

**EXAMINATION OF OCCUPATIONAL HEALTH AND SAFETY SYSTEMS IN
SELECTED MINING COMPANIES ON THE COPPERBELT PROVINCE OF ZAMBIA**

**By
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**A Dissertation Submitted to the University of Zambia in Partial Fulfilment of the
Requirements for the Master of Education in Environmental Education.**

THE UNIVERSITY OF ZAMBIA

2020

DECLARATION

I, **Cynthia Sikana**, do hereby declare that the dissertation hereby submitted is my own work and it has not previously been submitted for any degree, diploma or any other qualification at the University of Zambia or any other University.

Signed:

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APPROVAL

This dissertation by Cynthia Sikana is approved as a partial fulfilment of the requirements for the award of Master of Education in Environmental Education by the University of Zambia.

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ABSTRACT

Zambia has a long history of mining and a large known resource base of copper, emeralds, and other deposits. Despite these benefits, accidents and injuries have continued to occur. This Study sought to examine Occupational Health and Safety systems of selected mining companies on the Copperbelt Province of Zambia. The mining industry is expected to comply with the ISO 45001 on occupational health and safety. ISO 45001 is an ISO standard for management systems of occupational health and safety and its goal is to reduce occupation injuries and diseases. It also promotes and protect physical and mental health. The mining industry consists of rules that guide them when it comes to occupational health and safety in order to prevent the occurrence of accidents. These rules include provision for the supervision of safety and health in mines and inspection of mines by inspectors from the mine safety department. The provision also involves reporting, investigating of occupational accidents and compilation and publication of statistics on accidents. Despite the rules and regulations that guide the industry on occupational health and safety, there has been an increase in accidents, injuries and diseases in the industry. The purpose of the study was to examine the nature of occupational health and safety systems in selected mines in Zambia and to design a sustainable learning programme for occupational health and safety in the mines. The study was guided by the following objectives: to investigate the perceptions of occupational health and safety by workers and employers, to establish the importance of existing occupational health and safety systems at selected mining industries; to examine the how the existing occupational health and safety system comply with occupational health and safety authority and to design an educational programme that can be used to improve learning for occupational health and safety in the mines. A case study was used as a research design and a sample of 50 participants. The study used probability and non-probability sampling design. Stratified simple random technique and homogeneous expert purposive sampling technique were used. Furthermore, a semi-structured interview schedule, semi-structured questionnaire and observation guide were used. Education is an important tool which can be used to reduce the occurrence of accidents in the mining industry. Therefore, the Environmental Education context of the study was based on the Global Education Monitoring Report for 2016. The report states that education is crucial for disaster preparedness and if education progress is stalled, it could lead to 20% increase in disaster related fatalities. (GEM, 2016). The study revealed that methods used in training on health and safety were not effective enough. The results show that the perceptions of workers and employers to health and safety rules, regulations and guidelines was negative as accidents were not reported for fear of charges and loss of jobs. Furthermore, the curriculum on health and safety made it difficult for workers to understand and apply to their work. This was because the curriculum had a lot of topics which were covered in a week and this made it difficult for the workers to assimilate and process what they learn't. Thus, the study proposed an educational learning programme on health and safety. The study proposed that a behavioral course for supervisors and managers needed to be introduced in order for them to understand employee's behavior towards health and safety. This will enable them to implement effective health and safety rules.

Keywords: *Examining, Occupational Health and Safety System, Mining industry*

DEDICATION

This research dissertation is dedicated to my father Mr. Nahum Sikana, my mother Mrs. Fortunata Sikana and my brothers Mr. Kelvin Sikana, Mr. Andrew Sikana and Mr. Nathan Sikana for the gift of formal education and helping me to realize my full potential in life, and for their encouragement and moral support.

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ABBREVIATIONS AND ACRONYMS USED

BSI	British Standards Institute
CSO	Central Statistical Office
GDP	Gross Domestic Product
GRZ	Government of the Republic of Zambia
HSA	Health and Safety Authority
ILO	International Labor Organization
ISO	International Standardized Organization
KCM	Konkola Copper Mines
OHSS	Occupational Health and Safety Systems
OSHA	Occupational Safety Health Authority
PPE	Personal Protective Equipment
PTO	Planned Task Observation
UNESCO	United Nations Educational Scientific Cultural Organisation
VFL	Visible Felt Leadership
WHO	World Health Organization
ZCCM	Zambia Consolidated Copper Mines

CHAPTER ONE

INTRODUCTION

1.1 Background

Zambia has a long history of mining and a large known resource base of copper, emeralds and other mineral deposits. The country has maintained its potential for further discoveries and the mining sector is a significant source of government revenue and formal employment both directly and indirectly. The mining industry has continued to attract investment of over 62% of the foreign direct investment. GRZ (2004, 13). However, the gains from the mining sector are achieved at significant environmental, health and social cost to the country (Philips, 2007). According to (Alavosius, 2011), there have been several press reports about accidents occurring in the mining premises. Though the mining industry in Zambia has implemented rules and guidelines to ensure the health and safety of workers, a number of accidents and injuries have occurred over the years. For example, on the 2nd of March 2005, the Zambia Daily Mail reported that a miner was killed in a tragic accident at the Konkola Copper Mines and, in the same year, an explosion in Chambishi Mine killed 51 workers due to the company's failure to follow the Zambia Consolidated Copper Mines safety guidelines. Between 2000 and 2006, a total of 399 accidents resulted in the death of 9 mine workers. In 2008, 370 accidents were recorded and resulted in the death of 23 mine workers; in 2010, 312 accidents occurred and 8 mine workers died. In 2011, 121 accidents occurred and 10 workers perished (KCM, 2007).

In addition, mining operations contaminate the environment by emitting sizable quantities of dust particles or chemical emissions into the air which singly or in combination cause respiratory impairment if inhaled at adequate concentrations and over a long enough period of time (Crotty, 2003). Inasmuch as mining is viewed as one of the most important economic activities which Zambia depends on with the potential to contribute to the economic development of the country through employment creation, the mining activities are a major concern because of their impact on the environment and the health of workers and the surrounding communities. Therefore, there was need to examine occupational health and safety systems in relation to sustainable safety education among employees and employers in the mines (Workers Compensation Fund Board, 2005).

Occupational health and safety is one of the pressing concerns in the mining industry. It is the concern of both developed and developing nations alike. The World Health Organisation (WHO) describes health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (Abdullah, 2011). A work place environment, especially the mining industry must consist of workers who have a complete physical, mental and social well-being. Therefore, a healthy work place is an environment where health risks are recognised and controlled.

The Factories Act on Occupational Health and Safety deals with Occupational Health and Safety in Zambia and contains provisions on health and safety welfare (OHSA, 2010). The Act requires the employer to provide a clean working environment, adequate ventilation, first aid, lighting, sanitary facilities and fire extinguishers. It also requires the employer to prevent overcrowding in the work place.

The mining industry in Zambia is further governed by rules and regulations on occupational health and safety. One of the regulations entails that the employer provides systems of work that are reasonably and practicably safe and without any risks to human health and to maintain them in that condition (OHSA, 2010). The regulations provide for the supervision of safety and health in mines, inspections of mines by inspectors from the Mine Safety Department, investigating and reporting of occupational accidents and the compilation of statistics on accidents, occupational diseases and dangerous occurrences (ILO, 2013).

The Occupational Health and Safety Act of 2010 provides for the establishment of an Occupational Health and Safety Institute whose functions are the establishment of health and safety committees at work places and for the health and safety welfare of persons at work. Therefore, employers and employees have duties to carry out to ensure health and safety in the mining industry. The duty of the employers includes establishing a health and safety committee where he or she employs ten or more people; ensure health, safety and welfare of employees; and to place and maintain an employee in an occupational environment adapted to the employee's physical, physiological and psychological ability (ILO, 1996).

The duty of the employee is to take reasonable care for the employee's own health and safety and that of other persons who may be affected by the employee's acts or omissions at the

workplace; not to operate any machine or engage in a process which is unsafe or is an imminent risk to the employee's own health or safety and that of others; and to cooperate with the employer or any other person in relation to any duty imposed on the employer or that other person, so far as is necessary to enable that duty or requirement to be performed or complied with (ILO, 1996; Laws of Zambia, 2018).

A number of accidents and injuries have occurred at Mopani Copper Mines. Table 1 shows the number of accidents that occurred at the mine from 2001 to 2018.

Table 1: Number of accidents that have occurred at Mopani Copper Mines, 2001 - 2018

Year of accident	Number of accidents
2001- 2003	21
2004- 2006	34
2007 – 2009	18
2010 – 2012	15
2013 -2015	12
2016 – 2018	7
Total	107

Source: Field Data (2020).

Table 1 shows the number of accidents that had occurred in the mining companies from 2001 to 2018. In 2004 to 2006, 34 accidents occurred and in 2016 to 2018, seven accidents had occurred.

Occupational health and safety management system (OHSMS) is a proactive process in which an organised set of components enable an organisation and industries to accomplish a set of goals. It is a framework that allows an organisation and industries to consistently identify and control its health and safety risks, reduce the potential for incidents, help achieve compliance with health and safety legislation and continually improve its performance. When implemented, OHSMS ensures that the work place is safer and the employee morale is improved. It also ensures reduced costs and stakeholder confidence (BSI: 2018). Most successful OHSMSs are based on a common set of key elements. These include: management leadership, employee participation, hazard identification, hazard prevention and control, education and training, and programme evaluation

and improvement. Therefore, the mining industry all over the world has adapted their management system to ISO 45001, an international standard on occupational health and safety (published in March 2018) that every industry should adopt and comply to (BSI Standards, 2018).

1. 2 Problem statement

Each organisation is responsible for the health and safety of its workers and other people who may be affected by its activities. This responsibility includes promoting and protecting the workers' physical and mental health (BSI: 2018). Therefore, the adoption of an occupational health and safety management system is intended to enable an organisation to provide safe and healthy work places, prevent work- related injury and ill- health and continually improve its occupational health and safety performance.

In Zambia, the mining industry has an occupational health and safety management system which is guided by the ISO 45001. It is a standard for management systems of occupational health and safety and its goal is to reduce occupation injuries and diseases. It also promotes and protect physical and mental health (BSI, 2018). The ISO states that top management shall demonstrate leadership and commitment with respect to the occupational health and safety management system by taking overall responsibility and accountability for the prevention of work-related injury and ill health, as well as the provision of safe and healthy workplaces and activities and protecting workers from work-related reprisals when reporting incidents, hazards, risks and opportunities.

The ISO 45001 further states that workers shall be made aware of the implications and potential consequences of not conforming to the OHS management system requirements. The workers shall be made aware of the hazards, OHS risk and actions determined that are relevant to them. The organization shall establish, implement and maintain and audit programme(s) including the frequency, methods, responsibilities, consultations, planning requirements and reporting, which shall take into consideration the importance of the processes concerned and results of previous audits (BSI :2018).

Despite the mines' claims to conform to the ISO 45001 statutory, accidents and injuries have continued to increase in the mining industry on the Copperbelt Province of Zambia (Malama,

2018). These accidents have led to deaths of bread winners in families, thereby, leaving no one to support bereaved families financially. This has led to poverty in many households in the region. Accidents and injuries in the mines have led to the mines spending more money on compensation of injured employees, training of employees to replace the competent injured employees and on legal actions taken against them. The question which constitutes the problem, therefore, is why accidents have continued to happen in the mines despite the implementation of ISO 45001. Therefore, because accidents have continued to occur, this study was undertaken to find out the causes of accidents in the mining companies on the Copperbelt province of Zambia.

1.3 Purpose of the study

The purpose of this study was to examine the nature of occupational health and safety systems in the selected mines on the Copperbelt Province of Zambia and to design a sustainable learning programme for occupational health and safety in the mines.

1.4 Specific Objectives

The study was guided by the following objectives:

- i. to investigate perceptions of occupational health and safety by employees and employers in relation to their work,
- ii. to establish the importance of existing occupational health and safety system at selected mines,
- iii. to examine how the existing occupational health and safety system complies with Occupational Health and Safety Authority,
- iv. to design an educational programme that can be used to improve learning for occupational health and safety in the mining industry in Zambia.

1.4.1. General research question

What is the nature of the occupational health and safety system used in selected mines on the Copperbelt Province of Zambia?

1.4.2. Specific Research Questions

The study was guided by the following research questions

- i. What perceptions do employers and employees have on occupational health and safety in relation to their work?
- ii. What is the importance of the existing occupational health and safety system at the selected mines?
- iii. How does the existing occupational health and safety system comply with occupational health and safety authority?
- iv. What educational programme design can be used to improve learning for occupational health and safety in the mining industry in Zambia?

1.5 Significance of the study

The study may enable the mining industry to implement a sustainable learning programme as part of occupational health and safety system which may lead to positive behavioural and institutional change. The learning programme may enable employees and employers to have knowledge on health and safety in relation to the work which they carry out and how best they can ensure that the work environment is free from hazards and risks that lead to accidents, injuries and diseases.

The findings may enable management in the mines to come up with different approaches to health and safety learning so as to change the negative attitude that workers have towards health and safety and the rules and regulations it comes with. When employees and employers in the mining industry understand the importance of health and safety in a work place, accidents would reduce and their productivity would increase as the company would not be losing competent people to accidents and diseases. This may enable them to spend less money on training people to replace those who are dying or getting injured. The money saved can then be spent on production.

The study may also benefit the Ministry of Labour to formulate and implement policy in the health and safety act that may require each mine to have a sustainable training model on health and safety. This may enable employers and employees to learn more on health and safety,

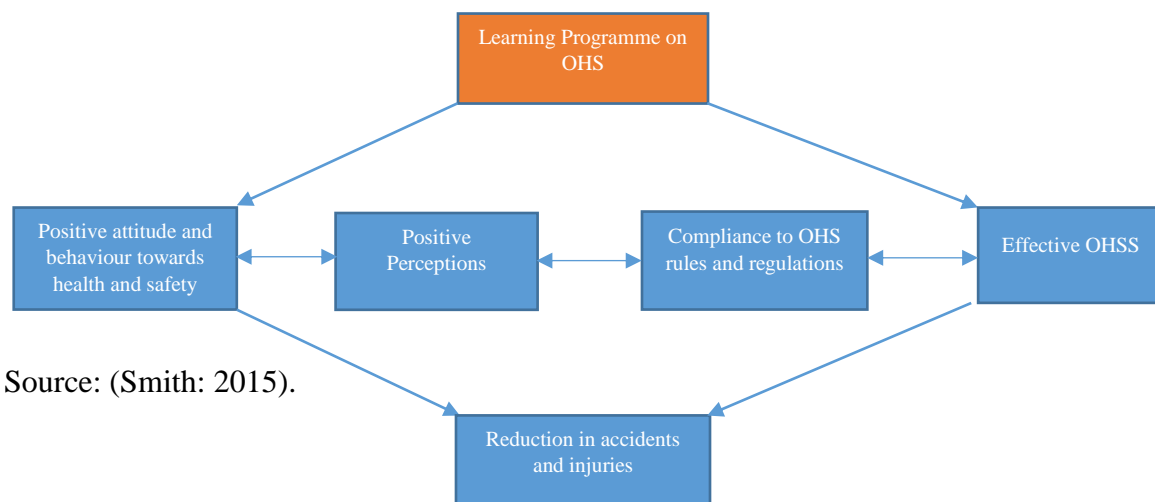
thereby leading to attitude and behavioural change. The findings of the study may also add to general scientific knowledge and Environmental Education.

1.6 Thesis Statement

An occupational health and safety system which does not include a sustainable learning system is ineffective and may be prone to accidents, injuries and diseases in work places.

1.7 Conceptual framework

A conceptual framework is a visual or written product that explains, either graphically or in a narrative form, the main things to be studied (Huberman & Miles: 1994). Figure 1 presents the conceptual framework for this study.



Source: (Smith: 2015).

Figure 1: The Conceptual Framework of the study.

In relation to the conceptual framework, the effectiveness of a system has a great effect on the perceptions that workers and employers have on health and safety in relation to their work. The perceptions that the workers and employers have on health and safety determine the attitudes and behaviour that they will portray to ensure that accidents are either prevented or increased. This will, in turn, depend on the learning programme that is incorporated in the occupational health and safety system (CSO, 2005).

Figure 1 shows that a good and effective occupational health and safety system consists of positive perceptions by workers and employers on occupational health and safety. The system also complies with the occupational health and safety authorities by carrying out all the necessary tasks to prevent accidents, injuries and diseases. Furthermore, an effective occupational health and safety system consists of a sustainable learning system that imparts knowledge, skills and right attitudes in the workers on occupational health and safety in relation to their work environment. This learning system leads to behavioural change and positive perception of occupational health and safety rules and regulations (Gomes, Lloyd & Norman, 2001).

1.8 Theoretical framework

According to Richard (2013), theories are formulated to explain, predict and understand phenomena. They are formulated to challenge and extend existing knowledge within the limits of critical bounding assumptions. Therefore, this study adopted one of the accident causation theories called the Multiple Causation Theory of accidents to understand why accidents occur in the mining industry in general and in Zambian mines in particular. This theory was propounded by Herbert William Heinrich in 1931. It is an outgrowth of the Domino Theory, but postulates that for a single accident, there may be contributing factors, causes and sub causes and that certain combinations of these give rise to accidents (Mahat & Ismail, 2015). According to this theory, the contributing factors can be grouped into the following categories:

1. Behavioural: This category includes factors pertaining to the workers, such as improper attitude, lack of knowledge, lack of skills and inadequate physical and mental conditions.
2. Environmental: This category includes improper guarding of other hazardous work elements and degradation of equipment through use and unsafe procedures (Viner, 1991).

Therefore, this study adopted the Multiple Causation Theory and its two categories. This is because there are a lot of contributing factors for accidents to occur in mines A and B. The occupational health and safety system needs to be examined to find out these factors. Furthermore, since accidents are not caused by a single factor, factors such as the improper attitude of workers and supervisors, and lack of knowledge and skills could also lead to the ineffectiveness of occupational health and safety systems in mines A and B, thereby leading to

accidents, injuries and diseases in the mining industry. Therefore, this study adopted this theory to examine the various factors that led to the ineffectual functioning of the occupational health and safety system in mines on Zambia's Copperbelt.

1.9 Environmental Education Context of the Study

The Environmental Education context of the study was based on the Global Education Monitoring Report which states that, "Education is crucial for disaster preparedness and if education progress is stalled, it could lead to 20% increase in disaster-related fatalities per decade" (GEM: 2016:2). Therefore, this study was within the context of Environmental Education because it sought to suggest measures to prevent the increase in accidents, injuries and diseases in the selected mines through education. Education leads to attitude and behavioural change and when used to address the accidents, injuries and diseases in the mining industry, it may lead to attitude and behavioural change by employers and the workers. This will enable them to comply with the set out rules and regulations on occupational health and safety, thereby reducing accidents, injuries and diseases in the mining industry and also contributing to an effective occupational health and safety system.

1.10 Summary

This chapter has presented the background of mining in Zambia and the number of accidents that have occurred in the industry in recent times. The chapter included the problem statement which revealed that despite the implementation of occupational health and safety rules in the mines, accidents have continued to occur. It also presented the objectives of the study, the significance of the study, the conceptual framework and the theoretical framework. Chapter Two will present literature which is relevant to the study.

1.11 Organisation of the dissertation

The study consists of six chapters. The first chapter introduces the study and presents the background to the problem under investigation, the statement of the problem, the purpose of the study. The chapter also outlines the objectives, research questions, significance of the study, thesis statement, theoretical framework, and the environmental education context of the study. The chapter also presents the organization of the dissertation. The second chapter presents a

review of literature related to the topic. The methodology of the study is described and outlined in chapter three. Chapter four presents the findings and an educational training programme on occupational health and safety while chapter five discusses the findings. Finally, chapter six draws the conclusion and makes some recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The literature review in this chapter is based on the four objectives of the study.

The human, social and economic costs of occupational accidents, injuries, diseases and major industrial disasters have long been a cause for concern at all levels, from the individual workplace to the national and international (ILO, 2003). Measures and strategies designed to prevent, control, reduce or eliminate occupational hazards and risks have been developed and applied continuously over the years to keep pace with technological and economic changes. Yet, despite the continuous if slow improvement, occupational accidents and diseases are still frequent (ILO, 2001).

Protecting workers in hazardous conditions – in what is often known as the “3D” jobs (dirty, difficult and dangerous) is, therefore, important. The International Labour Organisation sets forth the principle that workers should be protected from sickness, diseases and injuries arising from their employment. Yet, for families of workers, the reality is very different. The ILO estimates that 2.02 million people die each year from work-related accidents or diseases. A further 317 million people suffer from work-related diseases and there are estimated 337 million fatal and non-fatal work-related accidents per year (ILO, 1996).

The suffering caused by such accidents and illnesses to workers and their families is incalculable (ILO, 1996). In economic terms, the ILO has estimated that four percent of the world’s annual Gross Domestic Product is lost as a consequence of occupational diseases and accidents. Employers face costly and early retirements, loss of skilled staff, absenteeism and high insurance premiums due to work-related accidents and diseases (ILO, 1996).

2.2 The global perspective of OHS

Occupational health and safety hazards are common in many economic sectors and affect large numbers of workers everywhere in the world. This section presents a worldwide view of occupational health and safety.

