SCAFFOLD ACCIDENTS RELATIVE TO SOUTH AFRICAN CONSTRUCTION

BY

NDALENI PHINIAS RANTSATSI

Submitted in part fulfilment of the requirements for the degree of Master of Science in the Built Environment specialising in Construction Health and Safety Management in the Faculty of Engineering, the Built Environment and Information Technology to be awarded at the Nelson Mandela University

Supervisor : Dr Franco Geminiani

January 2018

DEDICATION

I dedicate this treatise to the following persons:

Both my late parents Mathiase Rantsatsi (2013) and Matsietsi Rantsatsi (1997).

To my wife and children :

Tsietso Rantsatsi, Katleho Rantsatsi and

Kananelo Rantsatsi

To my siblings

Anna Rantsatsi , Esther Rantsatsi ,Bongane Rantsatsi

Thembisile Rantsatsi and Sibongile Rantsatsi

To my nephew and nieces

Tumelo Rantsatsi, Refiloe Moila and Karabelo Rantsatsi

For their continued guidance, love, understanding, encouragement, support and inspiration

.

ACKNOWLEDGEMENTS

I deeply wish to express my sincere gratitude to the following people who made this treatise a success such as :

Dr Franco Geminiani for his professional guidance, support, expertise and great encouragement as supervisor.

Director of School of Built Environment, Prof. Winston Shakantu for his research methodology lessons.

Dr Jacques Pietersen and Ms Kirstie Eastwood for their statistical assistance from the Department of Statistics at NMU.

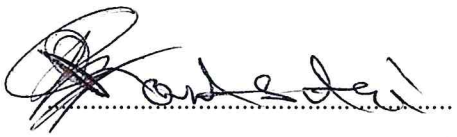
Mr Thomas Quinn, MSc Degree Post Graduate Coordinator for his patience and professionalism

The respondents for their timeous completion of the questionnaire and their inputs to my study.

Almighty God for giving me the strength, wisdom and knowledge which enabled me to submit this research work.

DECLARATION

I hereby declare that the above-mentioned treatise is my own work and that it has not previously been submitted for assessments to another University or for another qualification.



NDALENI PHINIAS RANTSATSI

29 March 2018

DATE

ABSTRACT

The aim of this research is to highlight the types, frequency and causes of accident experienced by the scaffold workers on construction sites. As a result, provide recommendations on how to prevent or reduce accidents of scaffolding contractors on construction sites

A review of related literature was conducted, primarily to avoid repeating existing research, in order to generate new findings. The quantitative research approach was adopted and a non-experimental research design was used for this research which prompted the use of questionnaires for scaffold site management and scaffold workers. The sampling included site scaffold management, supervisors, health and safety practitioners, scaffold labourers, scaffold fixers/erectors, scaffold team leaders/ charge hands and scaffold inspectors in the South African construction industry in all nine provinces.

The research findings revealed that slips, trips and falls accidents, struck by accidents and caught in/between accidents were the common accidents affecting scaffold workers on construction sites. The results further revealed that unsafe acts and conditions were the main causes of scaffold accidents. The empirical findings also revealed that most scaffold accidents occur during dismantling, manual handling and erection of scaffolding.

The respondents are mostly working in the Limpopo and Mpumalanga provinces of South Africa.

The research is vitally important for construction industry, scaffold contractors, clients and South African Department of Labour. It is recommended that a national accident register system be developed where accidents are captured and analysed to prevent possible accidents relative to scaffold contractors.

Keywords : Scaffold Accidents, Types of Accidents, Scaffold Contractors, Construction Industry.

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION AND PROBLEM FORMULATION

CHAPTER 2: THE REVIEW OF THE RELATED LITERATURE

CHAPTER 3: RESEARCH METHODOLOGY

CHAPTER 4: RESEARCH RESULTS, DATA ANALYSIS AND INTERPRETATION

CHAPTER 5: TESTING OF HYPOTHESES

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

LIST OF TABLES

LIST OF FIGURES

LIST OF ANNEXURES

CHAPTER 1 INTRODUCTION AND PROBLEM FORMULATION

1.1 INTRODUCTION

South Africa is one of the most influential countries in the Southern Africa and in the African continent in terms of the infrastructural developments. With the increase of infrastructural developments the country experiences the high amount of construction activities. In 2013 the construction sector contributed 3% to the gross domestic product (GDP) of South Africa, Statistics South Africa (as cited by Media Club South Africa. 2013, p. 3). Similarly, The construction industry's contribution to the total GDP of United States of America was 3.5% (The Construction Chart Book. (a). 2013, p. xv). The construction industry (CI) is instrumental in creating jobs and improving the public and private infrastructure of the country. CI contributed approximately 4% to the GDP of South Africa (Statistics South Africa. 2014, p. 11). The Statistics South Africa (Stats SA) (2014, p.28) reported that the construction industry employed about 4 % of the total workforce. Similarly, in 2013, the South African construction industry employed approximately 8% of the total labour force (Stats SA. 2014, p. 28). In Britain, the construction industry employed approximately 5% of the total labour force (HSE. 2014, p. 8).

