire 181(78.7%) indicated that protective gears are put on at all times when they are on site; whereas 49(21.3%) of the respondents on contrary disagreed and expressed their opinion that the contractor doesn't supervise wearing of the protective gears therefor giving a loophole of some individuals avoiding putting on such protective gears. Findings indicated that protective gears are worn all the time

while one is on the site thus enhancing OSH compliance levels of the construction project.

4.5.3 Provision of adequate water at the sites by contractor.

It is an Occupational Safety and Health requirement that the contractors should ensure that water is provided at the construction sites. Water should be accessible for all at all times on the construction sites. The respondents filled the questionnaire and table 4.8 illustrated their responses.

Table 4.8: Response based on whether adequate water is provided by the contractor.

Response	Frequency	Percent
Yes	184	80.0
No	46	20.0
Total	230	100.0

Responses as in table 4.8 indicated that out of 230 respondents who filled the questionnaires 184(80%) indicated that adequate water was provided on the site by the contractor as an OSH provision requirement; whereas 46 (20%) indicated that contractors did not provide adequate water on their respective site. However, based on the majority of the respondents, findings indicate that most of the sites the contractor provided adequate water as opposed to the minority say.

4.5.4 Accessibility of water for all.

In a view to ascertain whether water provided by the contractor in the sites is accessible to all persons on the construction sites. The respondents filled the questionnaire and table 4.9 illustrated their responses.

Table 4.9: Response based on accessibility of water.

Response	Frequency	Percent
Yes	182	79.1
No	48	20.9
Total	230	100.0

Findings, indicated that out of all respondents who filled the questionnaire 182(79.1%) indicated that a majority response from the respondents agreed accessibility of adequate water is assured to all by the contractor to all the inhabitants on site, whereas, 48(20.9%) of the respondents objected that water is not accessible to all persons on site. Findings clearly indicated that the majority of the respondents confirmed that accessibility of water thus promoting OSH compliance at the workplace.

4.5.5 ANOVA of Contractor's Competency and OSH compliance

The research sought to assess if the regression for ANOVA model was best fit for predicting OSH compliance after the use of employee's level of education variable. The regression ANOVA findings are presented in Table 4.10

Table 4.10: ANOVA of the Regression of contractor's competency and OSH compliance

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.671	3	.557	1.316	.270b
Residual	95.693	226	.423		
Total	97.365	229			

a. Dependent Variable: OSH compliance on the construction sites

b. Predictors: (Constant), Contractor's competency

The ANOVA results indicated that (F-statistics =1.671 is significant at P value $0.000 < 0.05$ implying that the predictor co-efficient is at least not equal to zero and hence the regression model results in significantly better prediction of contractor's competency effect on Occupational Safety and Health compliance.

4.6 Influence of Government policy on OSH compliance.

Government policy regarding construction projects controls a large proportion of activities on sites. On this context the researcher established that policies regarding employee rights, reporting of accidents and employee interaction and motivation and how they influence Occupational Safety and Health compliance at the construction sites. The third objective that the study sought to establish how government policy influence OSH compliance; therefore, the participants were requested to give their opinions on their level of agreements or disagreements with the statements of government policy on a Likert scale of 1-5 where Strongly agree(SA)=5, Agree(A)=4 Neutral(N)=3, Disagree(D)=2 and Strongly disagree. (SD)=1. The item mean as well as the standard deviation were computed and presented alongside as provided in Table 4.11.

Table 4.11: Statements on influence of government policy and OSH compliance

Statement	Mean	Std. Dev
Employees' rights to be trained influence OSH compliance	4.621	0.852
Right to report accidents influences OS compliance	4.230	0.959
Right to safety information by labellir chemicals influences OSH compliance	4.296	1.102
Composite mean and composite standar deviation	4.383	0.971

Three statements were developed to measure the extent to which government policy influence OSH Compliance

Statement (1) that '*Employees' rights to be trained influences OSH compliance*' had a mean of 4.621 and a standard deviation of 0.852. This results shows that the line statement mean score of 4.621 was above the composite mean score of 4.383; The implication of this result to the study is that government policy positively influenced OSH compliance on the construction sites. The lower standard deviation of 0.853 than the composite standard deviation of 0.971 indicated that there was a convergent opinion in the views of the respondents. The study results support finding by Muiriri and Mulinge (2014) who found out that the employee rights to be trained promoting

compliance on the construction sites. During the interview session with the contractors had this to say;

Employees rights to be trained before they are given assignment promotes their ability to work effectively by for instance getting safety tips on how to put on protective gears greatly attributes to OSH compliance on the construction sites (Engineers).

Statement (2) that '*Right to report accidents influences OSH compliance*' had a mean of 4.230 and a standard deviation of 0.959. This results shows that the line statement mean score of 4.230 was below the composite mean score of 4.383; The implication of this result to the study is that right to report accidents had a positive influence on OSH compliance. The lower standard deviation of 0.959 than the composite standard deviation of 0.971 indicated that there was a convergent opinion in the views of the respondents on the OSH compliance on the construction sites.