2.2.1. Compliance to occupational health and safety in India

A study conducted by Sishodiya (2013) on occupational health and safety in India revealed that India had a unique blend of big and small, manual and modernised opencast and underground mines. Eighty-nine minerals were produced, out of which four were fuels, 52 were non-metallic and 22 were minor minerals. The Indian mining industry was characterised by a large number of small operational mines, especially of minor minerals which continued to be operated manually either proprietary or partnership ventures owned by private entrepreneurs. These mining ventures remained the area of major concern for health and safety (DGMS, 2011).

In India, the safety, welfare and health of workers employed by the mines were the concern of the central government. Mines were regulated by the Mines Act of 1952 whose rules and regulations were administered by the Directorate-General of Mines Safety (DGMS) under the union Ministry of Labour. The directorate had specialist staff officers in mining, electrical and mechanical engineering disciplines who carried out health and safety inspections, audits and accident investigations in the mines. Furthermore, at mine level, depending on the mineral produced and the number of persons employed, the mine was required to appoint safety officers, medical officers and other competent person to ensure safe and healthy working conditions. Every person employed in the mine was required to undergo initial medical examination at the time of appointment and once every five years thereafter (DGMS, 2010).

The study by Sishodiya (2013) also showed that there was increasing awareness among workers, unions, mine management and the government about the level of occupational safety and health and prevention of accidents and diseases in mines. The government had formulated a National Policy on Occupational safety and Health and the mines Act was amended to address the needs of changing mining scenarios (DGMS, 2011). The researcher found this study to be important as it guided the researcher's study when it came to what India had implemented in terms of training

on occupational health and safety to reduce on injuries and accidents in the mines and how the study needed to compare India's training on occupational health and safety to that of the mining companies in Zambia. From the study, the researcher learnt that in order for accidents and injuries to be reduced in the mining companies in Zambia, every employee despite their specialization needed to be involved in ensuring that their work environment is safe and healthy to work in. The researcher also learnt that in order for accidents and injuries to reduce in the mines, the Ministry of Labour needed to be fully involved by ensuring the health and safety rules and regulations implemented by the mines are adhered to.

2.2.2 Compliance and Training in Occupational Health and Safety in United States of America

A study conducted in a coal mine in the United States of America by Moore (2009), on occupational health and safety revealed that the safety and health of miners was the responsibility of the mine operator with the assistance of the miners. In addition, two US federal agencies, by statute had complementary responsibilities for contributing to miner safety and health. These two government entities worked in conjunction to facilitate systems approach to safety and health through training, education, regulation, enforcement and development of engineering best practices, new technology and research.

The Mine Safety and Health Administration (MSHA), which was located in the Department of Labour had the statutory responsibility to develop and enforce mining regulations as well as approval and certification of certain equipment used in mines. MSHA facilitated inspection, enforcement, plan approvals and communication with mine operators and miners (MSHA: 2011).

MSHA performed complete inspections of each underground mine four times per year and each operating surface mine twice each year, to assure compliance with mining safety and health standards and regulations. It also investigated mine accidents, complaints of retaliatory discrimination filed by miners, hazardous conditions complaints and petitions for modification of mandatory safety standards.

MSHA reviewed approvals for mine operators' mining plans, education and training programmes for employees. It also operated the National Health and Safety academy, a national training centre where instructional programmes were designed and conducted to assist the efforts of the government, industry and labour to reduce accidents and health hazards in mining (NIOSH :2011). MSHA inspectors received mandatory and periodic re-training at the academy.

Mine operators were required to report fatalities, injuries and illnesses experienced by mine workers. This reporting system included information regarding the injured demography (e.g. age, gender, mine experience, job experience) and accident types (e.g. struck against stationary object and a fall down stairs).

MSHA and National Institute for Occupational Health and Safety (NIOSH) designed programmes to address the causes of fatalities, injuries and illnesses. Moreover, investigations conducted by MSHA following mine disasters such explosions, substantial fall of ground, fires and inundations also aided in the development of regulations and research projects. Furthermore, industry and labour partners were extremely active in assisting in the development and execution of both regulatory and training programme conducted by MSHA as well as research, technology, development and training programme at the NIOSH office Mine Safety and Health Research (MSHA, 2011). In this study, the researcher concluded that the coal mine carried out all the necessary measures on occupational health and safety to prevent accidents and injuries. This therefore relates to the study on examining of occupational health and safety in selected mining companies on the Copperbelt Province of Zambia because the researcher wanted to examine how the mines complied to health and safety authority and whether the training programme on occupational health and safety was sustainable.

The study by Moore (2009) reveals that the coal mine in the United States of America complied to health and safety standards and their training on occupational health and safety was sustainable, effective and prevented the occurrence of accidents and injuries. From this study, the researcher learnt that there was need to have a sustainable learning and training programme on occupational health and safety to prevent the occurrence of accidents and injuries in the mining companies on the Copperbelt Province of Zambia. Therefore, this guided the researcher by

looking at how sustainable the training programme on occupational health and safety was in the mining companies and how they complied to occupational health and safety authority.

2.2.3 Compliance to occupational health and safety in Chile

A study by Bachelet (2015) on work-related injuries resulting in death in Chile revealed that serious and fatal occupational injuries occurred in that country each year. Citing the International Labour Organisation, Bachelet also indicated that about 2.78 million workers died each year globally from work-related injuries and illnesses.

Bachelet's used data from mandatory registry for occupational deaths notified for 2014 and 2015 and reported overall occupational mortality rates for both years on the job and commuting fatalities. The study characterised the causes using many variables contained in the national registry for occupational deaths, especially taking into account data on health and safety occupational national regulations, which had not been previously reported. This study found out that nearly three out of every four fatal cases occurred in small and medium enterprises, that 63% of the cases occurred on the job and not during commuting and that little over a half of all fatal injuries occurred in workers who had been employed for less than a year in the company.

The sectors with the greatest mortality rates were agriculture, fishing, mining, transport and construction. Importantly, most of the companies that had a fatal injury case during the two study years did not have a risk prevention department and did not have an occupational safety joint committee. This indicates an overall laxity with regard to regulatory compliance (Bailes, 2003).

The analysis of workers fatality from occupational injuries in Chile 2014 and 2015 is that more workers died from incidents on the job than during commuting (Bachelet, 2014). The researcher learnt from this study that there was need to report fatalities and account for them. The study was a learning point as it taught the importance of finding out the causes of accidents so that preventative measures are put in place to prevent re-occurrence of fatalities. The researcher learnt that it was important for every mining company to have a risk preventing department and occupational health and safety committee that can monitor whether employees are adhering to the set health and safety rules and to implement health and safety rules that can prevent the occurrence of accidents and injuries.

This guided the study on examination of occupational health and safety systems in selected mining companies on the Copperbelt Province of Zambia by examining their compliance when it comes to reporting fatalities, carrying out accident investigations and whether the Health and Safety Department carried out occupational health and safety tasks to protect the workers from accidents and injuries. Furthermore, the findings by Bachelet (2014), guided this study by enabling the researcher to find out if the mining companies had a sustainable learning programme on occupational health and safety that leads to positive behavioural and attitude change by employees that would lead to reduction in accidents and injuries.

2.2.4 Training and Perceptions of Occupational Health and Safety in Nepal

A study by Budhathoki (2014) in Nepal found that proper use of safety measures by welders was an important way of preventing and reducing a variety of health hazards that they were exposed to during welding. In this study, data were collected from 300 welders all of whom were men with a mean age of 31.9 years and 93% were literate. The study found that there was a lack of knowledge about hazards and personal protective equipment and the use of PPE among welders was limited. About 9.3% of the welders were not aware of any specific hazard in their work; they could not think of any harmful factor in welding. For example, although 90.7% of the welders were aware that welding goggles/eye shield would protect their eyes, a high proportion of welders (74.3%) used sun glasses regularly at work. Sunglasses are not among the recommended PPE to protect the eye from welding radiation. The reasons for provision of sunglasses by the employer maybe that they are cheap, easily available and comfortable. The sunglasses used were also not certified for UV protection. And although 75% of the welders identified noise as a hazard at their work place, only 19.7% were aware of ear muffs. Similarly, the masks that were used by the welders were also commonly used cotton masks. These do not meet the requirements as respirators for use during welding. It was also seen that more than half of the welders (52.3%) did not use any PPE during work (Joshi & Dahal, 2008). The utilisation of at least one PPE among welders was 47.7%.

This study clearly demonstrates that the level of education has a significant influence on awareness of hazard, awareness of Personal Protective Equipment (PPE) and use of PPE. This showed that with an increase in the level of education among the population of welders,

awareness and safety practices also increased. Welders who had a higher level of education had the tendency to read news and get updates which increased their awareness of and use of PPE as well (Budhathoki, 2014).

It was also found that welders who were employed for longer durations reported being less aware of the hazards of welding. It may also be generally expected for the opposite to be true. The reasons for such findings in this study could be that welders working for longer duration failed to recognise exposure as hazardous after been exposed to it for many years.

The welders were also not trained or oriented regarding hazardous and safety measures at work, including basic First Aid. This was one of the reasons they were not aware of many hazards of their profession and protective measures that they should take (Isah, 2006).

2.2.5 Perceptions on Occupational Health and Safety in Mexico

Dawson (1992) conducted a case study among workers in a uranium mine in Navajo, Mexico, on the effects of occupational illnesses. There were 41 miners, 5 mill workers and 2 workers who worked both in the mines and the mills, primarily in drilling and manual labour positions. The workers responded by indicating that they had worked full time, working regular hours and often overtime to supplement their salaries.

The respondents agreed in their descriptions of working conditions that several problems were identified. These problems were lack of engineering controls (e.g. mine ventilation), personal protective equipment and worker safety and training. All the workers reported that at no time during their employment were they informed of the dangers of radiation nor were they informed of their rights under the state workers compensation laws when they became ill. The respondents also indicated that the workers were not even aware that radiation existed because there was no word for it in the Navajo vocabulary. The workers spoke little or no English, and believed that the uranium companies had their best interest in mind (Abdelhammid, 2000). Strydom (2002) explains that it is important to empower, educate and persuade workers to exercise their powers in the protection of their occupational health and safety.

2.2.6. Training on Occupational Health and Safety in China

China is one of the countries that have incorporated the promotion of occupational health and safety in its industries (Chondhry and Fang, 2008). The promotion of work place health emerged out of a workshop in 1984. The workshop was facilitated by the Ministry of Health and hosted by the Chinese Association of Health Education (CAHE). Under the leadership of CAHE, the committee on health education in a work place was established with 154 members. The constitution of the Chinese health education workshop was developed and formalised in 1996.

The purpose of the committee was to unite leaders in work places; the health promotion leaders, the health education workers and other health workers related to health education and industrial health in the work places in accordance with the government principles and policies on health and safety. The purpose of the committee was to carry out health education and health promotion in work places and also establish healthy behaviours and healthy environments for work and life. The study on examination of occupational health and safety systems in selected mining companies on the Copperbelt Province of Zambia can learn from the study conducted by Chondhry and Fang (2008), establish whether health promotion is used as one of the tools to disseminate information to the employees on occupational health and safety. Furthermore, the study by Chondhry and Fang (2008), guided the study by enabling the researcher to find out whether the training programme on occupational health and safety also included training of leaders such as; managers and supervisors.

2.3 The African Perspective

Work-related accidents and diseases take a particularly heavy toll in developing countries, where large numbers of workers are concentrated in the primary and extractive activities, particularly agriculture and mining. The majority of these countries are found in Africa. This section discusses literature on Occupational Health and Safety from an African perspective. The discussion is centred on perceptions of OHS, compliance levels and training in in nine African countries, namely Tanzania, South Africa, Uganda, Ghana, Nigeria, Rwanda, and Ethiopia.

2.3.1 Compliance to Occupational Health and Safety in Tanzania

In Tanzania, occupational health and safety is related with economic activities undertaken in the country. A study by Mrema, Ngowi and Mamuya (2015) reported that, as economic activities grew and expanded in the country, occupational injuries and diseases were also likely to increase among workers. According to Mrema et al. (2015), Tanzania's economy is growing steadily, with growth being driven by communication, transport, financial intermediation, construction and mining, agriculture and manufacturing. Along with this growth, hazards emanating from work in all sectors of the economy have increased and varied. The workers exposed to these hazards suffer from illnesses and injuries and yet they are not provided with occupational health services. Services are scanty and limited to a few enterprises that can afford it. Existing laws and regulations are not comprehensive enough to cover the entire population of workers. Implementation of legislation is weak and does not protect the workers. The implementation of legislation is weak and does not protect workers.

Like other developing countries, Tanzania faces challenges in promotion and provision of occupational health and safety services. According to Mrema et al. (2015, p. 545), these include the following:

- 1) Fast technological developmental and expanding economy.
- 2) Inadequate effective institutional framework to enhance OHS in formal and Informal sectors.
- 3) Low OHS skills among health care service providers.
- 4) Lack of resources (human, technical, and financial) to carry out OHS.
- 5) Low awareness of OHS matters among the general public, workers and employers.
- 6) Low compliance to OHS standards.
- 7) Government officers who are not fully committed or motivated to enforce health and safety law.
- 8) Poor work environment in the informal sector.
- 9) Lack of employer interest in providing a safe work environment.
- 10) Inadequate OHS information.

Therefore, millions of people are at risk and about 2 million workers die every year from occupational illnesses. Majority of the Tanzanians (over 80%) are not covered by the OHS law and they do not access occupational health services. With new stress factors as a consequence of technological development and work organisation, the health burden of workers is increased and legislation is limited for the new risks (Mrema et al., 2015).

2.3.2. Perceptions of Occupational Health and Safety in South Africa

Mojapelo, Mafini and Dhurup (2016) carried out a study at a steel processing company in South Africa over the perceptions of employees on occupational health and safety in a work place. The perceptions of the respondents regarding occupational health and safety standards were assessed using analysis of mean scores on a Likert scale. The scores on information and training of employees on occupational health and safety ranged from $x = 4.04$ to $x = 4.40$. The overall mean score for the scale was $x = 3.78$ which demonstrated an inclination towards an “agree” point on the Likert scale. According to Mojapelo et al. (2016, p. 106), the results revealed that “employees in the steel industry perceived that occupational health and safety standards were satisfactory in all seven occupational health and safety dimensions considered in this study. These are (1) information and training, (2) health and safety awareness, (3) employee behaviour (4) role of the supervisor, (5) health and safety reporting mechanisms, (6) workplace inspection, and (7) workplace environment. Among these dimensions, safety awareness emerged as the most important dimension to employees.” This study shows that, in South Africa, employees enjoy a constitutional right to a safe working environment through the Occupational Health and Safety (Mutemeri & Petersen, 2002).

The respondents in the steel industry in South Africa concurred that the work place environments met the required health and safety standards. The employees in this industries clearly mark chemical substances when inspection is being conducted and the work environment has sufficient ventilation to prevent the spread of hazardous chemicals within the work place and to ensure that appropriate measures are applied (Cantor, 2008).

2.3.3. Compliance to Occupational Health and Safety in Uganda

Another study in compliance to OHS in Africa was reported by Babatunde (2018). This is a study which was carried out in Uganda on the compliance to occupational health and safety measures at the work place. The welding sector in Uganda is dominated by the informal sector; there are very few industries where welding is carried out. Most of the welding sites are scattered along main roads from the city centre. The study conducted in Jinja district showed that 92% of the welders reported injuries or illness that were suspected to be caused by their work. The results of the study showed that only 50% of the welders in Jinja Municipality complied with the occupational health and safety practices. According to Babatunde (2018), the level of compliance obtained in this study was slightly higher than what was reported by Okuga, Mayega & Bazeyo (2012) in Uganda but lower than what was found by Adebola (2014) in Nigeria. The findings of this study suggested that half of all the welders in Jinja municipality were not compliant to occupational health and safety precautions. This was the reason why there had been rampant reports of work-related injuries among the welders in the municipality. A study by Monica (2011) found that ninety-two percent of the welders in Jinja municipality reported injuries and illnesses that they suspected of being caused by their work. The informant interview results concurred with the results and they mentioned that most of the welders never observed safety while carrying out the welding.

2.3.4. Training in Occupational Health and Safety in Nigeria

In Kaduna, Nigeria, the welding profession provides a means of livelihoods for many Nigerians but like other professions, it is not without risk. Sabitu, Iliyasu and Dauda (2009) conducted a survey in Kaduna in northern Nigeria among welders. A total of 330 welders out of 355 agreed to be interviewed on whether they had received training on occupational health and safety. The study showed that 257 (77.9%) of the welders were aware of work-place hazards. According to Sabitu et al., this was positively influenced by educational attainment, increasing age, nature of training and work experience. The report explains that educational attainment facilitates easy assimilation of instruction while maturity and work experience are expected to increase awareness of occupational hazards. Specifically, a higher proportion of elder welders were more aware of occupational hazards compared to their younger colleagues. Paradoxically, a higher

proportion of experienced welders were aware of occupational hazards compared to those that attended formal welding schools. Expectedly, a higher proportion of experienced welders were aware of occupational hazards compared to their inexperienced counterparts (Sabitu et al., 2008).

Another study was conducted in the welding industry in Sokoto, Nigeria (Awosan et al., 2017). The study was conducted on 280 workers or respondents and reported that, although most of the respondents stated that they observed the various preventive measures against welders' workplace hazards, accidents and injuries, consistent use of personal protective equipment (PPE) was poor. According to the report, nonuse of PPE was mostly because of non-availability. Therefore, accidents and injuries still occurred. The most common injuries included backache (14% of the respondents), eye injuries (6% of the respondents) and hearing problems (6% of the respondents). The most prevailing injuries were cut injuries to the hand and fingers.

The study disclosed that hazards could not be prevented among workers if they lacked knowledge of their respective work place hazards. The study indicated that 278 (99.3%) out of the 280 respondents stated that they had good knowledge of prevention of welder's work place hazards, accidents and injuries. The preventative measures most commonly known to the respondents were the use of personal protective equipment (99.3%), provision of water and soap for washing hand and face (98.2%) and keeping the work site clean and orderly (98.2%) and most respondents observed preventative measures such as keeping the work site clean and orderly (Awosan et al., 2017). The only preventative measure that was not kept was the provision of fire extinguishers at the work place. Further, despite them been aware of the preventative measure which involved wearing personal protective clothing and equipment, the other personal protective equipment was very poor and they were worn occasionally.

2.3.5. Compliance and Importance of Occupational Health and Safety in Nigeria

Umeokafor, Umeadi and Jones (2014) studied the state of occupational health and safety (OHS) in Nigeria, especially in the construction industry. This study found that compliance with OSH regulations (OSHR) was regrettably low in Nigeria; occupational health and safety had not received adequate attention and support because statutory regulations and provisions were non-functional (Diugwu et al., 2012). The study was able to unearth and examine key issues to

compliance with OHS regulations in Nigeria's construction industry. These major issues were client's influence, inadequate enforcement, and culture. Oyedele (2016) listed the issues in the same industry as institutional, legal, technical, financial, administrative, cultural, traditional, relationship and organisational. Somehow, the two studies came up with similar findings.

Using existing literature, Umeokafor et al. (2014) came up with a list of determinants of compliance with OSH regulations in Nigerian construction industry. Among these determinants were neglect of human rights (cited Idubor & Osiamoje, 2013); fear of legal sanctions (cited Idubor & Osiamo, 2013) and Nzuve & Lawrence (2012); weak legal structures in terms of interpreting and applying the governing laws (cited Idubor & Osiamoje, 2013). Other determinants included unemployment, which meant that employers took advantage of their workers (cited Idubor & Oisamoje, 2013); and lack of awareness and improper medium for disseminating information (cited Windapo & Oladapo, 2012). A popular saying in Nigeria states that "Knowledge is power". Should that be the case, it could be assumed that the Nigerian society is not empowered in terms of OSH due to lack of knowledge in this instance. If workers do not know or understand the regulations, they will not know when their rights have been violated. The study further showed that, although diseases and injuries and accidents were common on construction sites in Nigeria, people that suffered from occupational diseases or incidents would not know the necessary steps to take for compensation or to stop the occurrence.

The other determinants listed by Umeokafor et al. (2014) are social cultural issues were all (covered by Othman, 2012; Smallwood, 2002 and Kalejaiye, 2013); beliefs that accidents are inevitable because the construction industry is inherently dangerous (Smallwood, 2002); lack of a culture of safety at home or at school (Kalejaiye, 2013); and clients' influence who should ensure that the regulations are adhered to (Famakin & Fawehinmi, 2012). Clients influence on compliance with OSH regulations seemed to be overlooked in the Nigerian construction industry.

Industrial issues such as tendering process, perceptions of stakeholders in the industry were also listed as determinants. Critical analysis indicated that activities of the informal sector determined if the said industry would comply with OSH regulations. It should be noted that the informal sector contributed to about 70% of construction activities in Nigeria. This implies that the

informal sector could be a major contributor to the high level of accidents in the construction industry.

The study also cited enforcement of OSH regulations as another reason for non-compliance with OSH regulations in Nigeria (Nzuve & Lawrence, 2012). This, coupled with lack of governmental support and weak legal structures, influenced compliance (Umeokafor, 2014).