The afore-said points demonstrate the importance of the construction industry to many economies across the world. The construction of any structure invariably requires various specialist skills and disciplines. During the course of the construction project, many contractors provide specialist services and the scaffolding contractors also form part of the contractors contributing to the construction. Many construction sites require the erection, alteration and dismantling of scaffolding to reach high levels of structures that are being built, maintained, renovated or demolished. The current construction of both Eskom Medupi and Kusile Power Stations has heightened the need for correct erection of scaffold work. During the construction of these Power Stations the scaffolds have to be built from ground level to approximately 100 meter level in order to provide safe temporary access.

The scaffold workers are expected to erect, modify and dismantle every scaffold required on site. In the event, a scaffold worker is involved in a construction accident it does not only affect his work but it also affects the work of a person who needed a temporary access to perform their work. During the erection, modification and dismantling of scaffolding, manual handling becomes an important factor in ensuring safety of all involved. According to National Access and Scaffolding Confederation (NASC) 2017 Safety Report (2017, p. 03) manual handling training has previously helped in reducing occupational injuries suffered by the scaffold workers. Scaffold work is inherently a hazardous activity and even more hazardous when done on construction sites. PWC (2013, p. 44) identified scaffolding as the third cause of fatalities from falls in the construction industry. This sends a strong signal that falls occurring on site contribute considerably to the high number of fatal and serious injuries in the South African construction industry and even abroad.

These scaffolding fatalities affect both the scaffold users and the scaffold workers because both groups of workers have to work at heights. HSE (2014, p. 1) reported that a scaffolder fell, sustaining fatal injuries while working on the structure at North West London and also confirmed that the deceased was not wearing the safety harness at the time of the incident. Similarly, Buildsafe SA (as

cited by Furter. 2013, p. 1) stated that a scaffold worker was hit by a standard when it slipped through the hands of worker who was above him, this happens during the dismantling of scaffold, the incident resulted in serious head injuries.

The intended study will benefit the scaffold contractors and also the construction sector in general. If the causes, frequency and types of accidents among scaffold contractors are known, this may help the industry to better manage the accidents by proactively taking appropriate actions to arrest the trend. The information gained from this study will go a long way in providing the much needed data to help highlight the lack of knowledge with regard to scaffold accidents and the types, frequency and causes of accidents affecting scaffold workers. Taswell and Wingfield-Digby (2008, p. 1) argue that it is imperative to know the statistics of occupational accidents and ill health cases in order to devise prevention strategies. According to HSE (2015, p.2) there were 35 workers fatally injured in the construction sector during 2014/2015 in Great Britain. Similarly, PWC (2013, p. 26) reported that they were 171 fatalities and 755 injuries in the South African construction industry from 2007-2010.

Alternatively, International Labour Organisation (as cited by Okori et al. 2014, p. 951) reported that there are 60000 fatal accidents occurring on construction sites annually. According to Bureau of Labor Statistics (as cited by Jackson et al .2009, p. 481) further identify construction sector as one of the industries that have the highest rate of fatal occupational injuries in the United States of America. Similarly, Umeokafor et al (2014, p. 882) confirm that the construction industry remains one of the inherently dangerous industries. Similarly, Farooqui et al (2008, p. 1) contend that construction industry account for more fatal accidents than any other industry. The scaffold work is project or need based activity and is influenced by various contractors making requests for either the erection, modification or dismantling of scaffold work in order for them to do the work. Scaffold work is inherently a hazardous activity and even more hazardous when done on construction sites.

According to National Access and Scaffolding Confederation 2013 Safety Report (2013, p. 06) scaffolding industry suffered two fatalities in the 2003/2004 reporting period. Given the high number of workers that are employed by scaffold contractors, health and safety becomes more important. NASC 2013 Safety Report (2013, p. 07) indicates that there were fifty three fatalities in the construction industry and four fatalities which were suffered by the scaffolding contractors in 2008/2009 reporting period in the United Kingdom. Similarly, NASC (2014, p. 6) indicates that there were three fatalities in 2006/2007 reporting period and two fatalities in 2007/2008 reporting period affecting scaffolding contractors in the construction industry.

The erection, modification and dismantling of scaffold on construction differs from other industries in the sense that construction work keeps changing and requires specialist skill and adequate work experience from the scaffold workers. Taswell and Wingfield-Digby (2008, p. 2) indicate that there is lack of statistics on occupational injuries among many countries around the world. Taswell and Wingfield-Digby further state that the available statistics are often incomplete and limited. It is against this background that my research problem is formulated.