Statement (3) that '*Right to safety information by labelling chemicals influences OSH compliance*' had a mean of 4.296 and a standard deviation of 1.102. This results shows that the line statement mean score of 4.296 was below the composite mean score of 4.383; The implication of this result to the study is that the right to safety information by labelling chemicals influence OSH compliance on the construction sites positively. The higher standard deviation of 1.102 than the composite standard deviation of 0.971 indicated that there was a divergent opinion in the views of the respondents. The study results support finding by Kibe (2016) who found out that when employees right to safety information by labelling the chemicals in return influence OSH compliance positively.

4.6.1 Response as to whether government policy influence OSH compliance

The respondents filled the questionnaire and table 4.12 illustrated their responses.

Table 4.12: Response based on the influence of government policy on OSH compliance

Response	Frequency	Percent
Strongly disagree	5	2.2
Disagree	16	7.0
Neutral	7	3.0
Agree	95	41.3
Strongly agree	107	46.5
Total	230	100.0

Table 4.12 indicated that, out of respondents who filled the questionnaires 202(87.8%) indicated that government policy influenced OSH compliance on the construction sites. whereas, 21(9.2%) indicated their dissatisfaction, while 7(3%) were neutral on the aspect that government policy influence OSH compliance. This finding further provides that over 87% of the respondents agreed that government policy was influential as far as occupational safety and health compliance in the construction projects is concerned.

4.6.2 Influence employee rights as a government policy on OSH compliance.

The researcher investigated the government policy regarding right of employees such as right of training, right of employee integration through provision of safety information, and right of reporting any accident. The respondents filled the questionnaire and table 4.13 illustrated their responses.

Table 4.13: Response o ascertain whether reporting of any accident is done.

Response	Frequency	Percent
Yes	227	98.7
No	3	1.3
Total	230	100.0

Findings indicated that out of all respondents who filled the questionnaire 227(98.7%) agreed that they reported any accident because they knew it is their right to do so, whereas 3(1.3%) of the respondents in one way or the other noted that they usually don't report. This is a clear indication that the workers on site knew their rights.

4.6.3 Response on whether the reported matter was corrected.

The respondents filled the questionnaire and table 4.14 illustrated their responses.

Table 4.14: Response based on correction of matter reported.

Response	Frequency	Percent
Yes	221	96.1
No	9	3.9
Total	230	100.0

Table 4.14 indicated that 229(96.1%) of the respondents agreed that reported cases were responded to and corrected thereto, while 9(3.9%) had a differing opinion that the reported cases were not corrected. Therefore, findings indicate that over 96% of the respondents had a knowhow on their rights and the contractor had no otherwise other than responding to their lawful claims. In addition, sensitization of the employee rights as a political factor greatly influences occupation safety health and compliance.

4.6.4 Regression summary of Government policy and OSH compliance.

The model summary sought to determine how government policy is a predictor that significantly or insignificantly predicted Occupational Safety and Health compliance on the construction sites. The model summary results are presented in Table 4.15

Table 4.15: Regression Model Summary table of government policy and OSH compliance

Model	R	R Square	Adjusted Square	R Std. Error of the Estimate
1	.174a	.030	.018	.64631

- a. Predictors: (Constant), Government policy
- b. Dependent Variable: OSH compliance on the construction sites

The model summary results from Table 4.18 indicated that there is a positive correlation($R=0.174$) between government policy and the Occupational safety and health compliance and those predicted by the regression model. In addition, 3.0% of the variation in the occupational safety and health compliance was explained by

government policy. This finding is in agreement with findings by Nyaruai (2019) study that significant relationship between government policy and occupational safety and health compliance on the construction sites.

4.7 Influence the use of technology on OSH compliance.

Technological interventions play a great role in the construction sector. With a view of ascertaining whether use of technology influences occupational safety and health compliance in the construction industry, the researcher asked the respondent questions regarding technological supervision, accident alert systems safety behind labeling chemical, and whether they received training before using any machines and equipment. The fourth objective that the study sought to establish how use of technology influence OSH compliance; therefore, the participants were requested to give their opinions on their level of agreements or disagreements with the statements of use of technology on a Likert scale of 1-5 where Strongly agree(SA)=5, Agree(A)=4 Neutral(N)=3, Disagree(D)=2and Strongly disagree. (SD)=1. The item mean as well as the standard deviation were computed and presented alongside as provided in Table 4.16.

Table 4.16: Statements on influence of use of technology and OSH compliance

Statement	Mean	Std. Dev
Use of technological supervision influence OSH compliance	4.583	0.930
Use of emergency alert and reporting system influences OSH compliance	4.404	0.697
Use of effective modern equipment at machines influences OSH compliance	4.517	0.808
Composite mean and composite standard deviation	4.501	0.812

Three statements were developed to measure the extent to which use of technology influence OSH Compliance:

Statement (1) that ‘*Use of technological supervision influences OSH compliance*’ had a mean of 4.583 and a standard deviation of 0.930. This results shows that the line statement mean score of 4.583 was above the composite mean score of 4.501;

The implication of this result to the study is that use of technology positively influenced OSH compliance. The higher standard deviation of 0.930 than the composite standard deviation of 0.812 indicated that there was a divergent opinion in the views of the respondents. The study results support finding by Cangan (2019) who found out that the use of technological supervision systems promoted compliance on the construction sites. During the interview session with the contractors had this to say;

The use of technological supervision mechanism at the construction sites promotes their ability to identify faults hence prompting for necessary mitigation strategies towards realizing OSH compliance on the construction sites (Contractors).