2.3.6. Compliance in Ghana Gold mining

The mining sector is one of the world's most dangerous and hazardous sectors and is considered as such by many workers (Gyekye, 2006). People working in the mines are exposed to various physical, chemical, mechanical, biological and psycho-social risk factors. According to Owiredun (2011), Ghana is one of the West African countries that have become a preferred destination for mineral investment with the legal mining industry accounting for more than 49% of the country's gross foreign exchange earnings. Mining activities, however, present not only economic opportunities for the country but also major challenges, particularly in the area of occupational health and safety for employees in this sector (Amponsah-Tawiah & Mensah, 2016).

Calys-Tagoe, et al. (2015) studied gold mining in Ghana. The aim of their study was to characterise the physical injuries associated with artisanal and small-scale gold mining (ASGM) to guide policy formulation in the country. The survey which was carried out in the Tarkwa mining district of the Western Region of Ghana in 2014 recruited a total of 404 small-scale miners and interviewed them regarding their occupational injury experiences over the preceding 10 years. The study reported that nearly one-quarter (23.5%) of the miners interviewed reported getting injured over the 10 year-period. Nearly two-fifths of the workers believed that their injuries could have been prevented, with many citing personal protective equipment as a solution. About one-quarter of the employees reported that their employers never seemed to be interested in the welfare or safety of their employees.

A study by Amponsah-Tawiah and Mensah (2016) explored the relationship between occupational health and safety management and organisational commitment. The correlation analysis of the study confirmed that there is a moderate positive relationship between occupational health and safety management and effective commitment. Likewise, the regression

analysis showed that occupational health and safety management had a significant impact on effective commitment. Thus, as employees have positive impressions and perceptions of the management of health and safety on the job, their emotional attachment and identification with the organisation becomes stronger. These findings were consistent with an earlier study conducted by Siu (2002), who also found a positive relationship between physical wellbeing of employees and effective commitment. These two studies demonstrate that employees with high affective commitment demonstrate emotional attachment/ identification with, and involvement in the organisation. Such employees are less likely to engage in withdraw behaviours such as absenteeism, low performance and turnover (A'yunnisa & Saptoto, 2015, cited in Amponsah-Tawiah & Mensah, 2016).

Amponsah-Tawiah and Mensah's (2016) findings further showed that there was a moderate positive relationship and significant impact of the perception of occupational health and safety management on the normative commitment of employees. This also affirms the assertion of Cooper (1995), that in order for management to develop loyalty among employees, especially those working in highly hazardous organisations, the health and safety of these employees must be a top management priority. The results of this study further indicated that there is also a moderate positive significant association between occupational health and safety management and continuance commitment. Thus, employee's perception of the management health and safety in the organisation influences their decision to stay in the organisation and to contribute favourably to the organisation. Where employees perceive the management of health and safety in the organisation to be appropriate and adequate, they are more likely to have a continuing relationship with the organisation knowing that their health and safety are secured in the organisation.

By contrast, where workers perceive that their health and safety in the organisation is under threat, through their evaluation of the management of health and safety in the organisation, they tend to exhibit withdraw behaviours such as absenteeism and high turnover. This finding is consistent with Sinclair (2005), who found that, when organisations failed to address poor working conditions, such as excessive noise, abusive supervision, poor visibility and dusty conditions, there was a decrease in employees' continuance commitment to the organisation. Thus employees judge the cost of staying with their organisation to exceed the cost of leaving. In other

words, to get devoted, employees to work within highly hazardous organisations such as the mines, there is need to provide effective safety and health systems that safe guard employee's health and safety (Tawiah, 2016).

2.3.7. Compliance and Perceptions of Occupational Health and Safety in South Africa

Machabe and Indermun (2013) investigated management's perception of the occupational health and safety system used within a South Africa's steel manufacturing firm. This section reviews the findings of this study.

(a) Compliance with OHS

Machabe and Indermun (2013) assert that, like all South African companies, the steel manufacturing firm employs the globally accepted OHSAS 18001 regulatory standard for safety and health administration in the work place. The OHSAS 18001 work place regulation runs parallel to the ISO 18001 standards. ISO 18001 as an administrative tool is declared to be an ideal tool for occupational health and safety management worldwide in various industrial companies. In conjunction, the Occupational Health and Safety Act (OHSA) No 85 of 1993 is in place to provide health and safety of persons at work and for the health and safety of persons connected with the use of machinery, the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work, to establish an advisory council for occupational safety and health and to provide for matters connected with (Awwd, 2002).

(b) Perceptions on health and safety

The findings in this study indicated that the participants agreed that management identified, evaluated and controlled risks and hazards within the manufacturing plant. Hence, management appeared to be effective and efficient in monitoring and controlling various health and safety hazards that might been or were experienced at the company. However, some participants indicated that they were undecided (18.2%) or disagreed (9.1%) that management identified, evaluated and controlled health and safety risks. Perhaps this perspective represents employees that had experienced negative health and safety incidences within the company, possibly

denoting the need for management to further develop methods for improving, monitoring and controlling hazards (Bennet, 2002).

The largest proportion of the participants (38.2%) agreed that management committed themselves to continuous improvement of the safety, health, and environment system. Further, a substantial percentage of the participants (29.1%) also strongly agreed with this perception. These findings suggest that most of the participants believed that management were constantly active and engaged in improving safety, health and environment system. However, 29.1% of the participants indicated they were undecided about whether they perceived management as being committed to continuous improvement of the system. This, perhaps, suggests that many of the employees were aware that managerial personnel were involved in improving the system. Machabe and Indermun (2013) suggested that management should inform the employees of the progress and effort that were being devoted towards the health and safety within the organisation and outline the path for safety and health improvement to the employees. This would ensure that the employees were aware that management was active and committed to being involved and working towards the improvement of the system.

In the study it was also found that majority of the participants (52, 7%) agreed that management resolves the safety concerns indicated by employees. However, approximately one quarter of the respondents (23.6%) indicated disagreement. The discrepancies between the response patterns may denote that management resolved certain concerns and not others.

The study also revealed that participants agreed that safety related changes were communicated to all employees within their respective departments. This suggested that a high proportion of the employees were appropriately informed about health and safety alterations that had been instituted. However, some participants were undecided and disagreed, indicating that safety changes might not have been communicated to certain employees when they were implemented. Machabe and Indermun (2013) suggest that it is critical that each employee obtain specific details regarding any of the changes as any of the changes that are not detailed may result in accidents or a following of incorrect protocol-post incidents.

The highest proportion of participants (41.8%) indicated disagreement that management immediately investigated incidents that occurred in the plant. A further 10.9% strongly

disagreed. Machabe and Indermun (2013) assert that, considered collectively, this is a significant concern for the employees and organisation. From the perspective of employees and managers, the reasons and causes of incidents may not be resolved timeously, which may result in further injury to other employees (for example, if an accident occurred due to machinery malfunctioning and is not fixed or replaced). A large percentage (32.7%) suggested that management did not immediately investigate incidents that occurred in the plant. According to Machabe and Indermun (2013), this, perhaps, is even more of a concern as certain employees, accidents, or departments may be obtaining preferential treatment in terms of the initiation time of investigations that occur following the incident.

Machabe and Indermun (2013) concluded that it was important for management to commit and to take ownership of health and safety in the workplace. In addition, management should learn to get employees on the floor involved when making any health and safety changes and decision within the plant. In the case of this particular firm, management took too long to react and investigate health and safety incidents that occurred in the plant.

2.3.8. Occupational Health and Safety in Rwanda

Norine et al. (2016) studied the role of occupational health and safety measures in successful completion of construction projects in Rwanda, using the case of Nyarutarama Property Developers (NPD) Ltd in Kigali as evidence. It has been alleged that a lot of dangerous incidents occur as occupational hazards in the construction industry that may cause delays and unsuccessful construction projects. The general objective of the study was to evaluate the role played by occupational health standards (OHS) measures in ensuring successful completion of construction projects. Most the respondents who were employees in the construction industry were between 26-35 years and had worked in the industry for more than ten years (Angel, 2013).

(a) The Role of Occupational Health and Safety Regulation in Completion of Construction Projects

As indicated in the rules that govern OHS, there are a number of hazards that always happen in the construction industry. The respondents were asked about the most occupational hazards that they normally guarded against with available resources; all of them indicated that they guarded against accidents which, when they occurred, led to delays in construction and sometimes caused

deaths, 46% said they protected themselves from diseases while 54% said they did not mind about diseases. Fire was cited as a hazard that just had minor causes and so only 33% of the respondents indicated that they also protected themselves and their workplace against fire (Adebola, 2014).

(b) Occurrence of Dangerous Incidents

To find out about the occurrence of incidents that might have caused delays and unsuccessful construction projects, the respondents were asked about the occurrence of any dangerous incident in the last 12 months. Fifteen percent of the respondents cited heavy rains as having occurred, causing destruction to the building under construction while 85% said they had not seen any heavy rains in the period under review. About 11% said that an incident leading to the death of an employee falling from the building had occurred in the last 12 months while 89% disagreed with the notion. The results, therefore, indicated that occupational hazards, to a very small extent, can lead to delays in construction projects if they are not guarded against well (Brown, 1995).

(c) Protective Measures Used

The study by Norine et al. (2016) showed that all employees needed protective equipment at the place of work during construction activities, to be safe at workplace. For safety, most of the employees used different types of protective equipment. Among the equipment used were helmets, gumboots, and dust masks.

(d) Reporting Cases of Emergency

The findings of the study under review indicated that workers always responded to different incidents that they would report to management in case they happened at the work site. Eighty-two percent of the participants indicated that absence of protective gears at the workplace was the main challenge that would be reported as it was one of the indicators that helped them to work in a comfortable environment.

Existence of a crack in the wall was also ranked high as an indicator of a hazard. This was rated by 58% of the respondents who agreed that a crack in the wall should be reported before the worst happened. Thirty percent indicated that they would report a fire outbreak. This, however, came out to be for a small percentage as fire was a rare case in the construction industry. The scores for both cracks on the wall and fire outbreak are said to be low because most of the respondents said they had not seen such incidents occurring in most of their projects. Based on these findings, the study indicated that employees valued protection at the workplace. The workers indicated that, if a colleague had no protective equipment, he was reported as this was not safe for him and might lead to delays in project completion if an accident occurred.

(e) The Existing OHS Management Mechanisms

On 5th January, 2015, a ministerial order stipulated a mechanism in risk management. The study showed that 96% of the participants agreed that the company had a copy of the safety and health regulations that helped in managing and keeping employees safe; 86% of the participants indicated that it was necessary and important to wear personal protective equipment while at workplaces. This indicates that most of the employees at NPD Ltd had a positive mind about OHS requirements. The presence of OHS measures played a very big role in the completion of construction projects. This is because the company had adapted to what the law required as an induction to the safety of employees at workplace. However, only a small percentage of 17.5 indicated that the company had a formal safety programme for personnel and the building. This is because, in the construction industry, not all employees were aware of the policies. When asked about the emergency and evaluation plan for the employees in the case of any emergency, 65% of the employees agreed that there was an emergency plan (Taqi, 1996).

(f) OHS Prevention Measures

One of the objectives of the study was to identify the role of OHS measures in project completion. The study required the respondents to indicate the reasons why protective equipment was important; 88% indicated their reasons to be prevention of accidents, 46% stated that it helped in project completion while 3% stated that PPE minimised the spread of diseases. This indicates that OHS measures are important for project completion, a fact which is also known to all the employees.

(g) Responsible Persons for Employees Safety

To understand well the issues of OHS measures in construction projects, it was important to know who was responsible for the safety of workers on site as stipulated in the ministerial order. The big percentage of respondents agreed that every person was responsible for his/ her safety. This is shown by 72% of the respondents saying it was the responsibility of the employees to watch their steps. Sixty percent stated that it was the responsibility of the project manager to ensure the safety of employee, while 44% and 49% indicated that it was the responsibility of the site engineer and foremen, respectively (Poon, 2008).

(h) Employee's skills and knowledge on Occupational Health and Safety

The study also intended to find out about the knowledge and skills of employees on OHS. The study found out that 47% of the employees had low skills on safety and security systems with 39% indicating that they had moderate skills. Only 14% indicated that they had high skills in that aspect. The study went ahead to find out about hazard identification as this was a major aspect in construction projects. The study indicated that only 29% of the employees were able to identify a hazard. The bigger percentage of OHS skills was indicated in accident communication where 45% showed their skills to be high, with 30% indicating moderate skills. This is also a good indicator for project management and leads to successful completion of projects as most of the workers are able to communicate any dangerous incident (Norine, 2016).

2.3.9. Studies on Occupational Health and Safety in Ethiopia

Jilcha and Kitaw (2016) reviewed literature on global occupational safety and health practice. The purpose of the study was to identify existing gaps in the literature on workplace safety management and to propose future research areas. The two scholars summarised studies based on their methodologies, objectives, findings and conclusions. The study found that work place safety had been given less consideration in view of the fact that it was a global issue. The study further showed that many studies that were conducted in Ethiopia considered case companies at different locations with almost the same methodology of the study. Their studies, objectives, data analysis, research findings result targeted industries (textile and garment), recommendations and their conclusions were more or less similar. Their intention was also on the identification of workplace hazards and accident causing factors. After the identification of the factors, none of

them developed integrated systematic models. Almost all of the studies concentrated on medical aspects, leaving the working physical environments behind. Few of them raised the safety culture elements, management elements and organisational cultures (climates), policy and regulations, knowledge, diffusion, workplace innovation characteristics and how to approach the hazards in holistic ways.

Most of the studies had given recommendations that “Special attention has to be given to preventing occupational injuries” without answering the question “How?.” In general, they only found accidents causing factors on the occupational safety and health conditions. Therefore, the study concluded that there was need to develop a holistic improvement approaches that impacted workplace safety and health positively (Jilcha & Kitaw, 2016).

2.4. Training on Occupational Health and Safety in Nigeria

Aliyu and Auwal (2015) studied occupational risks and hazards among workers of a Nigerian Bottling Company Plc, Maiduguri in Borno State. A total of 231 workers participated in this study. The bottling firm was found a male-dominated workplace comprising 5 (2.16%) females and 226 (97.84%) males with a mean age of 25.21 ± 7.1 years. About 50.6% of the participants were permanent staff, while 43.3% had a diploma. The study was aimed at determining the exposure level of occupational risks and hazards, knowledge of occupational health and safety practice, safety precautionary measures and the use of personal protective equipment among workers at the bottling company. The study found that the majority of workers (48.5%) at the company were moderately exposed to occupational risks and hazards whereas 24.7% of the workers were highly exposed to occupational risks and hazards in the industry (Asuzu, 2002). This high exposure to occupational risks and hazards among this cohort group of workers is similar to a study carried out among small and medium scale industrial workers in Ethiopia which found that 32.4% of the workers were at high risk of exposure. A higher value (44, 1%) than that reported in the study by Aliyu and Auwal (2015) was found by their study among workers of Kaduna refinery and petrol chemical company in Nigeria (Ryan, 1998).

The study also found a significant association between the level of exposure to occupational risks and hazards and age. The reasons given for this lack of training, lack of supervision, lack of

experience on the job, lack of knowledge and lack of skill among the younger age groups. The study also determined that, because workers begun work at an early age and often without safety training, they were at greater risk to occupation risks and hazards exposure at the work place. According to Berlin (2011), younger workers have less experience and maturity in their job, which puts them at a risk of over estimating their physical capacities or underestimating the safety and health risks associated with their tasks.

Although there was no significant difference in occupational risks and hazards exposure among workers of different educational level, workers that had higher educational qualification (degree) were highly exposed to occupational risks and hazards. The high exposure to occupational risks and hazards among these workers might have been due to their poor usage of safety measures and personal protective equipment. The study also reported a marginal significant good level of knowledge of occupational health and safety practices among workers of different age groups. The study also found that there was a significant association in level of knowledge of occupational health and safety among workers of different appointment, although a much higher number of permanent workers reported good knowledge (70.1%) than the casual workers (63.2%). The study also found that there was good adoption of safety precautionary measures and use of personal protective equipment (57.6%) (Aliyu & Auwal, 2015). The study recommended that government should enforce compliance to health and safety measures in industries so as to minimise the level of occupational risks and hazards, and that government and supervising institutions should enforce compliance to occupational health and safety measures in the industries.

Working in an industry is full of potential risks and hazards that can be mitigated through proper occupational health and safety practices or adoption of safety precautionary measures and use of personal protective equipment among workers (Aliyu & Auwal, 2015). This section has shown that African countries experience work-related accidents and diseases as most of the people work in sectors and occupations which are dangerous. However, most of these countries are also those without adequate technical and economic capacities to maintain effective national OSH systems, particularly regulatory and enforcement mechanisms. As explained by Amponsah-Tawiah and Mensah (2016), management in various industries

must recognise the fact that workers who feel healthy and safe in the performance of their duties, develop emotional attachment and have a sense of obligation to their organisation and are most likely committed to the organisation. Employees do not just become committed to the organization; rather, they expect management to first think about their health and safety needs by instituting good and sound policy measures. Thus, management should invest in the protection of employees' health and safety in organisations. (p. 224)

The next section will discuss OSH systems in Zambia.

2.4.1 The Zambian Perspective

Zambia, like many other countries, faces workplace hazards which affect the wellbeing of workers. While industries such as mining and building construction are potential drivers for economic growth and green job creation, the industrial sector is poorly regulated in terms of occupational safety and health (OSH). According to the ILO's 2012 Zambia Country Profile on Occupational Safety and Health, mining and quarrying, chemical and building construction industries reported high numbers of fatalities, in that order. The fatalities were attributed to, among other things, the structure of the various industries and poor working conditions. This section looks at what the country is doing to promote and enforce occupational health and safety standards at places of work to ensure a safe and healthy working environment.

2.4.2. Legislative Framework: Constitutional Provisions for OSH

According to Mwanaumo et al. (n.d.), there is no express provision made in the Constitution of Zambia for the safety and health of workers, although, under Part 3, the Constitution addresses the "Protection of the Fundamental Rights and Freedoms of the Individual", and issues of public health and public safety have been alluded to in general terms. Further, Article 14 provides for the protection of individuals from forced labour.

The main laws on occupational health and safety in Zambia include:

- (a) The Factories Act, Chapter 441: This Act generally provides for the regulation of the conditions of employment in factories and other places as regards to the safety, health and welfare of persons employed therein.
- (b) The Mining Regulations: These regulations provide for the supervision of safety and health in mines, inspection of mines by inspectors from Mines Safety department (MSD), reporting and investigation of occupational accidents, and the compilation and publication of statistics on accidents, occupational diseases and dangerous occurrences.
- (c) The Occupational Health and Safety Act, 2010: This Act provides for the following: establishment of the Occupational Health and Safety Institute and its functions; establishment of health and safety committees at workplaces and for the health, safety and welfare of persons at work.
- (d) The Ionizing Radiation Act, Chapter 311: The purpose of the Ionizing Radiation Act is to protect the public and workers from dangers arising from the use of devices or materials capable of producing ionising radiation.
- (e) The Workers' Compensation Act, Chapter 271 (Act No. 10 of 1999): This Act provides for the establishment and administration of a Fund for the compensation of workers who are disabled by accidents or diseases contracted by such workers in the course of their employment.

2.4.3 Compliance with Occupational Health and Safety in Zambia

The mining industry is among the most delicate sectors in the world with regard to occupational health and safety. It is, therefore, expected to be the most compliant and to instill a culture of safety throughout the industry. However, levels of compliance may have been very low in Zambia. According to the United Nations in Zambia (2016), lack of familiarity with existing OSH frameworks among employers and workers has been identified as one of the main causes of (i) low rates of compliance; (ii) the high incidence of occupational accidents; and (iii) the lack of safety precautions in the workplace. In addition, most employers in the sector view OSH as a cost rather than an investment and thus pay very little attention to either its legal provisions or promotional aspects.

Several studies have been done on compliance to OHS in Zambian mines. Hayumbu, Robins, and Key-Schwartz (2008) studied silica exposure at Nkana and Mufulira Copper Mines.

This study noted that silicosis morbidity levels had been poorly studied among nearly half a million miners that had been employed in the copper industry since large-scale Zambian copper mining started in the early 1930s. The study further stated that control of silicosis as implemented in Zambia, using the methods of monitoring dust in mines and annual pneumoconiosis screening of miners had gaps. The study concluded that weak dust monitoring existed in the Zambian mines and this might have increased the risk of non-malignant respiratory disease in many miners. The report also pointed out that the Zambian mining regulations did not have crystalline silica exposure limits and that this should be changed to increase the protection of workers from dust (Hayumbu et al., 2008).

Currently there is insufficient documented information on air quality/levels of air pollution or reparable dust content in ambient air for the Nchanga mine as evidenced from the Environmental Council of Zambia database. Also, no information on such issues as the adherence to wearing personal protective equipment, dust control, smoking behavior among miners and how it relates to impairment of lung function was come across among other issues. It is, therefore, not certain whether the amount of dust is alarming or not and if it were, to state if any association exists between dust exposure and prevalence of lung function impairment in open-pit miners (Survey, 2007).