Statement (2) that ‘Use of emergency alert and reporting systems influences OSH compliance’ had a mean of 4.404 and a standard deviation of 0.697. This results shows that the line statement mean score of 4.404 was below the composite mean score of 4.501; The implication of this result to the study is that Use of emergency alert and reporting systems had a positive influence on OSH compliance. The lower standard deviation of 0.697 than the composite standard deviation of 0.812 indicated that there was a convergent opinion in the views of the respondents on the OSH compliance on the construction sites.

Statement (3) that ‘Use of effective modern equipment and machines influences OSH compliance’ had a mean of 4.517 and a standard deviation of 0.808. This results shows that the line statement mean score of 4.517 was above the composite mean score of 4.501; The implication of this result to the study is that the use of effective modern equipment and machines influences OSH compliance positively. The lower standard deviation of 0.808 than the composite standard deviation of 0.812 indicated that there was a convergent opinion in the views of the respondents. The study results support finding by Kimei (2016) who found out that when employees right to safety information by labelling the chemicals in return influence OSH compliance positively.

4.7.1 Technology based induction on use of machines/equipment.

On the aspect of whether workers received any training regarding use of any machine on the site and whether technological supervision was embraced at the sites. The respondents filled the questionnaire and table 4.17 illustrated their responses.

Table 4.17: Response based on whether workers received training

Response	Frequency	Percentage
Yes	195	84.8
No	35	15.2
Total	230	100

Table 4.17 indicated that out of respondents who filled the questionnaire 195 (84.8%) revealed that they received training before engaging in any task involving the use of machines and equipment. In addition, the respondents revealed that they were also inducted on modern safety alert systems and how to respond during an emergency. On contrary 35 (15.2%) of respondents indicated that they were not trained. However, a larger proportion of the respondents concurred that the training received enhanced their technological skills of ensuring OSH compliance on the construction sites is achieved.

4.7.2 Training time.

The researcher wanted to establish the time when training was done in order to correlate with the aspect of technology involved. The respondents filled the questionnaire and table 4.18 illustrated their responses.

Table 4.18: Response to ascertain when the training was carried out

Response	Frequency	Percent
over lunch time	21	9.1
during working hours	154	67.0
after work	25	10.9
other (specify)	30	13.0
Total	230	100.0

Findings indicated that out of all respondents who filled the questionnaire 154(67%) agreed that they were trained during working hours, 25(10.9%) of the respondent

stated that training is done after work, 21(9.1%) stated that it was carried during lunch time, while 30(13%) of the respondents never specified the time the training was carried out. The findings therefore, indicates with the majority of the respondents that the training was conducted during working hours a time when interaction with available machines and equipment is guaranteed.

4.7.3 Regression summary of use of technology and OSH compliance

The model summary sought to determine how the use of technology is a predictor that significantly or insignificantly predicted Occupational Safety and Health compliance on the construction sites. The model summary results are presented in Table 4.19

Table 4.19: Regression Model Summary table of use of technology and OSH compliance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.166a	.027	.015	.64730

a. Predictors: (Constant), Use of technology

The model summary results from Table 4.19 indicated that there is a positive correlation($R=0.166$) between use of technology and the Occupational safety and health compliance and those predicted by the regression model. In addition, 2.7% of the variation in the occupational safety and health compliance was explained by use of technology. This finding is in agreement with findings by Musyoki (2014) study that significant relationship between use of technology and occupational safety and health compliance on the construction sites.

4.8 Hypothesis testing

This study used Chi-square model to test the relationship that existed between the variables as shown below.

4.8.1 Hypothesis testing for the influence of OSH compliance

The respondents gave their views and rating of influence employee education on OSH compliance on the construction sites in Nairobi City County. The findings from the study were used to test hypothesis are as follows:

H₀1: There is no significant relationship between employee education and OSH compliance

H_a1: There is a significant relationship between employee education and OSH compliance

Chi-square test was also use to test correlation. Using the chi-square test of the statistics availed the results in table 4.20.

Table 4.20: Chi-square testing on the influence of employee education on OSH compliance

Response	Observed N	Expected N	Residual	Chi-square
Strongly disagree	5	46.0	-41.0	
Disagree	6	46.0	-40.0	
Neutral	4	46.0	-42.0	
Agree	25	46.0	-21.0	
Strongly agree	190	46.0	144.0	
Total	230			
Chi-square				570.43^a

$F = n - 1 = 5 - 1 = 4$; where F is degree of freedom.

$X^2C = 88.23 > \chi^2 = 9.488$ at 4 degrees of freedom and 5% level of confidence.

Since the calculated chi-square value of 570.43 is greater than the critical chi-square value at 5% level of confidence, we reject the null hypothesis. Thus, there is significant relationship between employee education and occupational safety and health compliance on the construction sites in Nairobi City County.

4.8.2 Hypothesis testing for the influence of contractor’s competency on OSH compliance

Respondents rated their views on the influence of contractor’s competency on OSH compliance in Nairobi City County. The findings from key informants were used to test hypothesis are as follows:

H₀2: There is no significant relationship between contractors’ competence and OSH compliance on the construction sites.

H_a2: There is no significant relationship between contractors’ competence and OSH compliance on the construction sites.

Using the chi-square test of the statistics availed the results table 4.21

Table 4.21: Chi-square testing on the influence of contractor’s competency on OSH compliance

Response	Observed N	Expected N	Residual	Chi-square
Strongly disagree	4	46.0	-42.0	
Disagree	1	46.0	-45.0	
Neutral	10	46.0	-36.0	
Agree	32	46.0	-14.0	
Strongly agree	183	46.0	137.0	
Total	230			
Chi-square				522.826^a

$F = n - 1 = 5 - 1 = 4$; where F is degree of freedom.

At 5% level = 9.488

Calculated value = 522.826

The standard table of χ^2 gives a value of 9.488 at 5% level with 4 degrees of freedom. Yet the calculated value is 522.826 which is higher than the table value. we reject the null hypothesis. Therefore, there is significant relationship between contractor’s competence and OSH compliance on the construction sites in Nairobi City County.

4.8.3 Hypothesis testing for the influence of government policy on OSH compliance

The respondents rated the influence of government policy on OSH compliance were used to test hypothesis are as follows:

H₀₃: There is no significant relationship between government policy and OSH compliance on the construction sites.

H_{a3}: There is no significant relationship between government policy and OSH compliance on the construction sites.

Chi-square test was also use to test correlation. Using the chi-square test of the statistics availed the results in table 4.22

Table 4.22: Chi-square testing on the influence of government policy on OSH compliance

Response	Observed N	Expected N	Residual	Chi-square
Strongly disagree	7	46.0	-39.0	
Disagree	2	46.0	-44.0	
Neutral	8	46.0	-38.0	
Agree	37	46.0	-9.0	
Strongly agree	176	46.0	130.0	
Total	230			
Chi-square				475.696^a

$F = n - 1 = 5 - 1 = 4$; where F is degree of freedom.

$\chi^2 C = 475.696 > \chi^2 = 9.488$ at 4 degrees of freedom and 5% level of confidence.

Since the calculated chi-square value of 475.696 is greater than the critical chi-square value at 5% level of confidence, we reject the null hypothesis. Thus, there is significant relationship between government policy and OSH compliance on the construction sites in Nairobi City County.

4.8.4 Hypothesis testing for the influence of technology on OSH compliance

Respondents who participated in the study whereby they gave their views and rating of influence of technology on OSH compliance on the construction sites in Nairobi City County. The findings from the respondents were used to test hypothesis are as follows:

H₀₄: There is no significant relationship between use of technology and OSH compliance

H_{a4}: There is no significant relationship between use of technology and OSH compliance

Chi-square test was also use to test correlation. Using the chi-square test of the statistics availed the results in table 4.23

Table 4.23: Chi-square testing on the influence of technology and OSH compliance

Response	Observed N	Expected N	Residual	Chi-square
Strongly disagree	10	46.0	-36.0	
Disagree	1	46.0	-45.0	
Neutral	8	46.0	-38.0	
Agree	37	46.0	-9.0	
Strongly agree	174	46.0	128.0	
Total	230			
Chi-square				461.522^a

$F = n - 1 = 5 - 1 = 4$; where F is degree of freedom.

$\chi^2_C = 461.522 > \chi^2 = 9.488$ at 4 degrees of freedom and 5% level of confidence.

Since the calculated chi-square value of 461.522 is greater than the critical chi-square value at 5% level of confidence, we reject the null hypothesis. Thus, there is significant relationship between use of technology and OSH compliance for construction projects in Nairobi City County.

CHAPTER FIVE

SUMMARY, FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction.

In this chapter, the qualitative and quantitative data collection was presented and discussed. In this chapter, Conclusions are drawn and recommendations are made. It also outlines certain contributions made by the study on this field of knowledge as well as putting forth number of recommendations to be considered in order to effectively address an investigation into occupational safety and health compliance on the construction sites.

5.2 Summary of the findings of the study.

The study was conducted in Nairobi City County targeting the active construction sites. The research objectives provided for ground developing questionnaires that was used as the technique of data collection. The probability sampling design involving simple random sampling, procedures was employed.

Respondents were interviewed with the aim of eliciting their understanding of occupational safety and health compliance on the construction sites. On critical service quality attributes, the following findings, emerged. Majority of the respondents engaged in this industry were aged between 18-40 years. This age group was found to be the period in life in which people became aggressive to stabilize economically for purpose of providing for the family. The high rating for men against the women was because men generally engage to activities outside their homes.

The observation from the findings of this study is that most of the respondents that 73(31.7%) of the respondents were Craftsmen /Artisans, 68(29.6%) were unskilled labourers, 30(13.0%) were supervisors/Foremen, 28(12.2%) were drivers, 11(4.8%) were construction managers/Engineers and Site Administrators and Plant operators had 10(4.3%) and 10(4.3%) respectively. This implied that the majority of the respondents were professionals.

5.3 Findings on OSH compliance on the construction sites

This section discussed findings with respect to the study objective as shown in each of the study objectives below.

5.3.1 Influence Employee's education on OSH compliance

The study confirmed that employees education greatly influenced OSH compliance on the construction sites whereby 47.0% agreed that indeed the employee's education was rated the most influential factor as far as Occupational Safety and Health is concerned; Use of technology had a response rate of 27.8% rated as the second influential, 16.5% rated the contractors' competency as the third influential factor, finally the fourth on the list as rated by the respondents was government policy regarding work place which received the least number of respondents 8.7% . These findings indicate further that the majority of the respondents concurred that the employee education significantly influenced OSH compliance on the construction sites.