Mwaanga, Silondwa, Kasali and Banda (2019) did a study to review mine air pollution in Zambia. The principal investigator, after having worked in a mining environment, noticed that the air appeared to be quite dust-laden. The study noted a paucity in studies on lung function impairment in open-pit mines in Zambia, with a focus on such variables as PPE, duration of service, etc. Although some studies have been done with focus on the smelter and its effects on children living in close proximity and lung function in adults and also mining in general, some gaps still exist (GRZ, 2004). Mwaanga et al., therefore, conducted their study in order to determine the prevalence and correlates of impaired lung function among open-pit miners using selected variables (PPE, duration of employment, educational level, age and also smoking).

In this study, the relationship between mere exposure to dust measured by length of duration of employment in the mine and lung function impairment was studied to determine if any associations existed. The study concluded that there was need for workplace improvement in terms of occupational health and safety for the benefit of the employer and the employee in order

to increase productivity. There was also need for worker participation in setting up, monitoring and maintaining safety systems that were not stiffening the legislation dealing with occupational health and safety issues but enforcing the available legislations. Philips (2007) demonstrates that the health risks and failure of employees to participate in fitness and health promotion programmes are associated with higher rates of employ absenteeism. Philips contribution can only be valid if the fitness programmes are in place. The study recommended that there was need for the employers' participation and government ensuring that the occupational health and safety programmes and policies were existent. If these OHS programmes are in place, it is more likely that the worker participates in order to preserve his or her life (ZCTU, 2005).

2.4.4. Training in Occupational Health and Safety in Zambia

Awareness, education and training, coupled with the use of technology (which reduces employee exposure to hazardous and life-threatening situations), advances in mine safety and health standards, and systematic inculcation of a safety culture among mine employees, can reduce fatalities and injuries in mines and other industries.

According to the United Nations in Zambia (2016), the majority of vocational and technical training institutions responsible for training artisans in various aspects of building construction have yet to integrate OSH into the training modules offered. UN-Zambia further explains that where such modules do exist, their coverage of important, relevant subject matter is scant. Consequently, artisans graduating from vocational training institutions have low levels of OSH awareness and do not have the necessary skills to conduct risk assessments and manage identified risks.

UN-Zambia (2016) advocates for strengthening and mainstreaming OSH in technical and vocational training. An example of this is the development of an OSH Training Manual on Construction Safety by Thorn Park Construction Training Centre (TPCTC) in conjunction with stakeholders such as the Ministry of Labour and Social Security's Department of Occupational Safety and Health, the National Council for Construction and the EcoLusaka Project, which falls under the VTT Technical Research Centre of Finland.

2.4.5. Status of Health and Safety in Zambia's Construction Industry

Tente (2016) carried out a study on safety and health in the construction industry in Zambia. Her findings highlighted the lack of coordinated safety and health practices in the industry which, in turn, translated into a high risk factor for accidents and ill-health. Tente asserts that the Factories Act which was used in the industry was found to be relatively adequate but lacked sufficient enforcement.

2.4.6. Safety and Health Guidelines

Tente's (2016) study showed that seven out of twelve interviewees and 30% of the respondents from questionnaire survey, did not know any health and safety guidelines that were used in the industry. Actually, some stakeholders argued that if they knew any guidelines, they would have adhered to them. Some companies had safety and health policies, while others used the health and safety guidelines found in the contract documents. The safety and health guidelines that were used in the construction industry were: the factories Act, Workers Compensation Fund Control Board (WCFCB) regulations, companies' safety and health policy, safety and health contract guidelines, National Council Construction (NCC) code of conduct SI 119 of 2008 and NCC Act No 15 of 2003. The most used were contract guidelines and the Factories Act. The latter was mainly used on big projects where it was one of the requirements. The contract guidelines were the most used because they were part of the contract documents and contractors were aware of them from the tertiary stage.

On some sites, guidelines were only followed during mobilization and forgotten thereafter since inspectors were few and could only manage to inspect a few times. The Factories Act and other known guidelines such as OHS Act 2010 were relatively adequate though they lacked enforcement. This finding is similar to that by Jere (2012). The effectiveness of the Factories Act was measured by how well the Act adhered to safety and health in the construction industry in terms of risk management and how well it was known in the industry and the views of stakeholders who were familiar with it.

The study by Tente (2016) showed that lack of enforcement of the Factories Act was evidenced by the few Ministry of Labour and Social Security, Occupational Safety and Health Services (MLSS- OSHS) inspectors in charge of safety and health in construction. During the inspection,

there were two inspectors despite the increase in construction projects. The interviewees and respondents who were familiar with the factories act were of the view that it needed to improvement to address safety and health challenges in the construction industry. Such as technology changes that take place every now and then. The innovation of technology has brought new inputs in terms of materials, equipment and machinery. This means that even strategies on health and safety should be improved to get the best results. The factories act has not been amended for the past 20 years. Furthermore, the factories act has general rules which are descriptive in nature. The rules were not up to date with the ever changing technology resulting in new sophisticated equipment, machinery and materials. The short coming of the factories act that emerged are that it does not cater for “after accidents” issues of workers and does not encourage all stakeholders to participate in safety and health issues. There is need to update provisions for the factories act in order to incorporate sophisticated machinery and materials in a safe and health manner. The factories act has to incorporate risk management and worker protection beyond PPE, like the mining industry, construction industry requires a tailor made safety health legislation to suit the sector together with its challenges. (HSE, 2006).

There was a new safety and health act that was enacted during the study known as the occupational health and safety act (OHS Act 2010) which was repealed by stakeholders in the construction industry. The OHS Act of 2010 was repealed because it was not an inclusive document. It was done by the ministry of health and focused more on health. The stakeholders in the construction industry were not consulted during the development process, if it were inclusive, it would have been used together with the factories Act to improve enforcement as it highlighted the enforcement part of safety and health. Lessons should be learnt from the repealing of the OHS Act, 2010 by the construction stakeholders. The lesson is that during the development of the NOSH policy, all stakeholders should have been involved from the beginning to the end, all players in the construction sector should be included in the development process (Ligard, 2005).

2.4.7. Enforcement of Safety and Health to Safety and Health Facilities

Safety and health facilities were expected to be provided during mobilization and during the course of the project. The interviews and questionnaire revealed similar results on the provision of safety facilities. In terms of safety, basic PPE such as suits, boots, hard hats and reflectors were generally provided by most companies. However, the basic PPE was provided only once in

a year as long as the project lasted, as evidenced by worn out PPE witnessed during observations on the case study sites. The PPE such as goggles, dust masks, safety harness or belts and ear plugs were rarely provided by companies that provided the rare PPE only gave few workers who worked in the areas where such PPE were needed. Moreover, the rare PPE were exchanged among workers which posed a health risk. It is law that all construction workers should be provided with full PPE by their employers. Unfortunately, the full PPE was deemed as an extra cost hence only the cheapest and poor quality basic PPE was provided (Rudmo, 2003).

In the area of health; clean drinking water, first aid boxes, clean toilets and clean eating rooms were generally provided. However, this was only the case of big projects with established sites camps. Provision of clean toilets and clean eating spaces were more challenging in road construction projects because of the distance from the working sites to established camps. Despite the provision of First Aid boxes, some of these did not contain necessary first aid medicine and materials. This was basic either the materials or medicine got finished and were not replaced or were not bought at all. Some first Aid boxes were empty and were used only for show during inspections which were rare and were mainly conducted before site meetings.

Signage to warn of dangers relatively enough on many sites. The common signage materials that were used were danger tapes, reflective cones and construction signs such as construction works ahead and heavy duty machinery at work in the road projects. Signage was one of the requirements for big projects especially in road and drainage projects. Usually big projects were inspected by MLSS-OSHSD and so contractors provided the basic safety and health requirements during mobilization. Moreover, some foreign big contractors provided the required safety and health facilities because of their experience in safety and health from their countries of origin. Unfortunately, other foreign companies were failing to comply with the basic health and safety guidelines provided for the factories Act (Walker, 2004).

2.4.8. Safety and Health Programs on Site

The most common health and safety programs performed on many sites were HIV and AIDS awareness and safety orientation followed by general safety health training. First Aid training and risk assessment session were mainly done in big projects. HIV and AIDS programme was the most common on sites because it was included in the Bill of Quantities (BOQs) as part of the

contract and it was conducted by HIV and AIDS based organizations such as Afyamzuri and Society for family health. Since HIV and AIDS programs were allocated some money in the BOQs, they were compulsory to both big and small contractors. In addition, the HIV and AIDS programs were successfully done on sites because clients paid money directly to the organization in charge and not to the contractor for fear that the contractor would divert the money to something else other than what was required in the contract (Neale, 2013).

Safety orientation, safety health training, first Aid box and risk assessments sessions were done on big projects and small projects whose clients prioritised safety and health like Lafarge Zambia. Safety orientation was performed to familiarize new workers to the whole site and the basic safety and health rules to follow during their routine jobs. During orientation, the workers were shown how to use PPE and safety health facilities. Risk assessment which is important in accident prevention was carried out on very few sites particularly on big projects. The safety manager, safety officer or representatives on site.

Ten out of 12 interviewees and 51% of the respondents from the questionnaire survey agreed to having a safety officer or representative on site, this might have been as a result of stakeholders slowly appreciating issues of safety and health in the industry. In addition, the other companies might be learning the importance of safety and health from other companies that had well established safety and health systems (Matiko, 2013).

Stakeholders were involved in safety and health programs through monitoring, sensitization, training and provision of safety and health equipment such as PPEs and First Aid boxes. Monitoring and sensitization were rarely done by MLSS- OSHS and NCC during their routine inspections. MLSS-OSHS inspects the safety and health facilities and equipment on sites as provided for in the factories Act, before the start of construction works. Usually, inspectors from MLSS- OSHS visited sites when an accident or serious near miss occurred. Their presence on sites was to investigate and decide the way forward either to close the site or not depending on the seriousness of the incident. (Musonda, 2008).

Furthermore, they concentrated on big projects and projects which had a duration of more than six months as provided for in the factories act. Accidents and ill health can happen any time even in short term projects because hazards are similar for both short- and long-term projects. NCC inspectors visited the sites to check the quality of construction works as a way to regulate

contractors. Apart from inspecting works, NCC inspectors evaluated safety and health on sites even though they should not make any decisions. One case in point that came to light during the study for MLSS-OSHS and NCC inspectors was that inspectors were not enough to execute their work and as a result some sites were not inspected (NCC, 2012).

Contractors mainly provided the basic safety and health facilities and equipment such as PPE, First Aid box, toilets, drinking water, eating places in some cases. Consultants sometimes monitored whether the contractors provided PPE and health facilities or not. Unfortunately, the stake holders are not involved at all, either because of being stationed at the head office or they left safety and health matters in the hands of site management. Interviewees and respondents generally agreed that all stakeholders should be involved in the implementation of safety and health on sites by putting more emphasis on safety officers and contractors.

Seventy –two percent of the respondents strongly agreed and 24% agreed with the proposal that safety and health should be considered at all stages of the project cycle in order to realize the full benefits. Safety and health should be considered during the feasibility, design, planning, speculations, construction, usage and demolition and renovation process (HSE: 2002).

2.4.9. Company adherence to Good Safety and Health Practices

The study by Tente (2016) stated that nine interviewees and 65% of the respondents argued that big and medium contractors adhered more to safety and health than small scale contractors. This could be because big and medium contractors

1. Had resources and so made safety and health a priority
2. Had qualified human resources in charge of safety and health
3. Cared about their reputation and corporate image
4. Had bigger profit margins than small scale contractors

In addition, some big and medium contractors that came from countries when health and safety was part of the work culture and so continued with the same culture even in Zambia. Some of the small-scale contractors adhered to safety and health because their managements knowledge of the benefits of good safety and health. Three interviewees and 27% of the respondents suggested that both big and medium contractors and small-scale contractors adhered to safety and health.

The argument was that it was depended on how the company management perceived safety and health (Holmes, 1997).

Many small-scale contractors were subcontractors on big projects by the main contractors. Subcontracting ten percent of works on all big projects was encouraged by the government which directed construction stakeholders to effect it. This was to empower small scale contractors. Furthermore, it gave small scale contractors an opportunity to learn about safety and health from the main contractors. Safety managers and officers from main contractors made effort to ensure that sub-contractors followed all safety and health guidelines on the construction sites. These results mean that safety and health in the construction industry in Zambia is slowly being appreciated by stakeholders (Hendrickson, 2000).

2.4.10. Reasons for Non-Adherence to Safety and Health

The study by Tente (2016) also revealed that companies shunned safety and health to maximize profit because of poor management. This could be common in small scale contractors whose profit margins are minimal and usually have unskilled human resource. Safety and health were also regarded expensive since no money was allocated for safety and health in the BOQ as argued by the study participants. Despite the efforts of some main contractors to empower subcontractors on safety and health issues, small scale contractors had difficulties in the safety and health management, some companies hoped to buy poor quality PPE. As the saying goes ‘Cheap is expensive’, so it is for safety and health facilities and equipment. Poor quality safety and health facilities would not effectively serve their purpose resulting in buying the same PPE several times during the project if completion time of the project was long (Champowx, 2003).

Safety and health was not an item in the BOQ like HIV and AIDS awareness, leading to organization to not allocate any money to safety and health. In addition, some organization’s suggested that corruption contributed to poor adherence to safety and health of small companies because they had to pay back the people who helped them get contracts. By the time the project started, part of the contract sum would have been paid off in corruption related issues, Lack of resources or no inspections by relevant authorities and no incentive were some reasons for non-adherence to safety and health. Zambia’s construction industry was growing fast because there were developmental projects been undertaken by the government and the private sector. The

increase in construction projects saw the influx of many businessmen starting small companies without proper training in any construction skills. These businessmen managed everything on their own which led to shady works and less adherence to safety and health as their aim was to make profit at all costs (Adane, 2013).

2.4.11. Common Types of Accidents

The study showed that the most common types of accidents was being hit by a moving machinery and drowning while questionnaire respondents suggested falling from heights as the most common. The results for the other types were similar to the interviews and questionnaire survey except for slips and trips which were third least from the interviews and second least from results from the survey. The questionnaire in the survey results superseded the interviews. The bigger the sample size was bigger than the sample for the interviews. The bigger sample size, the more precise the results. Falling from heights was found to be the most common type of accidents. The reason could be lack of safety harness and adequate safe scaffolds which are rarely provided or are even absent on some sites visited. This is similar to findings of (Larson, 2002). Being hit by falling objects from heights followed by collapse of the earth was common in the rainy season because of the wet soils in places where the ground was unstable. Furthermore, it was associated with unsafe excavation methods and the use of unsafe or substandard ladders.

2.4.12. Common Causes of Accidents

The study further revealed that poor attitude towards safety by stakeholders in the construction industry was established as being the most cause of accidents. This was linked to the reason why the National Occupation Safety and Health (NOSH) policy and the construction tailor – made safety and health was not a priority to some contractors and the workers. Some contractors concentrated on achieving work targets regardless of how it was done. Most casual workers used ‘short cuts’ which were usually unsafe to complete their work while ignoring safety. This is similar to the findings by Tam (2004) and Mukhalipa (2004) poor attitudes towards safety led to other causes such as not providing safety equipment, deficient enforcement of safety and lack of training.

Causes of accidents, such as non-provision of safety equipment, deficient enforcement of safety and lack of training was the responsibility of the contractors. Some contractors did not provide safety training and equipment hence putting workers at a high risk of accidents, Results revealed that despite some contractors providing PPE, it was not adequate. Many workers had the basic PPE which included work suits; safety boots or gum boots; and had hats. Safety belts, dust masks and ear plugs were rarely provided because these were considered as unnecessary expense. Some contractors alleged that workers were in a habit of losing the few 'rare' PPE that was provided. However, the rare PPE was provided by few well established contractors who prioritised safety and health and appreciated its benefits. Deficient enforcement of safety was observed during the case study site visitation as some supervisors and workers were not aware of the factories act or other safety and health regulation (Charles, 2007).

2.4.13. Prevention of Accidents and Ill-health

The study noted that preventing occupational accidents was an important task of human resource management. The preventative methods of accidents cited were good attitudes to safety: proper enforcement safe site conditions; using safe methods and providing safety equipment. Methods of ill-health prevention were providing good sanitary condition, good personal hygiene, providing clean water, proper safety training, wearing protective equipment and housekeeping on site camps. This is similar to the findings of McCann (2003). If all stakeholders changed their attitudes towards safety and health, took part in proper enforcement of safety and health guidelines such as the factories act, accidents and ill health would be mitigated. Offering adequate safety health training to the project team and the provision of the safety and health equipment and facilities would greatly prevent accidents and ill health. Safety and health training empower workers to take care of their own safety and of others, to control risks and eventually prevent accidents.

Training would also help workers to be responsible enough to properly use the provided PPE as some workers do not wear PPE because of discomfort, the weather or work pressure. (Phoya, 2012). When site conditions are not favorable, especially when it is raining, work should be stopped to prevent accidents. Improvement of sanitary conditions such as clean toilets and providing clean chlorinated water would prevent water borne diseases, especially diarrhea. Good personal hygiene would help prevent ill- health and encourage other preventative methods such

as good sanitary conditions. Respondents and interviewees suggested other methods of accident and ill – health prevention such as; no working over lunch, providing enough lighting, avoiding overcrowding and no work during the industrial break. Creating a safe and healthy environment site would greatly prevent accidents and ill health.

2.4.14. Benefits of Safety and Health

The study found that the benefits of implementing good safety and health were increased production; good corporate image; boosts morale confidence; increase in efficiency; less delays and project completed within budget. Companies that adhered to good safety and health had their image protected and many business partner liked to associate with them. This meant that they had got good business deals because of good health and safety (Hallowell, 2010).

Implementation of good safety and health led to mitigation of hazards and prevention of accidents and ill health. Prioritising safety and health of workers by creating a safe environment boosted worker's morale and confidence, hence their efficiency increased and ultimately production increased because workers were protected. There were no or less delays and so projects were completed within budget and on time. The study also established that on sites where good safety and health were priority, other working conditions of workers like minimum wages were better. These issues were revealed during interviews (Gibb, 2001).

The benefits of safety and health are good to all stakeholders in the construction industry. Just as the outcomes of accidents and ill- health affect stakeholders, so are the benefits of good safety and health. The cost of safety and health programs should be seen as means of promoting the most valuable assets; the human resource. Workers lives are saved, employers work targets are met and consultants deliver the completed projects to client on time and government records improvements in infrastructure. (Arboleda, 2004).

2.5. Research Gap

Most of the studies that have been conducted on occupational health and safety focused on the enforcement of rules and laws on OHS, compliance to OHS, perceptions on OHS, training on OHS and the importance of OHS in industry. Therefore, there seem to be a gap in the studies as the authors did not look at how an educational training programme on health and safety can

prevent the occurrence of accidents and injuries in the mining industries. An educational training programme on occupational health and safety would enable workers to understand training on health and safety and their behavior and attitude towards health and safety rules would change positively and this would lead to the prevention of accidents and injuries in mining companies. Furthermore, very few studies have been conducted on occupational health and safety in the mining industries, especially how the implementation of an educational training programme on occupational health and safety and how it could lead to positive behavioral change thereby reducing accidents and injuries in the mining companies. It is because of these gaps that the study was undertaken.

2.6. Summary

This chapter presented literature on compliance to health and safety, training in health and safety, perception on health and safety and the importance of occupational health and safety in various industries and countries. Most of the countries in the world, and Africa inclusive, comply to occupational health and safety by enforcing measures such as the proper use of personal protective equipment and the provision of adequate information on occupational health and safety. Furthermore, literature revealed that employees' perception towards occupational health and safety was negative in many countries; only employees of South Africa's steel processing company and the United States of America's coal mine reported positive perception. This means that employees in these companies were provided with adequate information on health and safety and the proper use of personal protective equipment which they adhere to.

CHAPTER THREE

METHODOLOGY

3.1. Introduction

This chapter presents the methodology used in this study. The chapter explains the paradigm which was used, including the research design, methods of data collection and analysis, and ethical considerations. The chapter also describes the target population, the sample size, and the sampling procedure.

3.2. Philosophical underpinning

The philosophical framework that was informing this study was post-positivism and the paradigm was critical realism. The choice of post-positivism is because this philosophical framework embraces both quantitative and qualitative techniques of data collection which this study used. Furthermore, the study used critical realism because it espouses that human beings are able to interpret reality based on their experiences about events that have occurred in their lives (Philip, 2008). According to Guba and Lincon (1994), critical realism views that reality is shaped by social, political, cultural, economic, and ethnic and gender values. They further explained that realities are socially- constructed entities that are under constant internal influences. In this study, the participants socially constructed the reality of problem that existed in their environment based on their experiences and occurrence of events such as accidents and injuries, and the initiatives their employers provided.

3.3. Ontological assumptions

Ontology is defined by Crotty (2003, p. 10) as “the study of being”. It is concerned with what kind of world is being investigated as well as the nature of existence and the structure of reality. Ontological assumptions are those that respond to the question, “What is the nature of reality?.” The ontological assumption of critical realism is that reality produces facts and events that people experience and empirically examine. In relation to the study, the experiences of the participants and the events that had occurred in their workplaces were gathered as data and analysed quantitatively and qualitatively. Therefore, in order to find out why accidents

continued to occur in the mining industry, the researcher had to get information from the workers who had experienced and witnessed the accidents and injuries so as to get the reality of what existed on the ground in the mining industry.