The study also revealed that, 'The employee's level of education influences OSH compliance' had a mean of 4.691 and a standard deviation of 0.723. This results shows that the line statement mean score of 4.691 was above the composite mean score of 4.484; The implication of this result to the study is that employees' education positively influence OSH compliance on the construction sites. The lower standard deviation of 0.723 than the composite standard deviation of 0.869 indicated that there was a convergent opinion in the views of the respondents. The study results support finding by Omulo (2016) who found out that the level of education of an employee greatly motivates them thus promoting compliance on the construction sites. In addition, key informants participated in a scheduled interview whereby they gave their views and rating of influence employee education on OSH compliance on the construction sites in Nairobi City County. Since the calculated chi-square value of 570.043 is greater than the critical chi-square value at 5% level of confidence, we reject the null hypothesis. Thus, there is significant relationship between employee education and occupational safety and health compliance on the construction sites in Nairobi City County.

5.3.2 Influence of Contractor's competency on OSH compliance

Finding revealed that contractor's competency is an integral process for any project undertaking. Provision of induction training, provision of safe working environment, equipment holding, human relation skills, provision of safe water, and labeling of the chemicals is crucial for ensuring occupational safety and health compliance on the construction sites.

Findings of this study further revealed that, as part of contractors' competency it is important to note that it is the duty of the contractor to provide a safe working environment in relevant construction sites. In addition, majority 93.5% of the respondents indicated that they were provided with protective gears. Only 6.5% of the respondents had no received protective gears. This depicts that majority of the respondents were provided with the protective gears at their workplace by the contractor. This helped the respondents to better manage any accident occurrence at workplace hence promoting adherence to occupational safety and health provisions. Moreover, findings, revealed that, protective gears are worn all the time while one is on the site thus enhancing OSH compliance levels of the construction project. Moreover, that 'Contractors' financial ability influences OSH Compliance' had a mean of 4.691 and a standard deviation of 0.733. This results shows that the line statement mean score of 4.691 was above the composite mean score of 4.491; The implication of this result to the study is that contractors' competency positively influence OSH compliance on the construction sites. The lower standard deviation of 0.733 than the composite standard deviation of 0.736 indicated that there was a convergent opinion in the views of the respondents. The study results support finding by Nyamboki (2019) who found out that the contractors financial ability promoting compliance on the construction sites.

It is an Occupational Safety and Health requirement that the contractors should ensure that water is provided at the construction sites. Water should be accessible for all at all times on the construction sites. In nutshell, studies revealed a positive influence. The deduction of the study infers that the calculated value is 522.826 which is higher than the table value. The researcher, reject the null hypothesis and

accepts the alternative hypothesis. Therefore, there is significant relationship between contractor's competence and OSH compliance on the construction sites in Nairobi City County.

5.3.3 Influence of government policy on OSH compliance

Work place government policy controls a large proportion of activities on sites. On this context the researcher anticipated to trace employee rights, reporting of accidents and employee interaction and motivation and how they influence Occupational Safety and Health compliance at the construction sites.

Findings revealed that, the right of employees such as right of training, right of employee integration through provision of safety information, and right of reporting any accident. Whereby, 98.7% agreed that they reported any accident because they knew it is their right to do so, whereas 1.3% of the respondents in one way or the other noted that they usually don't report. This is a clear indication that the workers on site knew their rights. It further revealed that, 'right to report accidents influences OSH compliance' had a mean of 4.230 and a standard deviation of 0.959. This results shows that the line statement mean score of 4.230 was below the composite mean score of 4.383; The implication of this result to the study is that right to report accidents had a positive influence on OSH compliance. The lower standard deviation of 0.959 than the composite standard deviation of 0.971 indicated that there was a convergent opinion in the views of the respondents on the OSH compliance on the construction sites.

Therefore findings indicated that over 99% of the respondents had a knowhow on their rights and the contractor had no otherwise other than responding to their lawful claims. In addition, sensitization of the employee rights as a political factor greatly influence occupation safety health and compliance. In addition, Since the calculated chi-square value of 475.696 is greater than the critical chi-square value at 5% level of confidence, the null hypothesis was rejected. Thus, there is significant relationship between government policy and OSH compliance on the construction sites in Nairobi City County.

5.3.4 Influence of the use of technology on OSH compliance

Technological interventions play a great role in the construction sector. With a view of ascertaining whether use of technology influences occupational safety and health compliance in the construction industry, the researcher asked the respondent questions regarding technological supervision, accident alert systems safety behind labeling chemical, and whether they received training before using any machines and equipment.

Findings revealed that, On the aspect of whether workers received any training regarding use of any machine on the site and whether technological supervision was embraced at the sites. In addition, 67% agreed that they were trained during working hours, 10.9% of the respondent stated that training is done after work, 9.1% stated that it was carried during lunch time, while 13% of the respondents never specified the time the training was carried out. The findings therefore, indicates with the majority of the respondents that the training was conducted during working hours a time when interaction with available machines and equipment is guaranteed.

Moreover, findings confirmed that there is a significant relationship between technology and occupational safety and health compliance whereby the hypothesis testing at 95% confidence level showed the calculated chi-square value of 461.522 is greater than the critical chi-square value at 5% level of confidence, hence leading to the rejection the null hypothesis. Thus, there is significant relationship between use of technology and occupational safety and health compliance for construction projects.