3.4. Epistemological Assumptions

Critical realism epistemology is based on real world phenomena and linked with societal ideology. Knowledge is both socially- constructed and influenced by power relations from within society. Cohen, Manion and Morrison (2009) explains that what exists as knowledge is determined by the social and positional power of the advocates of that knowledge. Regarding knowledge on the causes of accidents and injuries in the mining companies, the participants had different beliefs of what caused the accidents and injuries.

Epistemologically, the knowledge that was obtained from this study was subjective in the sense that it was socially constructed from what the selected participants had experienced and witnessed on what causes accidents and injuries in the mining companies. The standpoint for critical realism on the ordinary knowledge is that it is shaped by human actions. What people know about the world is shaped by what they do, can do and want to do in the world. And this includes to a large degree what they know about other people's doings (Cohen, 2009). The researcher collected data from the participants of the mining companies who may have experienced accidents and injuries either directly or indirectly in order to get the reality as to what causes accidents and injuries in the mining companies.

3.5. Research Design

This research adopted a case study as a research design. Case studies are in depth investigations of single persons, groups, events or communities (Diamond, 1997). In this study, a case study research design was used to examine the occupational health and safety system of two selected mines (mines A and B) on the Copperbelt Province of Zambia. This enabled the researcher to get an in-depth understanding of what caused accidents, injuries and diseases in the mining industry among the workers and employers.

The design was used to investigate and get an in-depth understanding as to what caused the accidents and injuries in the mines and also to get an in-depth understanding of whether the

failure to incorporate a sustainable learning system into the occupational health and safety system had contributed to the rise in accidents and injuries.

3.6. Target Population

The target population consisted of 5,000 employees of mines A and B, working in different sections or sites of the mines. The sections included the smelter, underground, and the safety and health departments of the mines. The reason for targeting these sections of the industry was because workers working in these sections were more prone to accidents, injuries, illnesses and they encountered a lot of risks and hazards. Furthermore, workers in these sites are more prone to accidents, injuries and diseases because their work environment is unfavorable and harsh.

3.7. Sampling Design

A sampling design comprises techniques that are widely used in research as a way to gather information about a population without having to measure the entire population (Creswell, 2012). This study applied probability sampling techniques, specifically stratified random sampling to select 40 respondents, 20 from mine A and 20 from mine B. Stratified random sampling was also used select respondents from each of the selected sections of mines A and B. Each of the four sections (two smelter sections and two underground sections) from mines A and B contributed ten participants. The advantage of using stratified sampling in this context was that it enabled the researcher to obtain a sample population that best represented the entire population under study.

Non-probability-sampling design was also used, specifically homogenous expert purposive sampling technique to arrive at ten key informants who were specialists in occupational health and safety from the health and safety department. This helped the researcher to focus on members of staff at the mines who were able to best answer research questions on the provision of OHS in the mines.

3.8. Sample Size

The study sites comprised of two mines, A and B. Each mine was divided into three sections, namely the smelter, underground and the Health and Safety department. From the smelter

departments of mines A and B, 20 employees participated in the study; another 20 participants came from underground departments of the two mines. There were 10 employees from the health and safety departments of both mines. The total sample size was 50 participants. The distribution of the participants among the departments is tabulated in Table 2.

Table 2: The population sample for Mines A and B

TARGET GROUP	SAMPLES
Smelter department	20
Underground department	20
Safety, health and Environmental management	10
TOTAL	50

Source: Field data 2020

3.9. Methods of Data Collection

The method of data collection that was adopted in this research is one that ensured accuracy in order to capture quality evidence that then translated into rich data analysis and allowed the building of convincing and credible answers to questions that were supposed to be in the research (Johnson and Turner, 2003).

The key method for data collection in this study was the use of a semi-structured questionnaire. The questionnaire was self-administered by the employees to allow them to complete it at their own convenient time. A semi-structured interview schedule was another method used to collect data. This involved the researcher conducting face to face interviews with employees from the Health and Safety Department. The use of semi-structured instruments enabled the researcher to collect both quantitative and qualitative data. The study also made use of an observation guide; it involved observing employees' behaviour towards health and safety rules. It also involved observing the work environment and if it conformed to occupational health and safety standards. The other method was by examining secondary data related to the study.

3.10. Instruments for data collection

As shown in section 3.1.8, the data collection instruments used in this study included a semi-structured questionnaire, a semi-structured interview schedule and a structured observation guide. A combination of the above mentioned instruments enabled the researcher to collect the necessary information. It also allowed for triangulation that is, using more than one method of data collection on the same topic to ensure the validity of the research. Table 3 shows a data collection matrix which integrates data from various sources and presents it in a unified composite manner.

Table 3: Data collection Matrix

No	Type of Information	Source of Information	Mode of Collection
1.	Investigate perceptions of employees and employers on occupational health and safety	Employees working in the smelter and underground sections Employees and specialists from Health and Safety department	Semi-structured questionnaire (Likert Scale) and semi-structured interview
2.	Establish the importance of occupational Health and Safety	Employees working in the mines. Employees from specialists from Health and Safety department	Semi-structured questionnaire and semi-structured interview
3.	Examine how the occupational health and safety system complies to health and safety authority	Employees and specialists from Health and Safety department	Semi-structured questionnaire, semi-structured interview and observation guide
4.	To design a sustainable learning programme on occupational health and safety	Employees and specialists from Health and Safety department	Semi-structured questionnaire and semi-structured interviews

Source: Field data 2020.

3.10.1 Semi-Structured Questionnaire

The questionnaire was self-administered by the participants. It contained both closed and open-ended questions. The open-ended questions provided the opportunity for the participants to

respond by briefly indicating their understanding of the questions while the closed ended questions gave them a chance to make some choices on their preferred responses. The questionnaire was distributed by the researcher to selected participants and were left with them to be answered at a time convenient to them. However, where clarifications were needed the researcher explained these needs to the participants.

The questionnaire used a questioning format called the Likert scale. This scale is used to measure attitudes, opinions and perceptions by asking people to respond to a series of statements about a topic in terms of the extent to which they agree with them and also tapping into cognitive and affective components of attitudes (Likert:1932). In this study, the Likert scale was used to measure the perceptions that the participants had on occupational health and safety.

3.10.2. Semi-structured interviews

Semi-structured interviews were conducted with participants from the Health and Safety departments of the two mines. Semi-structured interviews were used in this study because they offered the advantage of eliciting more comprehensive data along with maintaining a fairly conversational and situational solicitation of data. The advantage of this approach was that it was flexible and allowed questions that emerged from the immediate context of the interview on occupational health and safety. Furthermore, a semi- structured interview was used so as to get an in-depth understanding on occupational health and safety system and the causes of accidents and injuries in the mines. In this regard, Kvale (1996) explained that the qualitative research interview is focused on certain themes in the interviewee's life world. It is neither strictly structured with standardized questions, nor entirely non-directive, but is focused on certain themes. It is then up to the subjects to bring forth the dimensions they find important within the focus area. The researcher therefore brought out the most important themes on what caused accidents and injuries in the mining companies.

3.10.3. Structured observation guide

Observation as a method of data collection involves recordings that are taken of the participant without interference. The recordings are made while participants are engaged in routine behaviours and are used as an indicator of what participants actually do rather than relying

completely on self- reports of participant's behaviour (Key, 1997). In this study, this method with the help of a note book was used to check on whether the employees (participants) and the company complied with occupational health and safety rules and to check on the methods of teaching that were used to train the employees (participants) on occupational health and safety. The researcher had to observe whether the employees wore the necessary Personal Protective equipment, whether there was proper housekeeping and whether employees followed health and safety rules when operating mobile equipment.

3.11. Secondary Data

Secondary data was collected to supplement the primary data collected. This enabled in-depth of the case and to get a solid understanding of the causes of an ineffective occupational health and safety system of mines A and mine B. Secondary data came from various sources such as journals articles and theses.

3.12. Data Analysis

Qualitative data was analysed by grouping responses into emerging themes that were categorised and interpreted. This is because some of the participant's responses were subjective, derived from the open-ended questions both in the questionnaire and the interview schedule. Grouping responses together to form themes enabled the researcher to use the emerging themes as variables whose frequency distribution showed which ones were more recurring than others (Chipatu, 2011).

Quantitative data was analysed using descriptive statistics, namely the mean and standard deviation. The Statistical Programme for Social Sciences (SPSS) version 16, was used to process the data while excel was used to diagrammatically present the findings. Quantitative data was also presented in form of frequency tables and percentages.

3.13. Methods of Data Validation

To validate the data, the study used mirror data triangulation validation technique. This means that the researcher checked with the participants whether the information they had given was accurate and reliable. It also involved collecting information from a diverse range of individuals,

using a variety of methods. In order to minimise on the possibility of systematic bias that arises from a single method, the information collected was triangulated using mixed methods or drawing from a range of qualitative methods. Methods of information triangulation involved checking the consistency of findings generated by different data collection methods (Meyers, 2008). The researcher had to redistribute the questionnaires to the participant's in order to get data which is consistent. The researcher also had to ask the interview question more than twice in order to validate the data which was given.

3.14. Members Checking

The researcher checked with the participants whether the information they had given was accurate. The researcher had to ask the participants if the findings from the study were truthful and valid. Members checking is when data, analytic categories, interpretations and conclusions are tested with members and those groups from the data was originally obtained. This can be done formally and informally as opportunities for member checks may arise during the normal course of observation and conversation (Dash, 1993). In this way, the participant can revise and clarify earlier statements. Typically, member checking is viewed as a technique for establishing the validity of an account.

3.15. Ethical Considerations

The study strived to take into consideration ethical issues that would arise in order to conform to best research standards (Blaxter et al, 2001). All ethical concerns pertaining to this study were taken into consideration. Formal approval was sought and granted from the University of Zambia (UNZA) Ethics Committee and an introductory letter was obtained from the Assistant Dean, Postgraduate in the School of Education. Furthermore, permission was gotten from the mining companies on the Copperbelt Province where the study was undertaken. All data collected was strictly confidential and was used only for the intended (academic) purpose. All employees and the mining companies were given code names throughout the data collection, analysis and reporting phases. In the field, during interviews it was outlined to the participants how confidentiality and anonymity of research participants would be achieved. Verbal consent to participate in the study was sought from the respondents and participation was voluntary.

3.16. Summary

This chapter has presented the research methodology used in this study. The study was both quantitative and qualitative in order to collect data that was accurate, complete and meaningful. The chapter has explained the research design, the target population, the sample size, and the sampling procedures. Also described in this chapter were the methods of data collection, the instruments used to collect data and the procedures for data analysis. Lastly, the chapter has explained ethical considerations that the study conformed to.

The next chapter presents the results of the study.

CHAPTER FOUR

PRESENTATION OF RESULTS

4.1. Introduction

This chapter presents findings on occupational health and safety systems of selected mining companies on the Copperbelt Province of Zambia. The findings have been grouped according to the objectives of the study which now form the themes. The categories included: the perceptions of occupational health and safety, the importance of existing occupational health and safety systems, compliance of health and safety system to health and safety regulations and an educational programme to improve learning on health and safety. The chapter starts by presenting data on demographic characteristics.

4.2. Demographic Characteristics

Data was collected from the smelter and underground departments of both mines A and B. Each department contributed 10 workers or participants to the study, bringing the total number of participants to 40. Educational attainment and work experience were taken to best affect the workers' perceptions about the importance of OHS in a workplace. Therefore, data relating to these variables is presented in this section.

4.2.1. Educational Attainment

The study found that all the workers in the smelter and underground departments had attained some level of tertiary education. The results are shown in Table 4.

Table 4: Educational attainment of the participants.

Variable	Category	Frequency n = 40	Percentage
Education	Primary certificate	Nil	0
	Secondary certificate	Nil	0
	College certificate	18	45*
	College diploma	14	35
	University degree	8	20

The table shows that most of the participants had either a college certificate or a diploma.

4.2.2. Duration of employment

Figure 2 shows the duration of employment of the respondents. The data shows that most of them (40%) had been in employment for a period of over 15 years. This has implications on how much experience these workers have.

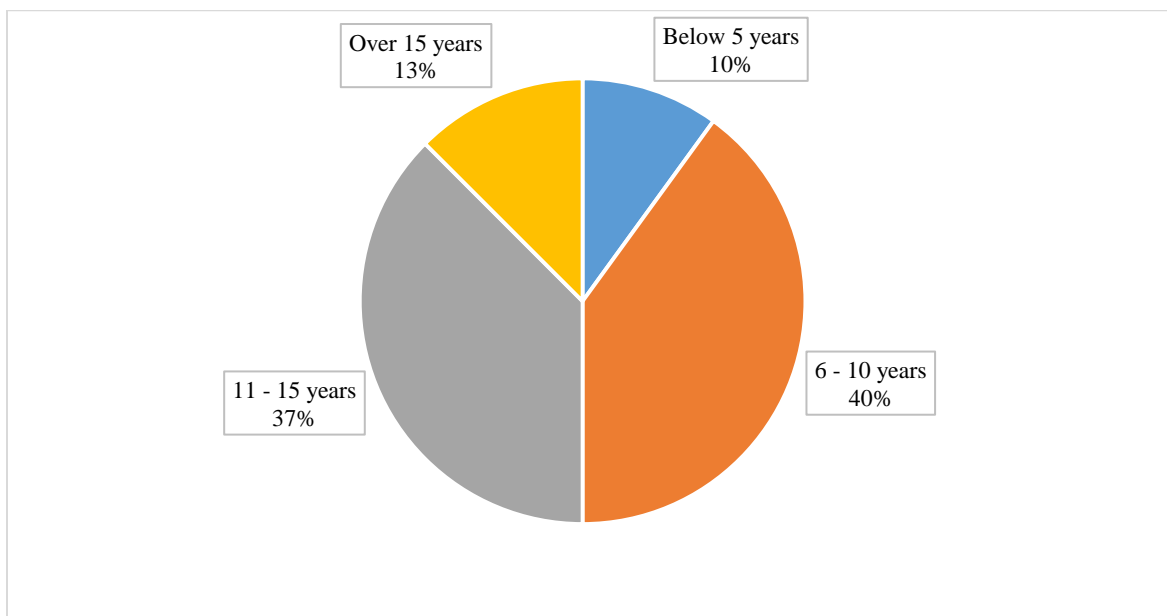


Figure 2: Duration of employment of respondents.

(Source: Field Data, 2020)

4.3 Objective 1: Responses on perceptions on occupational health and safety

The researcher wanted to find out the perceptions of the participants on occupational health and safety system in their workplace. Their responses are reported in this section.

4.3.1. Perceptions of occupational health and safety by employees

The respondents from the smelters and underground sections were asked about their perceptions on OHS in their workplace. The responses were ranked on a 4-point Likert scale, with 1 = strongly agree, 2 = agree, 3 = disagree and 4= strongly disagree. Table 5 shows the mean score responses for each item.

Table 5: Participants' perceptions of occupational health and safety in their workplace.

Items	Mean	SD
Keeping of the work environment safe from harm	1.33	-474
Following the health and safety rules of the company	2.07	1.071
Following health and safety protocol no matter how long and complicated.	3.57	-747
Not using shortcuts even when the procedure is too long and complicated.	1.58	-9844
Doing work in a safe manner.	1.40	-9844
Ensuring the safety of yourself and fellow workers	2.70	1.159
Not skipping any safety procedure.	1.75	-707
Following health and safety procedures even when some situations at work cannot allow me to.	1.60	-709
Does not always mean using personal protective equipment even when they are not comfortable.	3.08	1.071
Not using protective equipment always because the size that fit properly is not known	3.72	-506
Protective equipment is only used when production is too high on a particular day.	3.30	-758
Following safety procedures even if the work environment is never safe.	1.23	-423
When Management cares about the safety of workers	1.95	-959

Source: Field data 2020

The results indicate that most of the miners (Mean = 3.72, SD = -506) agreed that they did not use Personal Protective Equipment because they did not know what size fitted them properly. The next most commonly supported item was that the miners were following health and safety

protocols no matter how long and complicated the protocols were (Mean = 3.57, SD = .742). The third highest item was that miners only used protective equipment when production was high on a particular day (Mean = 3.30, SD = .758). That miners did not always use protective equipment because they were very uncomfortable was the fourth commonly supported item with a Mean = 3.08, SD = 1.071.

The least scored response was that the miners followed safety procedures even if the work environment was never safe (Mean = 1.23, SD = .423). The responses on perceptions on occupational health and safety were that miners did not use personal protective equipment because they did not know what size fitted them properly. Despite following health and safety protocols, no matter how long and complicated they were, the participants perceived the use of protective equipment as very uncomfortable. This was the main reason why they never always used PPE and that they only used personal protective equipment when production was high on a particular day.

4.3.2. Perceptions of occupational health and safety by specialists

The ten specialists from mines A and B were asked to explain their views on occupational health and safety in their respective mines. The specialists had different views on what occupational health and safety meant. One of the specialists indicated that:

Health and safety is when workers follow health and safety rules by wearing the right PPE, by not operating machinery if it has a fault and by identifying hazards in the working environment. Some workers do not follow health and safety rules as they feel following the rules takes long and wastes their time. - Specialist 9 (audio recording, 10 minutes).

Yet another specialist had this to say:

Health and safety is ensuring that the environment is safe and healthy for the workers. Health and safety is ensuring that the workers put on personal protective equipment when they are working. Injuries also serve as a lesson to other employees when another worker injures themselves. Employees are very disrespectful as they do not like being controlled when they have made an error in terms of following health and safety procedures. The employees always say that it's not convenient for them to follow guidelines on health and safety and at the same time do their work and I get disappointed with the employee's negative

attitude towards health and safety guidelines. – Specialist 10 (Audio recording, 10 minutes).

4.4. Objective 2: The importance of existing occupational health and safety system at mines A and B.

The researcher wanted to find out the importance of occupational health and safety system in the mining industry from the participants. This section presents the findings about the importance of OHS.

4.4.1. Importance of occupational health and safety system according to the participants

The respondents from the smelters and underground sections were asked about the importance of OHS in their workplace. Their responses are shown in Table 6.

Table 6: Responses from the participants on the importance of Occupational health and safety systems

Responses	No of participants	%
Identification and reporting of hazards	5	12.5
Reduced accidents and injuries	5	12.5
Reduction in reporting for work under alcohol influence	6	15
Reduced damage to machinery	6	15
Health and Safety programmes valued by workers	4	10
Reduction in loss of human resource from accidents	4	10
Reduced absenteeism	5	12.5
Higher productivity	4	10
Reduction in compensation and machinery replacement	1	2.5
Total	40	100

(Source: Field Data, 2020)

Table 6 shows that the highest response from six (15 percent) of the participants, was that the system reduced damage of machinery while the lowest response from 1 (2.5 percent) of the

participants, was that the occupational health and safety system was important because it reduced money spent on compensating injured workers and replacement of damaged machinery.

The responses on the importance of existing occupational health and safety is that all the participants revealed that occupational health and safety was important.

4.4.2. Importance of occupational health and safety systems according to specialists

All the 10 specialists from mines A and B revealed that the occupational health and safety system of the industry was important. The findings from the health and safety specialists were that occupational health and safety systems had reduced absenteeism and workers reporting under the influence of alcohol for work. The findings were that despite this, accidents had continued to increase. Two of the specialists had this to say about OHS:

Occupational health and safety systems, especially the safety rules that have been implemented, have reduced absenteeism as workers used to be absent from work when they were drunk. Most workers, when they are drunk, would go to the hospital to get a sick note for fear of being fired from work when alcohol was detected in their systems. This led to them being absent from work but this is not the case lately as the workers have come to appreciate the health and safety rules that have been implemented and absenteeism has reduced. The introduction of biometric which registers whether a person reported for work or not has also made workers not to be absent from work as the number of times one uses the biometrics, it registers in the system and its able to deduct money from a worker whose presence at work is not reflected by signing in through biometrics and the introduction of automated breathalyzer has reduced the number of workers who report for work drunk as the automated breathalyzers are able to detect alcohol in one's system. Despite the introduction of automated breathalyzer and biometric to reduce the number of employees reporting for work with alcohol in their system and absenteeism, accidents have not reduced. Workers do not care about following health and safety rules; they have become familiar with their work that following health and safety rules does not matter to them. Some workers feel following health and safety rules is a waste of time and especially that they start their work early and knock off late and tired. – Specialist 5 (Audio recording, 10minutes).

Occupational health and safety rules and regulations have made the company to be known as a good company by its stakeholders due to the fact that it has implemented

health and safety rules that have reduced accidents in the mine. - Specialist 3 (Audio recording, 10 minutes).

4.5. Objective 3: Compliance to occupational health and safety system

Under objective 3, the researcher wanted to examine how the company's occupational health and safety system complied with occupational health and safety authority regulations. This was important to understanding why accidents and injuries continued to occur despite the implementation of OHS. The researcher looked at how the employees complied to the set out rules on health and safety and the activities on health and safety that the companies carried out as a way of compliance to health and safety authority.

4.6.1. Compliance to Health and Safety Authority Regulations

Table 7 shows multiple responses from the participants on their ways of compliance to health and safety rules.