5.4 Conclusion

From the study, conclusion were made based on the findings. In concurrence with the previous studies conducted by different scholars in this fields. It can be concluded that employee's education, contractor's competency, government policy and use of technology directly influenced occupational safety and health compliance on the construction sites. The above mentioned contributions provide a framework for the

understanding and boosting the occupational safety and health compliance on the construction sites. Areas of improvements were also suggested for future studies.

5.5 Recommendation of the study.

5.5.1 Occupational Safety and Health Compliance Framework

The study recommended adoption of the occupational safety and health compliance framework in order to enhance compliance of OSH on the construction sites.

Table 5.1: OSH compliance framework

	Indicators	Means of Verification
GOAL: Development of OSH framework to enhance compliance on the construction sites	<ul style="list-style-type: none"> • Changes (%) in construction sites OSH compliance pattern <p>Qualitative evaluation using the most significant change or other tool on learning and application on:</p> <ul style="list-style-type: none"> • changes in safety training that improves OSH compliance • changes in the way 	<ul style="list-style-type: none"> – Evaluation (weekly, monthly, semi-annually and annually) reports – Enforcement of the OSH regulations on weekly basis
OUTCOME 1: Occupational safety and health compliance on the construction sites increased.	<ul style="list-style-type: none"> – % of workers supporting OSH compliance mechanisms and reported an increase in compliance levels in the construction sites – Percentage of workers supporting OSH compliance by putting on the safety gears and ensuring that their safety on the construction sites is paramount – Percentage of sites which adopted OSH compliance guidelines to realize a significant drop in fatality cases. 	<ul style="list-style-type: none"> – Baseline Survey Reports; Evaluation (mid-term and end-term) reports – Accident monitoring and evaluation factsheets – Periodic compliance assessment reports(semi-annually)

	Indicators	Means of Verification
OUTPUT 1.1: Construction workers on the sites selected to effectively increase access to safety trainings.	<ul style="list-style-type: none"> - Number of workers who accessed safety training. - No. of workers practicing OSH compliance procedures, practices and skills taught - Number of capacity development and expertise partnerships and linkages established for the constructions sites 	<ul style="list-style-type: none"> - Quarterly and annual reporting <ul style="list-style-type: none"> o Safety Training Reports o Construction site surveys o Training attendance records o Accident report records o Training Mission Reports/Exchange learning reports
OUTPUT1.2: Adoption of construction site technology to be enhanced in order to increased efficiency	<ul style="list-style-type: none"> - Number of workers who have improved access to construction technology and safety services (Machine operation manuals, automatic control systems, Chemicals handling procedures and security monitoring, alert and reporting systems - Number of workers who have adopted the use of computerized technology at the workplace (computerized cranes, automated survey machines) 	<ul style="list-style-type: none"> - Quarterly and annual reporting <ul style="list-style-type: none"> o Using technology to monitor workplace incidences and digitally generate reports

	Indicators	Means of Verification
Output 1.3: Construction sites to increase adherence to compliance guidelines.	<ul style="list-style-type: none"> – Number of OSH compliant construction sites established and strengthened – Number of construction sector stakeholders who have agreements signed to ensure compliance in the construction sites is achieved – Number of project managers involved policy formulation and guideline on OSH compliance regulations in construction industry. 	<ul style="list-style-type: none"> – Quarterly and annual reporting Contracts signed with institutional markets – Conducting stakeholders’ analysis in the construction industry annuary – Project managers to be involved in OSH compliance and reporting process

The study further, recommends a Technological Innovations in OSH compliance exercise to explore the potential of emerging technologies, such as wearable devices, Internet of Things (IoT), and data analytics, in improving OSH management. Assess their effectiveness in hazard detection, risk assessment, incident reporting, and overall safety performance.

It also recommends establishment of Occupational Safety Culture where a study to be carried out on the factors influencing safety culture within organizations, including leadership practices, employee engagement, and safety climate. Identify effective strategies for fostering a positive safety culture and evaluating its impact on OSH compliance outcomes.

The questionnaires need to be properly tested so that internal and external validity can be improved. The t-test on this study sample yielded a result that was over 90%, the percentage has to be improved to enhance the credibility of the result. In cases where one to groups methods of questionnaire administration are conducted, more research assistants would be required to guard against participants who tend to help each other in completing questionnaires. Closer monitoring of respondents would enhance the validity of the research results. More time and financial resources would be required for the study, an obvious constraint of this study that had adverse effects on the quality of the data collected. Funding would be obtained from stakeholders like government. Thus committing financial and other resources as its disposal to

such investigations would be more rewarding than the damage caused by failure of the current regulation process.

5.6 Areas for Further Research

It is important that the future research be conducted to investigate a more statistically relevant research procedure in order to ensure that the validity problem identified by some researchers in respect of the disconfirmation theory be reduced or eliminated (Gronroos 2000). Another focus of a future study would be to establish ways of incorporating more independent variables. This would enable researchers to attribute perception of transport services to the antecedents more accurately.

Further research on Occupational Health and Emerging Risks be carried out to Investigate the impact of emerging technologies, such as artificial intelligence, robotics, and automation, on worker health and safety. Examine the potential risks associated with these technologies and develop preventive measures and guidelines to mitigate them.