Table 7: Responses from participants on ways of compliance to health and safety rules

How do you comply with health and safety rules?	Number of Participants	(%)
Wearing PPE (goggles, hard hat, safety boots, safety clothing, safety gloves etc.)	12	30
Reporting hazards and injuries	8	20
Going for medicals	5	12.5
Participating in OHS meetings	5	12.5
Attending training on health and safety	5	12.5
Choosing health and safety representatives	5	12.5
Total	40	100

(Source: Field Data, 2020)

The table shows that most of the participants (12 or 30%) complied to health and safety rules by wearing PPE, while eight (20%) complied by reporting hazards and injuries. The other indicators scored five (12.5%) participants each. The participants reported multiple responses on ways through which they complied to health and safety rules.

4.6.2. How the mining companies comply with Occupational Health and Safety Authority regulations

This section shows how the mines complied with the regulations of the Occupational Health and Safety Authority.

Table 8: Responses from participants on the compliance of mines to Health and Safety rules made by the Occupational Health and Safety Authority.

How does the mine comply with Health and Safety Authority regulations?	Number of Participants	(%)
Health and safety inspections	5	12.5
Internal and external audits	6	15
Provision of health and safety information	4	10
Training on health and safety	6	15
Provision of PPE	8	20
Implementation of health and safety measures to prevent accidents/injuries	6	15
Investigations of accidents and injuries	5	12.5
Total	40	100

(Source: Field Data, 2020).

Table 8 shows that the participants indicated that mines complied with the regulations of the Health and Safety Authority in one way or another. Most of the participants (eight or 20%) revealed that the mines complied by providing workers with PPE. However, 4 (10%) of the participants stated that mines complied by providing health and safety information to workers.

4.6.3. Specialists' views on compliance of mines with Occupational Health and Safety Authority regulations

The specialists were asked about how the existing occupational health and safety systems in the mines complied with occupational health and safety authority. The specialists gave different answers to this question. One of the specialists said:

Our occupational health and safety system complies with health and safety authority regulations by carrying out inspections and internal audits of the work environment. The system also ensures that the mine safety departments send health and safety inspectors to inspect the mines to find out whether it is complying with the set standards of the authority. – Specialist 1 (Audio recording, 10 minutes).

Another specialist said:

The occupational health and safety system of this mine complies with the occupational health and safety authority by ensuring that workers wear the right PPE, by also ensuring that supervisors report accidents that occur in their departments. Although this is the case, most of the workers are disrespectful and do not wear the correct personal protective equipment and since the mining industry has always partnered with contractor companies, these companies do not provide their workers with personal protective equipment. Furthermore, it's on very rare occasions that the supervisors of departments report accidents. All the supervisors care about is for work to be done and workers fail to report to them about unsafe work conditions and hazards as they fear to be charged or to be fired. – Specialist 7 (Audio recording, 10 minutes).

The finding is that the occupational health and safety system mines A and B complied to the Health and Safety Authority regulations by carrying out inspections and internal and external audits, ensuring that workers used personal protective equipment, and reporting accidents and injuries.

4.7. Findings through observation

This section presents the findings which were obtained through observation. It links these findings to the checklist on how mining companies complied with occupational health and safety.

4.7.1 Compliance to OHS system

Under compliance to occupational health and safety system, it was observed that communication underground on health and safety was very weak as hazards were not always reported to the supervisors or managers. When the job to be done was not safe, the workers did not communicate with their supervisors and, even if they did, the supervisors did not take it seriously; supervisors preferred the job was done even if it was not safe. Furthermore, workers in different shifts did not communicate about the importance of housekeeping when starting and ending shifts.

It was also observed that, in all the sections where the study was conducted, supervisors and the people in charge did not conduct visible felt leadership. This is to say that they did not check particular hazards and risks that a job that was to be assigned to the workers had. Visible felt leadership is a document that a supervisor or a person in charge is supposed to fill in when they identify hazards and risks in an environment where they are working and also if the job assigned to the workers is not safe and consists of hazards. It was observed that visible felt leadership forms were not taken to the health and safety departments of the two mines so that remedial action could be taken to reduce fatalities and injuries.

The researcher also observed that supervisors did not carry out planned observation of tasks (PTOs) for workers. This means that they did not observe whether the workers were following safety procedures when they did their work. At the end of the month, the supervisors faked the PTOs and presented them to the health and safety departments. This gave an impression that the PTOs for each department by each supervisor for the year had been done when in fact not. Furthermore, when there was need to make a follow up on a certain employee who did not follow the correct procedure during the PTO, the follow up was ignored. Similarly, if there was need to follow up on a deviation in a department to verify if remedial action had been put in place to reduce fatalities and injuries, the follow ups were not done. It was further observed that in the departments or sections, employees did not report incidents and near misses. A near miss is an unplanned event which did not result in injury, illness or damage but had the potential to do so (Jones, 1999).

Another observation was that there were pools of water underground which contributed to injuries. The pools reached knee level and workers complained of injuring themselves from stones that were covered (hidden) by the water. The researcher observed that there were naked electricity cables underground as well as the smelter. The danger was that the naked wires underground when they were in contact with pools of water could lead to electrocution of workers thereby causing death.

It was also observed that the ventilation system underground was quite poor. Some areas did not have ventilation which made it difficult for workers to concentrate on their work. It also compromised their safety.

The researcher observed that most workers wore personal protective equipment which included helmets. It was further observed that very few workers wore safety goggles when doing work which required them to wear safety goggles or when they were in an environment where they were required to wear safety goggles. It was also observed that most workers, when working at heights, did not wear safety harness belts to prevent them from hitting the ground if they had to fall.

The researcher also observed that the pace at which workers worked underground was different. When their shift was about to end, some workers worked faster without observing safety rules and did not care about how the tools they were using were left or stored for other workers in the next shift. Poor housekeeping after each shift, therefore, made it easier for fatalities and injuries to occur.

It was also observed that, in most places where workers carried out their work, there was weak ground which was prone to rock fall. Despite the workers witnessing rock fall in the areas where they worked, they did not report such deviations to the rock mechanic engineers and the health and safety departments in the two mines. Furthermore, it was observed that workers did not check the strength of the area to be blasted.

The study further observed that drivers of the dump trucks and magnetos did not wear seat belts when driving these machines. This had, therefore, caused a lot injuries and fatalities. In addition,

observation revealed that the drivers driving magnetos had licenses which they always renewed upon expiry.

Another observation was that workers usually moved in mobile equipment areas even though these areas were prohibited. Furthermore, the mobile equipment areas were not barricaded to prevent workers from entering them. The areas had no signage to warn workers from moving into them.

4.8 Designing an educational programme to improve learning for OHS in the mining industry in Zambia

The fourth objective of this study was to design an educational programme that can be used to improve learning for occupational health and safety in the mining industry in Zambia. This section presents the findings on that educational programme.

4.8.1. Sustainability of the Training Programme on Health and Safety

The researcher wanted to find out from the participants whether the current training programme on health and safety was sustainable. Table 9 shows the responses to this question.

Table 9: Participant's views on the sustainability of the health and safety training programme

Is training on health and safety sustainable?	Number of Participants	(%)
Yes	6	15
No	24	60
Not Sure	10	25
Total	40	100

(Source: Field Data, 2020).

Table 9 shows that the majority of the participants (24 or 60%) said that the current training on health and safety was not sustainable. Only six (15%) said that the training was sustainable. A further 10 (25 %) of the participants said they were not sure.

4.8.2. Reasons why training on occupational health and safety was sustainable

The researcher wanted to find out from the six (15%) participants who indicated that the training was sustainable why they thought so. Table 10 shows responses to this question.

Table 10: Participants responses in why training on Occupational Health and Safety was Sustainable

Responses	Number of Participants	%
It caters for all employees with different levels of education	3	50
Training on health and safety is ongoing	3	50
Total	6	100

(Source: Field Data, 2020).

Table 10 shows that three (50%) of the participants apiece indicated that training on health and safety was sustainable because it catered for employees with different levels of education and that training on health and safety was ongoing even after employees had undergone inductions and were familiar with the work.

4.8.3. Reasons why training on occupational health and safety was not sustainable

For the 24 (60%) who responded that training on health and safety was not sustainable and the 10 (25%) who said that they were not sure, the researcher asked them to give reasons why they thought training was not sustainable. The responses are shown in Table 11.

Table 11: Participants responses on why training on occupational health and safety is not sustainable.

Responses	Number of Participants	%
No training for managers/ supervisors	8	33.3
Poor application of health and safety knowledge	4	16.7

Poor training methods	5	20.8
Negative behaviour of employees to health and safety rules	7	29.2
Total	24	100

(Source: Field data, 2020)

Table 11 shows that most of the participants (eight, 33.3 %) stated that the training was not sustainable because managers and supervisors did not attend training on health and safety. A small number of the participants (four or 16.7 %) gave poor application of knowledge by employees to their work as the reason why.

4.8.4. Employees' suggestions on making training in health and safety sustainable

The researcher asked the 24 participants who had indicated that the training programme was not sustainable what they thought should be done to improve training on health and safety to make it more sustainable thereby preventing accidents and injuries in the mining industry. This information was key in designing a training programme on health and safety appearing in item 4.2.7 of this document. The responses are shown in Table 12.

Table 12: Making training in health and safety sustainable

How can training in health and safety be sustainable?	Number of participants	(%)
Supervisors/ managers to attend training	10	41.7
Using different training methods	8	33.3
Introduction of behavioral course for managers and supervisors	6	25
Total	24	100

(Source: Field data, 2020).

Table 12 shows that 10 (41.7%) of the participants thought supervisors and managers needed to attend training on health and safety for it to be sustainable, eight (33.3 %) suggested using different training methods on health and safety and six (25%) suggested that a behavioural course should be introduced for managers and supervisors to enable them to understand the

behaviour of employees in relation to health and safety. This, in turn, would enable them to give the employees effective health and safety guidelines.

4.8.5. Suggested topics to be included and maintained in the proposed Health and Safety Educational Training Programme

The researcher enquired from the 24 participants who indicated that training on health and safety needed to be improved what topics needed to be included and maintained in the training programme. The findings are shown in Table 13.

Table 13: Issues to be covered and maintained in the proposed Health and Safety Educational Training Programme

Responses	Number of participants	(%)
General training on health and safety	7	29.2
Fire and radiation and safety signs	8	33.3
Types of PPE	4	16.7
Training according to tasks	5	20.8
Total	24	100

(Source: Field data, 2020)

Table 13 shows that the participants proposed general health and safety training (29.2 %), fire and radiation (33.3%), types of PPE to wear for a particular task and site (16.7 %), and health and safety in relation to their assigned tasks (20.8 %) as the main topic that needed to be included.

Having examined suggested topics to be included and maintained in the improved version of the training programme on health and safety, the next subsection looks at the suggested mode of training in health and safety.

4.8.6. Suggested Mode of Training on Health and Safety

The researcher asked the participants to suggest the best ways (mode) of training in health and safety. The suggestions are presented in Table 14 and included the following:

1) Learning from fellow workers on how to go about health and safety rules.

(a) **Social constructivism**- Learning by socialising with fellow employees.

Social constructivism states that knowledge can be constructed through interactions with others.

2) Learning from the way other workers follow health and safety rules when working

(b) **Behaviourism** – observing employees’ behaviour towards health and safety and also employees observing fellow employees’ behaviour towards health and safety (following role models).

Behaviorism states that knowledge can be attained by observing the behaviour of others.

3) Learning by discussing occupational health and safety with fellow workers. Discussing what needs to be changed to improve on occupational health and safety during working hours or during inductions.

(c) **Interactive learning** - learning by having discussions, brain storming on health and safety with fellow employees and instructors.

Interactive learning involves engaging the learners in the learning process through learner participation, using questions that stimulate responses and by using teaching aids that press for answers.

4) Discussing with fellow workers the challenges faced when it comes to occupational health and safety and taking their concerns to management

(d) **Social critical approach** - employees critically discussing challenges faced and then taking them to the employer.

Social critical approach is the ability to assess political and social structures in which society exists and to empower people to question authority and speak against injustice.

5) Giving employees information on health and safety rules each time they report for work.

(e) **Sensitisation and raising awareness** - through presentations, drama, health and safety meetings and putting up posters on health and safety.

Sensitisation is a way of making oneself or others aware of and to be responsive to certain ideas, events, situations and phenomenon. Awareness is the state of being conscious of oneself and the environment.

Mode of training on occupational health and safety suggested by the participants as tabulated in Table 14.

Table 14: Mode of Training on Health and Safety

Mode of Training	Number of Participants	(%)
Social constructivism	6	25
Behaviorism	3	12.5
Interactive learning	6	25
Social critical approach	5	20.8
Sensitization and raising awareness	4	16.7
Total	24	100

(Source: Field data, 2020).

4.8.7. Preferred methods of Assessment in Training for Health and Safety

The researcher wanted to find out from the 24 (60%) participants who indicated that training on health and safety was not sustainable what mode of assessment they preferred after training. All the 24 (60%) participants stated that they preferred examinations as the mode of assessment.

4.8.8. Responses of Specialists on Training in Health and Safety

The ten specialists from mines A and B were asked for their views on training in OHS. The specialists stated. One of the specialists said:

Training on health and safety is sustainable as it is ongoing even for those who are beginning work for the first time. However, the period that the workers are given to be trained is not enough. - Specialist 1 (Audio recording, 10 minutes).

Yet another specialist said:

Training in occupational health and safety is not sustainable in the sense that supervisors do not attend training on health and safety. It is important for supervisors to attend training on health and safety so that they can understand what workers experience when working in an environment which is not safe and also it is important for them to attend training on health and safety so that they will be able to understand the workers when they report to them about the unsafe working environments or conditions. This, therefore, is not the case at the moment. – Specialist 8 (Audio recording, 10 minutes).

Another specialist had this to say:

Training on health and safety is not sustainable as the workers find it difficult to master what they learn on health and safety and to apply it to their work. Furthermore, the workers' attitudes and behaviours towards health and safety rules is negative. There is need to develop a sustainable training programme on health and safety which will lead to positive attitude and behavioral change towards health and safety by workers and also to enable workers to understand easily what they learn on health and safety, later on making it easy for them to apply it to their daily work routines. - Specialist 5- (Audio recording, 10 minutes).

4.8.9. To design an educational programme that can be used to improve learning for occupational health and safety in the mining industry.

Table 15 presents activities in the educational training programme proposed for occupational health and safety which was designed by the researcher to improve learning on occupational health and safety in the mining industry. The table includes activities that employees were to be trained in, the actors and the audience. The programme also includes the methodology of teaching or learning, duration, type of assessment and the expected outcome.

Aim

The aim of the proposed training programme on health and safety is to reduce accidents, injuries and deaths in the mining industry.

Objectives

1. To instill knowledge and skills in occupational health and safety in employees
2. To make use of the four methods of learning in health and safety so as to bring about behavioural and attitude change in employees and employers
3. To introduce a behavioural course for managers and supervisors in workers' health and safety.
4. To carry out routine sensitisation and awareness on health and safety.

Table 15 shows activities in the proposed educational learning programme for occupational health and safety.

Table 15: Activities of the proposed Educational Learning Programme for occupational health and safety

Activity	Actors	Actions	Audience	Method of teaching/ learning	Duration of learning	Type of assessment	Expected out come
General training in health and safety	Health and safety instructors	Training managers, supervisors, shift bosses and employees in health and safety	<ul style="list-style-type: none"> ➤ Managers ➤ Supervisors ➤ Shift bosses ➤ Employees 	<ul style="list-style-type: none"> ➤ Social constructivism ➤ Behaviorism ➤ Interactive learning ➤ Social critical approach 	One week	Exam	<ul style="list-style-type: none"> ➤ Positive behavioral and attitude change ➤ Knowledge on health and safety ➤ Compliance to health and safety rules and regulations
Training on firefighting radiation and first Aid	Instructors on firefighting, radiation and first Aid	Training employees, supervisors and managers on firefighting, radiation and first Aid	Managers Supervisors Employees Shift boss	Social constructivism Behaviorism Interactive learning Social critical approach Sensitization and awareness	Two weeks	Exam	The learners/ trainees to have knowledge and skills on firefighting, radiation and first aid

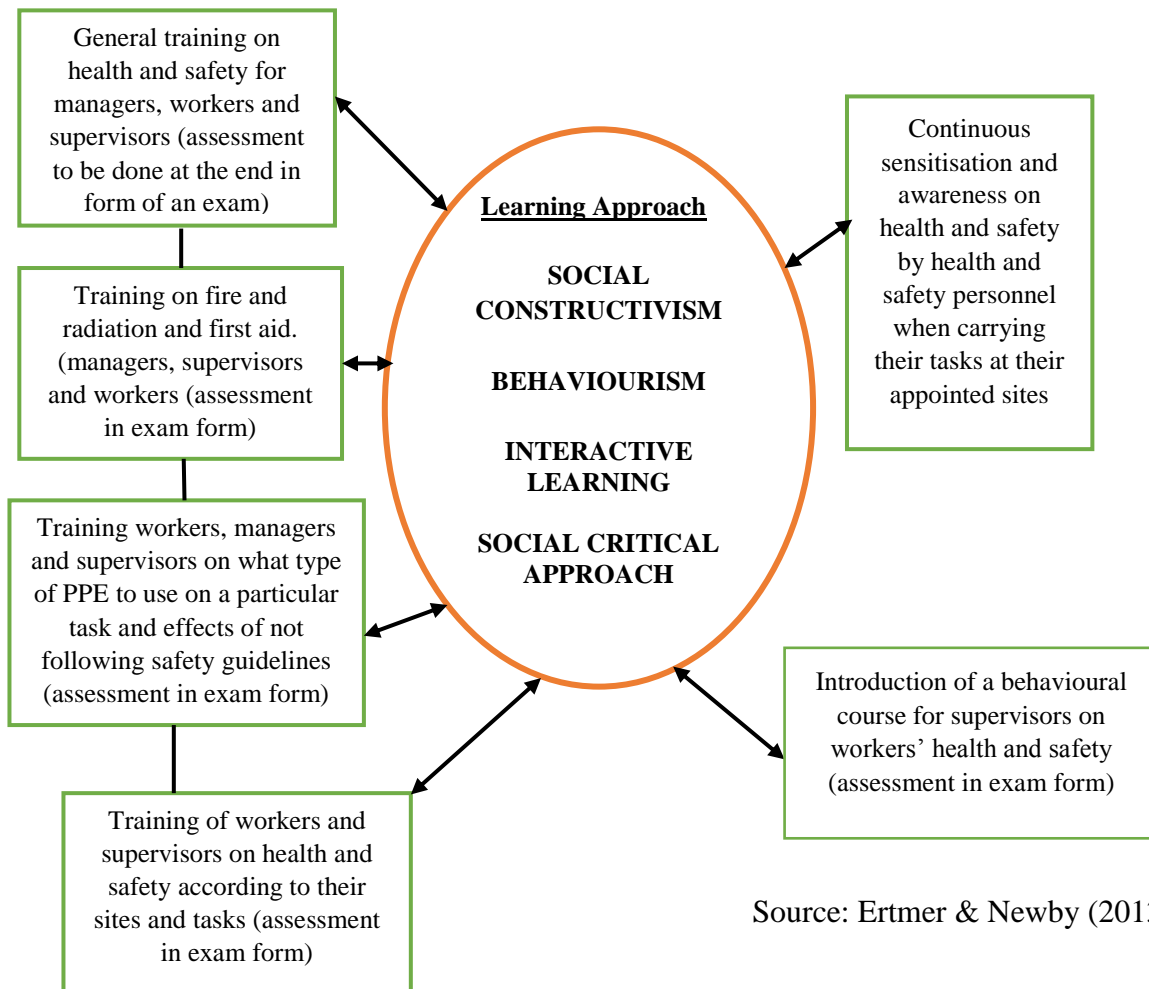
Training on PPE	Instructors for health and safety	Training on required PPE for each site and task	Managers Supervisors Employees	Social constructivism Behaviorism Interactive learning Social critical approach	Two weeks	Exam	Positive behavioral and attitude change Knowledge on required PPE Compliance to health and safety rules and regulations
Training on health and safety signs	Instructors for health and safety	Training on the meaning of safety signs in relation to health and safety	Managers Supervisors Employees Shift bosses	Social constructivism Behaviorism Interactive learning and Social critical approach	Two weeks	Exam	To have knowledge on health and safety signs To comply to health and safety signs
Training on health and safety according to task and department	Instructors on health and safety specialized in the tasks	Training on health and safety according to the tasks each group of workers perform	Managers Supervisors Employees	Social constructivism Behaviorism Interactive learning Social critical approach	Three weeks	Exam	To be able to carry out tasks in a safe manner To top unsafe work conditions To report unsafe work conditions and environments
Introduction of behavioral course	Health and safety instruction/ Management	Training manager and supervisors on behaviors and attitude of employees	Managers Supervisors	Social constructivism Behaviorism Interactive learning Social critical approach	Two weeks	Exam	To understand employee's behavior towards health and safety To implement measures that can lead to positive behaviors on health and safety in employees

Continuous awareness and sensitization on	Health and safety manager Supervisors	Creating awareness and continuous sensitization on health and safety	Employees Managers Supervisors	Interactive learning Behaviorism Social critical approach Social constructivism	Continuous	Question and answer	Positive behavior and attitude change Compliance to health and safety rules Reporting of hazards, injuries and unsafe working conditions and tasks
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Source: Field data 2020

4.8.10 The Proposed Educational Training Programme for Occupational Health and Safety

Figure 3 summarises the proposed educational training programme for occupational health and safety for the mines. It shows the learning approaches that are to be used in each topic or course in health and safety.



Source: Ertmer & Newby (2013).

Figure 3: Schematic representation of the proposed learning programme on health and safety

The information below explains in full detail Table 14 and Figure 3. It explains how the learning approaches are to be used to train the workers on occupational health and safety and gives an explanation of how the objectives on the activities were to be achieved.

- The instilling of knowledge and information on health and safety in employees, managers and supervisors will lead to positive behavioural and attitude change that will enable them to comply with health and safety rules and regulations, thereby reducing the number of accidents, injuries and deaths in the mining industry.
- Training in health and safety by using teaching methods such as social constructivism, behaviourism, interactive learning and social critical approach
-

(a) Social constructivism

Social constructivism is a sociological theory of knowledge according to which human development is socially situated and knowledge is constructed through interaction with others (Vygotsky, 1978). Therefore, social constructivism can be used to train employees, managers and supervisors. This can be done by the instructor putting the trainees in groups so that they can learn about health and safety by interacting amongst themselves. The usefulness of this approach is that employees, managers and supervisors will learn from each other, not just from the instructor. They will also learn how to carry out different tasks in their work environment. They will be able to learn from each other how to carry out a particular task in a safe and healthy environment to avoid injuries, accidents and deaths.

(b) Behaviourism

Behaviourism is a psychological approach that emphasises scientific and objectives methods of investigation. The approach is only concerned with observable stimulus-response behaviours and states that all behaviours are learnt through interaction (Skinner, 1948). Behaviourism emphasises the role of environmental factors in influencing behaviour and states that behaviour is learnt through classical conditioning or operant conditioning (Bandura, 1963).

Therefore, the instructors training in health and safety in the mining industry can use behaviourism as a teaching method. This can be done by observing the behaviour and attitude of employees towards health and safety rules and regulations. If the behaviours of

the employees are positive, there should be positive reinforcement and if the behaviours of the employees are negative, there should be negative reinforcement. Reinforcement is a stimulus which strengthens or increases the probability of a specific response. Positive reinforcement is a treat that increases the response and negative reinforcement is a treat that reduces a response (Watson, 1913).

Therefore, the instructors can observe the behavior of the employees towards health and safety. If the behaviors are positive, then they can be positively reinforced by giving the employees incentives. For example, if a particular site or department show positive behavior towards health and safety rules, they should be given an incentive such as money or a bonus in addition to their salaries for good behavior towards health and safety rules. When the behavior of the employees is negative, the employees should be punished by charging them, this can be done by deducting a percentage from their salaries. Furthermore, suspension for not following health and safety rules should be considered.

(c) Interactive Learning

Interactive learning is a hands-on approach that helps learners to become more engaged and retain more learned material. It helps learners strengthen their problem solving and critical thinking skills (Hatten, 2003). Interactive learning can be used as a teaching method to train employees, managers and supervisors in health and safety. This will be interactive in the sense that the instructor will learn from the trainees and the trainees will learn from the instructors. This will also make it easier for the instructor to operate at the level of knowledge and understanding of the trainees and how far he or she should go to enable them learn and understand health and safety and what is required of them so as to reduce accidents, injuries and deaths in the mining industry.

(d) Social Critical Approach

Social critical approach is the reflective assessment of the political and social structures in which society exists and to empower people to question authority and speak out against injustices. The approach focuses on the masses and those who are disadvantaged

by injustice. In other words, the main interest of critical education is education for liberation from social injustice (De Beer, 2005).

The relevance of this approach to the training programme in OHS is that instructors for health and safety will use social critical approach as a method of teaching to enable employees to voice out the challenges that they face when it comes to following health and safety and regulations and what the mining industry can do to address the challenges faced by the employees. The approach will also enable management to keep on revising the curriculum for occupational health and safety to address the challenges, making the learning programme flexible enough for revisions. Additionally, when the employees voice out their challenges on health and safety rules, it will enable the industry to address the actual challenges faced. This may result in learning for health and safety to be effective and thereby leading to positive attitude and behaviour change in employees, managers and supervisors. Ultimately, there will be reduction in accidents, injuries and deaths in the industries.

General training on occupational health and safety

General training on occupational health and safety would include managers, supervisors and employees. The training would enable these groups to have an idea about health and safety in general. It would enable employees working in both hazardous and non-hazardous sites to have basic knowledge and understanding about health and safety and of the environments in which they worked and how they are supposed to conduct themselves in such environments to ensure their safety. Furthermore, general knowledge on health and safety is a way of building up the trainees' understanding of occupational health and safety from the basics of occupational health and safety to complex knowledge and information on occupational health and safety. This would make it easier for the trainees to understand other complex topics on health and safety in relation to their work environments and their assigned tasks. In addition, this would enable the instructor to assess the level of understanding of the trainees and to know what should be done in the next stage of training to make the trainees understand the content.

Training on fire, radiation and first aid

This training would include managers, supervisor, shift bosses and employees. For managers, supervisors and shift bosses, training on firefighting and radiation will expose them to what the employees face when carrying out their work. This training will enable them to be more concerned about the health and safety of employees and to put the workers' health and safety as a major priority other than just the production of copper and making of profits. It will also make them understand how the health and safety of employees is closely linked to production and making of profits. Furthermore, the managers, supervisors and shift bosses will have knowledge on firefighting and first aid which they can use to put out a fire and to treat an injured person before seeking medical attention.

For employees, training in firefighting, radiation and first aid will equip them with knowledge and skills in firefighting and how to prevent accidents, injuries and deaths. Knowledge on radiation will enable them to protect themselves when working in areas where there is radiation. For employees who do not work in sites where there is radiation, the knowledge will help them to keep away from radiation zone areas.

Training in first aid is important for employees; in case of any injuries, they will know how to use first aid to save a life. Besides, having knowledge about first aid will enable the employees to be concerned about ensuring that the first aid box is always equipped with all the materials necessary for an emergency.

Training in the use of PPE

Training in the area of PPE is necessary for several reasons. In the first place, most of the employees did not know what PPE should be used for a particular task and environment in which to use it. Apart from that, some workers did not know what sizes fitted them properly while others stated that wearing PPE made them uncomfortable and made their tasks more difficult. Other employees wore personal protective equipment given to them according to their sites but did not know why the PPE should or was used for that

particular site. Furthermore, employees who worked for contractor companies were not given personal protective equipment by their managers.

Training in the use of PPE was important for managers and supervisors as they would be able to advise workers on the required PPE for a particular site and task. Furthermore, if the supervisors found that any of the employees they were supervising did not have the required PPE, they would be able to advise the employee on the importance of wearing the right PPE. For managers, this training would enable them to provide PPE for their employees and to make provision of PPE as a policy and priority. Training in PPE for employees would enable them to know what size fitted them properly, what PPE was required for a particular site and task and the importance of wearing the required PPE all the time.

Training workers in health and safety according their sites and tasks

There is need to train employees in health and safety according to their tasks and sites so that they will be able to know what health and safety measures they should put in place to have a health and safe environment.

Introduction of a behavioural course for supervisors and managers

A behavioural course for supervisors and managers is important as it will enable managers and supervisors to know how to handle employees when it comes to health and safety. Through observation of behaviour and they will be able to know what methods or measures worked effectively to enable workers to follow health and safety rules and regulations.

Continuous sensitisation and awareness on health and safety

There should be continuous sensitization and awareness on occupational health and safety. At each and every shift there should be a health and safety meeting to sensitise and create awareness on health and safety and what is expected of workers when they go to their sites. During meetings, workers should be given an opportunity to make known

the challenges they faced when it came to health and safety and their task or site so that the problem can be rectified before proceeding to their given tasks. This will help to prevent accidents, injuries and deaths from occurring. In these meetings, employees should be sensitised on the importance of housekeeping after each shift as a safety rule so as to prevent accidents and injuries. Sensitisation can also be done by using signage warning the workers about where there is danger.

Managers and supervisors for each site should attend the meetings so that employees can know and understand that their health and safety is a priority of management. Furthermore, after the meetings, managers should visit the working sites for workers to have on-site experience in terms of health and safety. This will help the managers to find out the potential hazards for the workers and to understand the challenges the employees face. Necessarily, this will make it easier for employees to report hazards, unsafe working conditions and tasks, accidents and injuries without the fear of being sent back by supervisors to do the unsafe task and to work in environments which are not safe. Furthermore, when the supervisors and managers undergo the employee's experience, they will ensure that the working sites and conditions are safe enough for workers.

Routine inspections

Inspections should be done by health and safety management. Such inspections should include whether belts are worn by employees driving heavy machinery and also ensuring that they are licensed to drive the machinery. Inspections and internal audits should also be carried out to ensure that all employees are wearing the required PPE and that the working environments are hazard free.

Assessment

Assessments should be done after every training. This will be done by giving the trainees examinations to gauge their levels of understanding. Furthermore, when a person fails the examination, they should repeat the programme after a week and not after six months, as this will enable them to assimilate and process what they learnt on health and safety

without any challenges. It will also be easier for them to apply what they learnt to their routine tasks.

4.9. Summary

Chapter 4 presented the findings of the study. The results showed that most participants complied with occupational health and safety rules in one form or another but there were still lapses in which OHS was managed by both the workers and the managements in the two mines studied. Therefore, most of the participants indicated that there was need to make training on occupational health and safety more sustainable. In this regard, the chapter presented a proposed educational training programme which could make training in OHS more sustainable.

CHAPTER FIVE

DISCUSSION OF FINDINGS

5.1 Introduction

This chapter discusses the results of the study, presented in chapter four in the context of the study objectives. The chapter discusses the findings under the following themes: perceptions of occupational health and safety by workers and specialists, the importance of existing occupational health and safety systems in the two mines, compliance of occupational health and safety systems to the Health and Safety Authority regulations and educational learning programme on health and safety.

The findings of the study indicated that all the workers in the two mines had attained tertiary education. The importance of this finding is that all the workers should be able to understand occupational health and safety rules and the training conducted on health and safety. The finding that 90 % of the workers had worked in their posts for over six years shows that the majority of the workers had witnessed and even experienced accidents and injuries that had occurred in the mines. They also had enough experience to comment on the adequacy of the training in health and safety and whether these methods needed changing or not. This is consistent with the assertion by Sibatu (2008) that, usually, a higher proportion of experienced welders are aware of occupational hazards compared to those that attended formal welding schools. Similarly, Sibatu (2008) argued that a higher proportion of experienced welders were aware of occupational hazards as compared to their inexperienced counterparts.

5.2 Perceptions of Occupational Health and Safety by Workers

Occupational health and safety is the discipline that deals with the prevention of work-related injuries and diseases as well as the protection and promotion of the health of workers. It aims at the improvement of working conditions and environment (ILO, 1998). The study findings revealed that health and safety was keeping the environment safe from harm and following the health and safety of the company. The participants perceived health and safety as following the health and safety protocol no matter how long and complicated it was. Health and safety was

perceived as doing work in a healthy and safe manner. Furthermore, the participants perceived health and safety as ensuring the safety of oneself and others. The findings are consistent with Norine (2016), who argued that every person at a workplace is responsible for his or her safety; it is the responsibility of the employees to watch their steps and for the project manager to ensure the employees' safety. Furthermore, the study revealed that it was the responsibility of the site engineer and foreman to ensure the health and safety of employees.

Most of the participants felt that health and safety means not skipping safety procedures. The study revealed that the participants viewed health and safety as following health and safety procedures even when situations at work could not allow them to. The findings are at variance with Tawiah (2016), who argued that there was a moderate positive association between occupational health and safety management and continuance commitment. Tawiah had argued that employees' perception of how health and safety was managed in an organisation influenced their decision to stay in the organisation. The findings were, however, consistent with the findings by Budhatoki (2014) that the level of education had a significant relationship with awareness of hazards, awareness of PPE and the use of PPE. This study found that, as the level of education among the population of miners increased, awareness and safety practices also increased.

Another finding is that participants only used personal protective equipment when production was high on a particular day, that the work environment was never safe to work in even if they followed the health and safety rules, and that health and safety did not mean using protective equipment always even when they are not comfortable. The study by Norine (2016) also found that some workers did not follow health and safety as they felt that following the rules took long and wasted their time. These issues are a matter of attitude. The finding affirms McCann's (2003) argument that if all stakeholders changed their attitudes towards safety and health, took part in proper enforcement of safety and health guidelines such as the factories act, accidents and ill-health would be mitigated. The behavioural category of accident causation has a factor called improper attitude as one of the factors of accident causation.

5.2.2. Perceptions of Occupational Health and Safety by Specialists

The findings from the specialists in the safety departments of the two mines that health and safety is when workers follow health and safety rules by wearing the required personal protective equipment, not operating machinery if it has a fault and by identifying hazards in the work environment shows that there were multiple causes of accidents and injuries in the mines. Norine (2016) emphasised the need for hazard identification in construction projects; in her study, only 29 % of the employees were able to identify a hazard. Similarly, the specialists also stated the need for ensuring a safe and healthy environment for workers. This could be achieved by making sure the workers wore the right PPE and that injuries served as a lesson for other workers. The finding that workers were not able to follow health and safety rules by wearing the required personal protective equipment, not operating machinery if it has a fault and by identifying hazards is inconsistent with the findings by MSA (2002) who argued that employees were adequately provided with information and training on occupational health and safety inductions and instructions by the employer.

Further findings from the health and safety specialists that employees were very disrespectful had the implication that the workers could not be controlled when they had made an error in terms of following health and safety procedures. For example, the employees did not practice proper housekeeping, that is, they did not stow away equipment after their shift in readiness for the next shift. As a result, the specialists were largely disappointed with the attitude of the workers who could not follow safety guidelines.

Within the multiple causation theory, the various issues surrounding improper attitude of employees could be some of the causes of accidents and injuries in the mines.

5.3. Importance of Existing Occupational Health and Safety System

Although Norine (2016) established that only 29 % of the employees in her study were able to identify a hazard, the current study has found that workers were aware of hazards in their work environment and were even able to identify and report them. However, like in the case of Norine's findings, the specialists also revealed that employees did not report unsafe working conditions and hazards as they were afraid of being charged or fired. The reason for the

conflicting information could be that, while some of the workers reported unsafe working conditions and hazards, others did not. Therefore, the specialists only received a few reports on the unsafe working conditions and hazards.

The findings also revealed that the health and safety system reduces accidents and injuries. Health and safety had reduced the number of workers reporting for work with alcohol in their systems as it impaired their judgment. Maintaining an awareness of and knowledge around alcohol safety and health obligations is important in the mining industry because of the precarious nature of the work that is done there.

The finding that occupational health and safety system has led to the reduction in the loss of human resource through accidents and that it has reduced the damaging of machinery because workers reported to the health and safety department when the machinery was malfunctioning is consistent with the findings by Norine (2016). Her study revealed that workers valued protection at the workplace and reported employees who did not have protective equipment. Health and safety has meant that delays in project completion were minimised, and absenteeism. The overall impact is that workers value the programmes on health and safety and are happier in the work place. This finding agrees with the findings by Sui (2002) that there is a positive relationship between the physical wellbeing of employees and effective commitment, emotional attachment and identification with an organisation. Such employees are less likely to engage in withdraw behaviours such as absenteeism, low performance and turnover.

The participants revealed that occupational health and safety environment has led to higher productivity and has reduced on compensating injured workers and replacing damaged machinery due to accidents. This is consistent with the findings by Norine (2016) that employing occupational health and safety measures reduced the burden and the cost an employer would incur for compensation when occupational health systems for employees are not in place in a case were risks or accidents.

5.4. Importance attached to existing Occupational Health and Safety Systems

The findings also revealed that occupational health and safety systems, especially the safety rules that had been implemented had reduced absenteeism. Before the OHS system was put in place,

workers used to be absent from work whenever they were drunk. They would get a sick note from the mine hospital for fear of being fired when alcohol was detected in their system. The rules, together with the biometrics which register workers' attendance with the Department of Human Resources, have substantially reduced the number of workers who did not report for work. The introduction of automated breathalyzers, which are able to detect alcohol in someone's system, has further helped to reduce the number of workers who report for work drunk. The workers have come to appreciate and obey these rules.

It was further revealed that occupational health and safety rules and regulations had given the company a good name and it was valued by its stakeholders. The findings were consistent with the findings of Tente (2016) that the benefits of implementing good safety and health regulations were increased production, good corporate image, boosted workers' morale and confidence and increased efficiency.

5.5. Compliance of Existing Occupational Health and Safety Systems to Occupational Health and Safety Authority Regulations

The findings revealed that all of the participants complied with health and safety rules. The employees complied with health and safety rules by wearing the right protective clothing such as safety goggles, hard hats (helmets), safety boots and safety gloves. This is in line with the findings Norine (2016) that in order to carry out work well, most of the employees used different protective equipment. To ensure safety, workers used helmets, gumboots, and dust masks. Participants complied with health and safety rules by reporting hazards in the work environment. They also attended medicals when they were just beginning to work for the company and also after every six months to check if they were fit for work. This is in line with the findings by Sishodiya (2013) that every person employed in the mine was required to undergo initial medical examination at the time of appointment and once every five years thereafter. It was also revealed that the participants complied with health and safety rules by participating in OHS meetings.

The finding was, however, inconsistent with the findings by Monica (2011) that half of all the welders in Jiinja municipality in Uganda were not compliant with occupational health and safety precautions and this was why there were rampant reports of work-related injuries among those

welders. In the current study, participants indicated that they complied with health and safety authority by attending training on health and safety and by choosing health and safety representatives to represent them on health and safety matters.

The findings of the study further revealed that the two mining companies complied with occupational health and safety authority regulations by carrying out health and safety inspections and audits in all the sites and departments. This finding is similar to the findings by Moore (2009) in his study of a coal mine in the United States of America that Mine Safety and Health Administration (MSHA) performed complete inspections of each underground mine four times per year and each operating surface mine twice each year, to assure compliance with mining safety and health standards and regulations. In the current study, the participants indicated that the companies complied with OHS by providing information on health and safety, providing training in health and safety and by providing personal protective clothing and equipment. The company also complied with health and safety authority regulations by implementing health and safety measures that prevented accidents and injuries, and carrying out investigations of accidents and injuries. This is also in line with the findings by Moore (2009) that MSHA also investigated mine accidents, complaints of retaliatory discrimination filed by miners, hazardous conditions complaints and petitions for modification of mandatory safety standards.

The finding that supervisors in the two mines ensured that accidents and injuries were reported to the health and safety departments is a good thing for workers to do. Morris (2018) explains that accidents in the workplace can cause a lot of stress and anxiety and reporting them can be nerve-racking. They should, however, be reported immediately to the employer (or supervisor in this case). This will help to curtail such accidents in future by adopting proper safety precautions. In the cases of Tam (2004) and Mukhalipi (2004), for example, the lackluster approach towards reporting safety concerns by workers led to other problems, such as the employers not providing safety equipment, deficient enforcement of safety and lack of training.

5.5.2. Compliance to existing Occupational Health and Safety systems by Specialists

The study revealed that occupational health and safety systems complied with the health and safety authority regulations by carrying out inspections and internal and external audits of the

work environment. The system also ensured that the mine safety departments sent health and safety inspectors to inspect the mines to find out whether they were complying with the set standards of the OHS authority. These health and safety inspections that were carried out fulfilled the industry's set up goals and objectives on health and safety. These findings are very similarly to those by Sishodiya (2013) in India whose study indicated that specialist staff officers in mining, electrical and mechanical engineering disciplines carried out health and safety inspections, audits and accident investigations in the mines. The study by Moore (2009) in the USA also showed that MSHA performed complete inspections of each underground mine four times per year and each operating surface mine twice each year, to assure compliance with mining safety and health standards and regulations. This shows that mines everywhere in the world are concerned about health and safety issues and, because of this, carry out regular inspections.

The finding that the OHS system of the two mines complied with the OHS authority regulations by ensuring that workers wore the right PPE and that supervisors reported accidents that occurred in their departments is consistent with Budhatoki's (2014) argument that the proper use of safety measures by welders is an important way of preventing and reducing a variety of health hazards that they are exposed to during welding.

Furthermore, the study showed that the health and safety departments in the two mines had put up punishable and disciplinary measures for workers who failed to follow health and safety procedures. This finding is significant because both mines A and B had reported that some workers were disrespectful to their supervisors and did not wear the correct PPE. In addition, some contractor companies did not provide their workers with personal protective equipment which left the workers exposed to injury. Furthermore, supervisors of departments rarely reported accidents. All they cared about was for work to be done. All these issues required enforcement of disciplinary measures to restore sanity in the workplace and to prevent accidents and injuries. According to Nash (2003), safety rules and procedures must be published, understood, enforced and accepted by everyone. The authorities should also be sure to document the enforcement efforts so that, in the event of an employee getting hurt while breaking the safety rules, the supervisor will have proof that he or she takes rules seriously enough to discipline those who break them.

5.5.3. Observation of compliance of existing occupational health and safety systems to occupational health and safety authority regulations.