Regulatory Compliance as an area of further research to investigate factors influencing compliance with OSH regulations and standards. Explore the effectiveness of enforcement strategies and the role of incentives and penalties in promoting compliance. Identify barriers to compliance and develop strategies to enhance regulatory effectiveness.

An aspect of further research touching stakeholder engagement to be carried out in order examine the role of stakeholder engagement in OSH policy development and implementation. Investigate methods for involving employers, workers, unions, industry associations, and other relevant stakeholders in the policy-making process. Explore strategies for building consensus and ensuring representation of diverse perspectives.

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APPENDICES

Appendix I: Introductory Letter

Phires Mokeira Abaya,
Department of Real Estate and Construction Management,
School of Architecture and Building Sciences,
Jomo Kenyatta University of Agriculture and Technology
P.O BOX 54913-00200,
NAIROBI.

Date: 15th February, 2021

Dear Respondent,

RE: MASTER OF CONSTRUCTION PROJECT MANAGEMENT RESEARCH

I am a student at Jomo Kenyatta University of Agriculture and Technology conducting a research on **An investigation into Occupational Safety and Health compliance on construction sites in Nairobi City County** as part fulfillment for the award of **Master of Construction Project Management**. Kindly answer the questions in the attached questionnaire as objectively as possible. Indicate your answer to each question by filling in the space (s) provided or ticking in the correct answer as appropriate. Your answers will strictly be used for academic purposes only and will not be used for any other purpose whatsoever.

Your assistance in the completion of this questionnaire will be highly appreciated.


Yours faithfully,

Phires Mokeira Abaya

Reg. No: AB343-2984/2014 –

Cell phone No. 0722407795

Appendix II: Proposal Approval Letter



**JOMO KENYATTA UNIVERSITY
OF
AGRICULTURE AND TECHNOLOGY
DIRECTOR, BOARD OF POSTGRADUATE STUDIES**

NAIROBI - 00200 P.O. BOX 62000 NAIROBI - 00200
KENYA
Email: director@jkuat.ac.ke

TEL: 254-067-52711/32041-4
FAX: 254-067-52194/32030
TEL: 254-067-52711/32041-4
FAX: 254-067-52194/32030

REF: BPS/AB343-2984/2014 17TH FEBRUARY, 2016

ABAYA PHIRES MOKERIRA
C/O CONSTRUCTION
JKUAT


Dear Mr. Abaya,

RE: APPROVAL OF MSc. RESEARCH PROPOSAL AND SUPERVISORS


Kindly note that your research proposal entitled: "An investigation into occupational safety and health compliance levels in construction projects" has been approved. The following are your approved supervisors:-

1. Dr. Abednego Gwaya
2. Dr. Stephen Diang'a

Yours sincerely,


PROF. MATHEW KINYANJUI
DIRECTOR, BOARD OF POSTGRADUATE STUDIES

/s/
Copy: Dean, SABS



JKUAT is ISO 9001:2008 and 14001:2004 Certified
Setting Trends in Higher Education, Research and Innovation

Appendix III: Research Permit from NACOSTI

 REPUBLIC OF KENYA	 NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
Ref No: 805121	Date of Issue: 15/February/2021
RESEARCH LICENSE	
	
<p>This is to Certify that Ms. PHIRES MOKEIRA ABAYA of Jomo Kenyatta University of Agriculture and Technology, has been licensed to conduct research in Nairobi on the topic: AN INVESTIGATION INTO OCCUPATIONAL SAFETY AND HEALTH COMPLIANCE ON CONSTRUCTION SITES IN NAIROBI CITY COUNTY, KENYA A CASE IN EMBAKASI SUB-COUNTY for the period ending : 15/February/2022.</p>	
License No: NACOSTI/P/21/9048	
805121 Applicant Identification Number	 Director General NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
	Verification QR Code 
<p>NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.</p>	

Appendix IV: Questionnaire

Questionnaire No: _____

Part I: General Information

Section A. Background Information

Please tick and/or state the appropriate answer in the space(s) or box(es) provided. More than one answer may be ticked or stated where applicable.

1. How old are you?

- | | |
|---------------------|-----|
| Below 18 years | { } |
| Between 18-25 years | { } |
| Between 25-30 years | { } |
| Between 30-40 years | { } |
| Over 40 years | { } |

2. You are in the construction site as?

- | | |
|----------------------|-----|
| Construction manager | { } |
| Site administrator | { } |
| Supervisor/Foreman | { } |
| Craftsman/Artisan | { } |
| Safety officers | { } |

Part II: Specific Objectives

Section B: Employee’s Level of Education

3. This section is set to establish the influence of employees’ education on occupational safety and health compliance on construction sites. To achieve this, you are required to give your opinion on the level of agreement or disagreement using Likert scale of 1- 5 where: 5= strongly agree, 4= agree, 3= neutral 2= disagree and 1= strongly disagree (single response for each statement)

	Statement					
	The employee’s level education influences OSH compliance					
	Adequate employee induction influences OSH compliance					
	Employee capacity building influences OSH compliance					

4. How does the level of education of employees’ influence OSH compliance in construction industry

.....

5. a) Does induction, capacity building and development of employees’ influence OSH compliance in construction industry?

b) If yes/no, briefly explain

.....

.....