The observation that communication underground was very weak needs attention and should be a source of concern for the two mines. It was observed that when there was a deviation or the job was not safe, the workers did not communicate with their supervisors and even if they did, the supervisors did not take the reports seriously. The supervisors' preference was for the job to be done even if it was not safe. It was further observed that workers in different shifts did not communicate about the importance of housekeeping when ending and starting shifts. This lack of communication can have several injurious implications. According to Grossman (2018), poor communication can lead to employee mistrust, absenteeism and low morale, bad interpersonal relationships, and the grapevine effect. On the contrary, good communication can help to achieve productivity and maintain strong working relationships at all levels in the mines. If the mines invested time and energy into delivering clear lines of communication they would rapidly build trust among the employees, leading to increases in productivity, output and morale in general.

The fact that it was also observed that supervisors and other people in charge of employees did not conduct visible felt leadership was another area of concern. Visible felt leadership is a document that a supervisor or another person in charge is supposed to fill in when they identify hazards and risks in an environment where they are working and also if the job assigned to the workers is not safe and consists of hazards. It would have been an act of responsibility if these forms had been adequately completed and taken to the health and safety departments so that remedial action could be taken to reduce fatalities and injuries. Visible felt leadership is a key component of the employee engagement equation; it builds a connection that resonates and inspires the workers to perform to their best. Shah (2018) argued that felt leadership is not only about driving revenue and contributing to shareholder value, but about preservation and protection of an organisation's most valuable resource – employees.

Another phenomenon observed was the faking of planned observation of tasks (PTOs) by supervisors for workers at the end of the month so that they indicated that the workers were following safety procedures of doing their work when they were not. The act of intentionally changing or modifying information on a document with the intention of misleading a person or

company is called falsification. Falsifying documents in a sensitive workplace such as a mine can only hurt the organisation and employees. The problem is that falsification would paint a picture that everything is being done correctly when in fact not. The repercussion will be that there will be no follow ups and remedial action where there is need to. The ramifications are usually increased fatalities and injuries in the workplace. However, the study revealed that, generally, employees did not report these incidents and near misses. The study also observed pools of water underground which potentially could contribute to injuries. It was revealed that the pools of water reached knee high, shielding stones which could harm the workers by way of injury. Trotto (2015) explains that floors in working areas should be kept clean and dry and drainage should be present where wet processes are used.

The study also revealed that the ventilation system underground was quite poor; some areas did not have ventilation. This did not only make it difficult for workers to concentrate on their work but it also compromised their safety. Inadequate ventilation can result in damage to health and even fatalities. Work must not be allowed to continue in places not properly ventilated (Extractive Hubs, 2020). It was also revealed through observation that there were naked cables underground as well as the smelters. When in contact with pools of water, electric cables can lead to electrocution of workers thereby causing death. All these dangers were emanating from laxity in the implementation of OHS by mine authorities. These are some issues which must be covered by the sustainable education programme.

It was also revealed through observation that in most places where workers carried out their work, the ground was weak and rocks fell off. Despite the workers witnessing rock fall in the areas in which they worked, they did not report such deviations to the rock mechanic engineers and the health and safety departments. Furthermore, it was revealed that workers did not care to find out the state of the ground before blasting. This is similar to findings of Larson (2002) that being hit by falling objects from heights followed by collapse of the earth was common in the rainy season because of the wet soils in places where the ground was unstable. Iramina et al. (2014) also noted that the majority of the 433 fatal accidents that occurred in the Peruvian mining industry from 2000 to 2007 were caused by rockfalls in underground excavations. Among the fundamental causes of these accidents was human error and non-complying procedures. In Larson's case, the accidents were associated with unsafe excavation methods and the use of

unsafe or substandard ladders. In the current study, it was observed among the human errors and non-complying procedures was that the workers did not report the frailties in the rocks to the rock mechanics in order for those areas to be secured with props and mesh to prevent the rocks from falling.

The revelation that very few workers wore safety goggles when doing work which required them to wear safety goggles or when they were in an environment where they were required to wear safety goggles was another safety concern. Further, the study established that most workers did not wear safety harness belts when working at heights. This meant that they did not have anything to prevent them from hitting the ground if they had to fall. That workers were allowed to work without protection shows negligence and an abrogation of regulations on the part of the supervisors who were supposed to make sure employees had and used safe tools and equipment. The fact that all these workers had a tertiary education makes this finding inconsistent with the findings by Budhathoki (2014) that the level of education had a significant relationship with the awareness of hazard, awareness of PPE and use of PPE. The current study does not show that an increase in the level of education among the mine workers corresponded with awareness and safety practices.

Housekeeping is crucial to safe workplaces. According to Trotto (2015), housekeeping can help prevent injuries and improve productivity and morale, as well as make a good first impression on visitors. In the current study, however, it was observed that housekeeping was not practiced by underground workers; when they were about to knock off, they would work at a faster pace, without observing safety rules and would leave without properly stowing away the tools for the next shift of workers. Without housekeeping, it is easy for fatalities and injuries to occur among the workers. Therefore, experts agree that all workplace safety programmes should incorporate housekeeping, and every worker should play a part (Trotto, 2015). All workplaces should be kept clean and orderly and in a sanitary condition to avoid workers slipping, tripping and falling.

The study through observation revealed that workers usually moved in mobile equipment areas even though these areas were prohibited. Furthermore, the mobile equipment areas were not barricaded to prevent workers from moving into them. The areas had no posters or signage warn the workers from entering into those areas. Yet, safety regulations stipulate that workplaces must

be furnished with clear signage designating hazards that are likely to cause serious injury and/or death. Therefore, the mines should consider installing warning signs to help with blind spots and prohibited areas. For drivers of the heavy duty dump trucks who were observed not to be wearing seat belts when driving these machines, the danger is that dump trucks can roll over and cause a lot of injuries and even fatalities to the drivers. An article titled “*Seat belt training recommended after fatal dump truck rollover*” (Mining Editor, November 23, 2015) explains the importance of seat belts in mining vehicles after a dump truck rollover killed an operator on a Western Australian site while he was hauling waste rock from an open pit to the waste dump.

It was also revealed through observation that drivers driving dump trucks, magnetos and heavy machinery had licenses which they renewed when they expired.

5.6. Proposed Education Training Programme on Health and Safety

The fourth objective was to design a sustainable training programme on health and safety in order to address the occurrence of accidents and injuries in the mining industry. A sustainable training programme on health and safety was designed based on suggestions from the employees of the two mines studied.

5.6.1. Major issues lacking in the current OHS programme

Several issues were raised by both the employees and the specialists from the departments of health and safety in mines A and B concerning the current OHS programme. The first one was that training in OHS was not sustainable because managers and supervisors did not attend training. Since managers and supervisors were not trained in OHS, it was adduced that they lacked knowledge of OHS, and so could not adequately guide the workers. The second issue was that, although employees had attended training in OHS, they still found it difficult to apply what they learnt to their work. The third issue concerned the improper attitude that workers displayed towards health and safety rules; it was adduced that this could also be among the causes of accidents and injuries in the mines. The fourth issue was that the methods used for training were either inadequate or inappropriate. For example, there was no course which taught supervisors and managers about how to manage the workers’ behaviour. The fifth issue concerned the

duration of the training programme; many of the participants indicated that the period that the workers were given to be trained was not enough.

5.6.2 Making training in health and safety more sustainable

The study findings revealed that there was need to make training in health and safety more sustainable. Among the recommendations made by both the workers and the specialists was that supervisors and managers needed to attend training on health and safety. The participants further suggested that there was need to use different training methods on health and safety. They suggested that a behavioural course should be introduced for managers and supervisors so that they will be able to understand the behaviour of employees in relation to health and safety and will be able to give the employees effective health and safety guidelines.

5.6.3. Topics to be included or maintained in the proposed health and safety educational programme to be designed

The findings revealed that training in health and safety needed to be improved and that topics needed to be included and maintained in the training programme. Among the topics suggested were general health and safety training, training in fire and radiation, training in what type of PPE to wear for a particular task and site, and training in health and safety in relation to assigned tasks.

5.6.4. Suggested mode of training on Health and Safety for the Programme to be designed

The participants suggested social constructivism, behaviourism, interactive learning, and social critical approach as the philosophies to inform learning on the programme. The methods would include classroom contact, sensitisation and awareness-raising. These methods are suggested by Walters (1996) who argued that trade unions had made extensive provisions of education and training in OHS. His argument is that it is possible to identify a common pedagogy in a trade union education and training in OHS. This pedagogy is rooted in the educational methods of labour education, emphasising the value of participants' own experience and developing a collective approach to the definition and solution of problems, while encouraging listening and communication skills in this process.

5.6.5. Preferred mode of Assessment in Training for Health and Safety

The study established that majority of the participants who stated that training in occupational health and safety was not sustainable preferred examinations as a mode of assessment after training on health and safety.

5.6.6. How the Theoretical Framework Guided the Study

As a concept and accident prevention theory, the multiple causation theory of accidents provided an important basis to finding out what causes accidents and injuries in the mining industry. The structure followed was informed by the items in Figure 4.

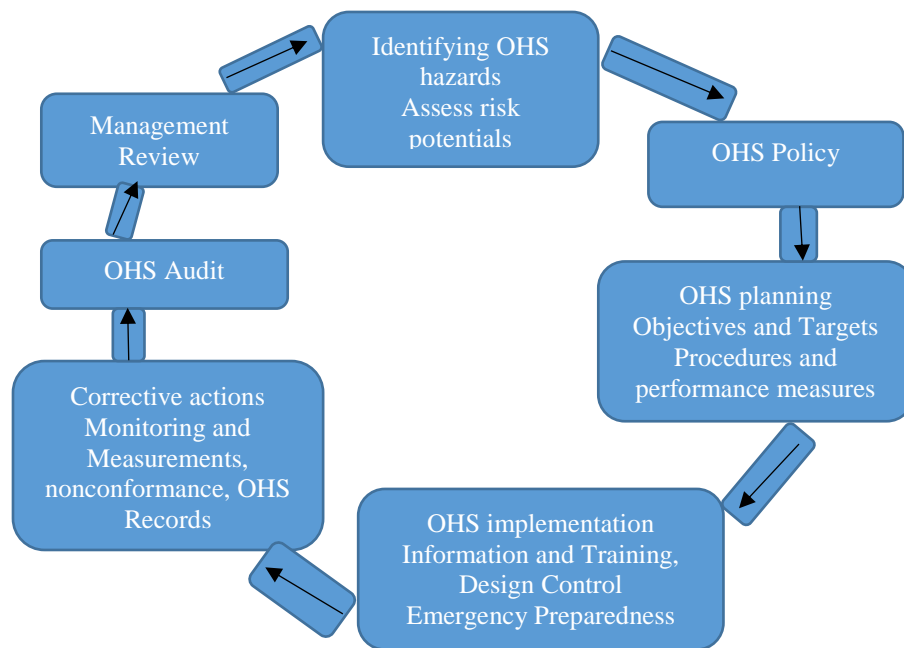


Figure 4: Occupational Health and Safety management system (BSI, 2018)

The theory enabled the researcher to explore all angles of the health and safety management systems used by mines A and B through the objectives of the study in order to find out the causes of accidents and injuries in the mining industry. The researcher had in mind that since the occupational health and safety management system of the mining industry is cyclic in nature, factors leading to accidents and injuries could emerge from different stages of the occupational health and safety management system.

5.7 Summary

This chapter has discussed the findings of the study in the light of existing literature and prevalent knowledge. The main issues that have come out are that, although several efforts have been made to implement OHS in the mines, accidents and injuries have continued because of several factors. These factors have been explained in terms of the multiple causation theory of accidents. Some of the factors are that, although the workers have been undergoing training, the managers and supervisors have not. This has created a gap between what the managers know and what the workers know. This has made supervision difficult. Furthermore, even the trained workers have not found it easy to apply the knowledge that they obtained from their training. Arising from this, it is clear that there is need for a programme which caters for both the workers and the managers. In addition, the programme should be structured in such a way that it appeals to the knowledge, beliefs, values, and attitudes of both the workers and the supervisors/managers.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This study examined occupational health and safety systems in selected mines on the Copperbelt Province of Zambia. It was a case study that was conducted on two mining industries in the area. This chapter concludes the study and also presents recommendations based on the findings.

6.2 Conclusions

Based on the responses given by respondents and key informants, it can be concluded that the learning programme on health and safety currently used in the mines is not sustainable enough to change the attitudes that workers have towards health and safety. The workers only use PPE when the production was too high on a particular day. This is because they did not have much training on the importance of wearing protective equipment. Furthermore, accidents were not reported by workers to their supervisors for fear of being charged and losing their jobs. It was also found out that the educational programme is not sustainable because the supervisors and managers do not attend training in a class room form like their employees do.

The findings also show that there is need to initiate different methods of training on health and safety in order to make the employees understand what they are being trained in. This would enable the employees to easily apply what they are trained in to their work or tasks without facing many difficulties. It would also be easier for them to remember what they are trained on. Furthermore, the study has shown that introducing a behavioural course for managers and supervisors will enable them to understand the employees' behaviour towards health and safety and how to address the employee's behaviour towards health and safety and enable them to adhere to the rules and guidelines on health and safety.

6.3 Recommendations

Based on the findings of the study, the following recommendations were made:

1. To adopt a sustainable learning programme on Occupational Health and Safety

Based on the finding that workers find it difficult to apply what they learn on health and safety to their work, there is need to adopt a sustainable learning model that will ensure that the workers both understand and are able to apply what they learn.

2. To ensure that supervisors and managers are part of the training in OHS

From the finding that supervisors and managers do not undergo training in OHS, a learning model which includes supervisors and managers is recommended.

3. Supervisors and managers should conduct safety meetings before workers report to their assigned tasks.

Supervisors and managers should hold safety meetings with workers so that they can talk about the risks of each particular task to be carried out and how they can reduce the risks.

4. Booklets or handouts with instructions on how to safely carry out a particular task should be given to employees.

Booklets and handouts with instructions on health and safety should be given to workers so that they can be guided on how to do the work safely.

5. Workers should be educated on housekeeping after each shift.

Workers need to know the importance of good housekeeping and ensuring that the tools that are used for each particular task are kept in their place. This will enable workers in the next shift to find things in place and also to prevent accidents and injuries.

6. A behavioural course should be introduced for supervisors, managers and persons in charge

A behavioural course should be introduced for supervisors, managers and people of in charge of sections so that they will be able to understand the behaviour of the workers.

6.4 Suggestion for further study

A further study could focus on how best an educational training programme on occupational health and safety could be implemented in the mining companies. Despite the mining companies having a training programme on occupational health and safety as indicated in chapter four, it would be of great benefit to assess the status of educational training programmes on occupational health and safety and how they could be implemented effectively in the mines.

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APPENDICES

Appendix 1: Letter of Consent

Dear Participant/ Respondent,

My names are Cynthia Sikana. I am a post graduate student at the University of Zambia, pursuing my Master's Degree in Environmental Education. As a partial fulfillment of the programme, students are required to carry out a research on a topic of their own interest. Therefore, the topic of my interest is the "Examination of occupational health and safety system of a selected mining industry on the Copper belt province of Zambia." This topic wishes to examine the perceptions of occupational health and safety by employers and employees in relation to their work. The study also wishes to determine the effectiveness of the existing occupational health and safety system at Mine A and also to find out if there is a sustainable learning system that has been incorporated into the system.

Therefore, this study will bring to light the factors that have led to the ineffectiveness of occupational health and safety systems thereby leading to accidents, injuries and diseases in mine A. The findings will enable mine A to improve its occupational health and safety system thereby improving the safety of the workers in mine A.

This study will apply confidentiality and anonymity. It will not reveal the name of the mining industry and the names of the participants. It is therefore, with sincere hope that the answers that will be given by the participants will be truthful enough for the study.

Participants Signature

Appendix 2: A Likert scale schedule for workers on the examination of occupational health and safety systems of selected mining industries on the Copper Belt Province of Zambia.

Likert Scale

This paper shall uphold confidentiality and anonymity will be upheld. No names will be mentioned and the company name will not be mentioned.

On the following items, please USE the scale to rate the following situations and statements.
Circle any answer of your choice

1 = Strongly Agree 2=Agree 3= Disagree 4= Strongly Disagree

PERCEPTIONS OF OCCUPATIONAL HEALTH AND SAFETY				
	Strongly Agree	Agree	Disagree	Strongly disagree
1 Health and safety is keeping the environment safe from harm	1	2	3	4
2 Health and safety is following the health and safety rules of the company	1	2	3	4
3 Health and safety is following safety protocol no matter how long and complicated	1	2	3	4
4 Health and safety means not using short cuts when the procedure of the work is too long and complicated	1	2	3	4
5 Health and safety is doing work in a safe and health manner	1	2	3	4

6 Health and safety is ensuring the safety of yourself and fellow workers	1	2	3	4
7 Health and safety means not skipping safety procedures	1	2	3	4
8 Health and safety is following safety health and safety procedures even when situations cannot allow me to	1	2	3	4
9 Health and safety does not mean using protective equipment always even when they are not comfortable	1	2	3	4
10 I do not use protective equipment because I do not know what size fit me properly	1	2	3	4
11 I often use protective equipment when the production is too high on a particular day	1	2	3	4
12 The work environment is never safe even if I follow the safety procedures	1	2	3	4
13 Health and safety is when Management cares about the safety of workers	1	2	3	4

Appendix 3: Semi- structured interview for health and safety specialists

This paper shall uphold confidentiality and anonymity. Names of respondents shall not be mentioned and the company's name shall remain confidential.

PERCEPTIONS OF OCCUPATIONAL HEALTH AND SAFETY

1.What is your perception of occupational health and safety?

.....

IMPORTANCE OF OCCUPATIONAL HEALTH AND SAFETY SYSTEMS

2.Is the occupational health and safety system important?

Yes ()

No ()

Not sure ()

3.If the answer to question 2 is yes, what is the importance of occupational health and safety systems in the mining industry?

.....

.....

4.If the answer to question 2 is no, why is it not important?

.....

.....

COMPLIANCE OF EXISTING OCCUPATIONAL HEALTH AND SAFETY SYSTEM TO OCCUPATIONAL HEALTH AND SAFETY AUTHORITY

5. Does the industries occupational health and safety system comply to occupational health and safety authority?

Yes ()

No ()

Not sure ()

6. If the answer to question 5 is yes, in what ways does the company comply to the health and safety authority?

.....

7. If the answer to question 5 is no, why does it not comply to the health and Safety authority?

.....

EDUCATIONAL PROGRAMME TO IMPROVE LEARNING ON OCCUPATIONAL
HEALTH AND SAFETY.

8. Is the educational programme on occupational health and safety sustainable?

.....

.....

Appendix 4: Semi- Structured Questionnaire for Respondents

All information provided in this study will be treated as confidential and your anonymity is assured.

Demographic Characteristics of Respondents

1. Gender:
 - a) = Male []
 - b) = Female []
2. Marital status:
 - a) =Single []
 - b) =Married []
 - c) =Divorced []
 - d) =Separated []
 - e) = Widowed []
3. Educational level:
 - a) =No schooling
 - b) =Primary education
 - c) =Secondary education
 - d) =Tertiary
4. State the department you are working.....
5. How many years have you been at post?
 - a) 0 – 5 []
 - b) 6 – 10 []
 - c) 11 – 15 []
 - d) 16 –20 []
 - e) 21years []

IMPORTANCE OF OCCUPATIONAL HEALTH AND SAFETY SYSTEMS

6. Is the occupational health and safety system important?

Yes ()

No ()

Not sure ()

7. If the answer to question 6 is yes, what is the importance of occupational health and safety?

.....
....

8. If the answer to question 6 is no, why is the occupational health and safety system of the industry not important?

.....

9. Do you comply to occupational health and safety rules implemented by the company?

Yes ()

No ()

Not sure ()

11. If the answer to question 9 is yes, how do you comply to health and safety rules of the company as an employee?

.....
.....

12. If the answer to question 9 is no, why don't you comply?

.....
.....

13. How does the mining industries Occupational Health and safety System comply to Occupational health and Safety authority?

.....

.....

14. Is the educational programme on occupational health and safety sustainable?

Yes ()

No ()

Not sure ()

15. If the answer to Question 14 is yes, why is it sustainable?

.....

16. If the answer to Question 14 is No, why is it not sustainable?

.....

.....

17. How can training on Health and Safety be improved?

.....

18. What topics should be included and maintained in the curriculum for Occupational Health and Safety?

.....

.....

19. What methods of training on health and safety do you think should be used to improve training on Occupational Health and Safety?

.....

20. How do you want to be assessed after training on Health and safety?

.....

**Appendix 5: Observation Checklist for Compliance to Occupational health and Safety
authority**

Observer:

Department:

Date.....

Compliance of occupational health and safety systems to occupational health and safety authority	Comments
<ul style="list-style-type: none"> - Communications on accidents and injuries, unsafe work, filling in of planned task observation forms and visible felt leadership forms by departments -pools of water and Naked Cables -ventilation underground/smelter 	
PPE Personal Protective Equipment - As required <ul style="list-style-type: none"> - Clothing - Helmets - Goggles -Safety Harness 	
Housekeeping <ul style="list-style-type: none"> - Proper storage of tools - Ground Strata 	
Mobile Equipment <ul style="list-style-type: none"> - Seat belt - Driving license for mobile equipment drivers - movements of employees in mobile equipment areas -Posters and barricades for warning of mobile equipment area 	