6. a) Were you first trained before you use any plant, machinery or equipment on site?

Yes { } No { }

b) If yes, do you pay any charges for the training?

Yes { } No { }

c) When is the training done?

Over lunch time { }

During working hours { }

After work { }

Other (specify).....

Section C: Contractor’s Competency

7. This section is set to determine the influence of contractors’ competency on occupational safety and health compliance on construction sites. To achieve this, you are required to give your opinion on the level of agreement or disagreement using Likert scale of 1- 5 where: 5= strongly agree, 4= agree, 3= neutral 2= disagree and 1= strongly disagree (single response for each statement)

	Statement					
	Contractors’ financial ability influences OSH Compliance					
	Provision of safe working environment of workers					

	influences OSH compliance					
	Human relations skills practiced by contractors influences OSH compliance					

8. a) Do you report to the contractor/supervisor any matter/situation that you consider not safe or is a risk to your health:

Yes { } No { }

b) If yes, is the matter/situation corrected?

Yes { } No { }

c) If no, why?

.....
.....
.....
.....

9. a) Do you report to the contractor/supervisor any accident or injury that arises in the course of or in connection with your work?

Yes { } No { } I have never been involved in an accident { }

b) If No, why?

.....
.....
.....
.....
.....
.....

10. a) Are protective clothing at all times provided by the contractor e.g. head gear,

footwear, gloves, goggles and nose muffles?

Yes { } No { }

b) If yes, do you at all times wear or use them while at work?

Yes { } No { }

c) If not provided, do you request for their provision?

Yes { } No { }

Section D: Government Policy

10. This section is set to assess the influence of government policy on occupational safety and health compliance on construction sites. To achieve this, you are required to give your opinion on the level of agreement or disagreement using Likert scale of 1- 5 where: 5= strongly agree, 4= agree, 3= neutral 2= disagree and 1= strongly disagree (single response for each statement)

	Statement					
	Employees' rights to trained influences OSH compliance					
	Right to report accident influences OSH compliance					
	Right to safety information by labelling chemicals influences OSH compliance					

11. a) Has the contractor provided an adequate supply of wholesome drinking water at the workplace?

Yes { } No { }

b) If yes, is the water accessible to all persons employed?

Yes { } No { }

12. a) Have you used any kind of chemical(s) in this workplace?

Yes { } No { }

b) Are the chemical labeled?

Yes { } No { }

Section E: Use of Technology

11. This section is set determine the extent to which use of technology influence occupational safety and health compliance on construction sites. To achieve this, you are required to give your opinion on the level of agreement or disagreement using Likert scale of 1- 5 where: 5= strongly agree, 4= agree, 3= neutral 2= disagree and 1= strongly disagree (single response for each statement)

	Statement					
	Use of technologic supervision influences OSH compliance					
	Use of emergency alert and reporting systems influence OSH compliance					
	Use of effective mode equipment and machine influences OSH compliance					

13. According to your view tick the major factor that affect OSH compliance in your workplace

Employees' education { }

Contractor's competency { }

Government policy { }

Use of technology { }

Section F: Occupational Safety and Health compliance

12. This section is set determine whether occupational safety and health compliance on construction sites is practiced. To achieve this, you are required to give your opinion on the level of agreement or disagreement using Likert scale of 1- 5 where: 5= strongly agree, 4= agree, 3= neutral 2= disagree and 1= strongly disagree (single response for each statement)

	Statement					
	There is efficiency on the construction sites due to compliance of OSH regulations					
	There is a reduction in the number of accident cases due to OSH compliance					
	There is minimal cost of supervision on sites due to adoption of technology					

I SINCERELY THANK YOU FOR YOUR TIME AND PATIENCE

Appendix V: Interview Guide for Engineers, Occupational Safety Officers and Contractors

SECTION A: DEMOGRAPHIC INFORMATION

1. What is your highest level of education?.....
2. How long have you been involved in the construction industry?.....

SECTION B: SPECIFIC INFORMATION ON STUDY VARIABLES

Using the Five-Point Likert Scale of: 5-Very high; 4-High; 3- Moderate; 2-Little; 1 Very little, how would you rate the following:.

1. Occupational Safety and Health (OSH) compliance levels on construction sites in Nairobi City County?.....
2. Influence employees' education on OSH compliance on construction sites in Nairobi City County?.....
3. Influence of contractor's competency on OSH compliance on construction sites in Nairobi City County?.....

2. Using the Five-Point Likert Scale of 5-Very great extent; 4-High extent; 3- Moderate extent; 2-Little extent; 1-Very little extent, how would you rate the:

- a). Influence of government policy on OSH compliance on construction sites in Nairobi City County?.....
- b). Influence of use of technology on OSH compliance on construction sites in Nairobi City County?.....

3. What are some of the strategies which could be employed to mitigate fatalities on the construction sites in Nairobi City?

.....
.....
.....

4.How can OSH compliance be achieved on the construction sites in Nairobi City County?

.....
.....
.....
.....

5. How would do you promote the culture of workers wearing protective gears on the construction sites in Nairobi City County?

.....
.....
.....
.....

6.What suggestions and recommendations would you advance to enhance OSH compliance on the construction sites in Nairobi City County?

.....
.....

THANK YOU FOR TAKING YOUR TIME TO PARTICIPATE IN THIS STUDY.