1.2 RESEARCH PROBLEM STATEMENT

The lack of knowledge and frequency of accidents that affect scaffold workers is sub-optimal in South African construction.

1.3 SUB-PROBLEMS

From the literature review and the research problem the following sub-problems are identified to help address the main problem:

1.3.1 Scaffold workers have accidents and incidents frequently

1.3.2 Scaffold workers lack skills and knowledge

1.3.3 Management is not committed to health and safety management systems

1.3.4 There is shortfall of experience among scaffold workers

1.4 HYPOTHESES

The following hypotheses were identified and are presented as:

1.3.1 Scaffold workers do not have accidents and incidents frequently

1.3.2 Scaffold workers have construction incidents because of lack of skills and knowledge

1.3.3 Management is fully committed to health and safety management systems

1.3.4 Scaffold workers are inexperienced due to a lack of training

1.5 DELIMITATIONS OF THE STUDY

The following delimitations are applicable to the research:

- The research focuses on the scaffold contractors in the South African construction sector.
- The research is limited to the study of construction accidents affecting scaffold workers.
- The research does not analyse scaffold contractors accidents as that data is not readily available.
- Respondents are limited to only scaffold labourers, fixers/erectors, charge hands, inspectors, site management, site supervisors, construction health and safety practitioners and department of labour health and safety inspectors.
- The empirical study is limited to South Africa, but literature is also obtained from international sources.
- The research literature only covers 2006 to 2016 period.
- The research does not focus on accidents affecting scaffold users.

1.6 DEFINITIONS OF KEY TERMS

For the purpose of this research and for facilitation of key terms and concepts the following clarifications are provided:

Accident: ''An event arising out of and in the course of an employee's employment and resulting in a personal injury, illness or the death of the employees: OHS Act No 85 of 1993 (Lexis Nexis. 2015, p. 12).

Competent person: ''Any person who has in respect of the work or task to be performed the required knowledge, training and experience and where applicable, qualifications, specific to that work or task'': OHS Act No 85 of 1993 (Lexis Nexis. 2012, p. 13).

Contractors: ''Any person or legal entity entering into contract with the client for the execution of the works or part thereof'' (SACPCMP. 2013, p. 3).

Fall risk: ''Any potential exposure to falling either from, off or into'' OHS Act No 85 of 1993 (Lexis Nexis. 2015, p. 64).

Fatal injuries: "Any injuries that victim may die immediately or at some time after the accident''. (Taswell and Wingfield-Digby. 2008, p. 20).

Hazard: "A source of or exposure to danger'': OHS Act No 85 of 1993 (Lexis Nexis. 2015, p. 8).

Health: ''State of being free from illness or injury attributable to occupational causes'' OHS Act No 85 of 1993 (Lexis Nexis. 2015, p. 8).

Non-fatal Injuries: ''Injuries which lead to physical or emotional damages'' (Khdair et al. 2011, p. 85)

Risk: ''Probability that injury or damage will occur'': OHS Act No 85 of 1993 (Lexis Nexis. 2015, p. 9).

Safety: '' State of being free from any hazard'': OHS Act No 85 of 1993 (Lexis Nexis. 2015, p. 9).

Scaffold:'' is any temporary elevated platform and supporting structure used for supporting workmen or materials or both'': OHS Act No 85 of 1993 (Lexis Nexis .2015, p. 64).

Skill: '' is the ability of carrying out the tasks and duties of a given job" (DHET. 2013b, p. 6).

Training: "activity which deliberately attempts to improve a person's skill at a task" (Adesola et al. 2013, p. 109).

1.7 ABBREVIATIONS AND ACRONYMS

For the purpose of this research and for facilitation of acronyms and abbreviations the following clarifications are provided:

ANSI: American National Standards Institute

BSI: British Standards Institution

B TECH: Bachelor of Technology

CBE: Council for the Built Environment

CI: Construction Industry

CIDB: Construction Industry Development Board

COIDA: Compensation for Injuries and Diseases Act No 130 of 1993

DHET: Department of Higher Education and Training

DMR: Department of Mineral Resources

DOL: Department of Labour

FEMA: Federated Employers' Mutual Assurance Company Limited

GDP: Gross Domestic Product

H&S: Health and Safety

HSE: Health and Safety Executive

HSMS: Health and Safety Management Systems

ILO: International Labour Organisation

IWH: Institute for Work at Height

MHSA: Mining Health and Safety Act No 29 of 1996

MSN: Microsoft Service Network

N/A: Not Applicable

NASC: National Access and Scaffolding Confederation

NIHR: National Institute Health Research

NMU: Nelson Mandela University

NMMU: Nelson Mandela Metropolitan University

NOSA: National Occupational Safety Association

OHS: Occupational Health and Safety

OHSA: Occupational Health and Safety Act No 85 of 1993

OHSA: Occupational Health and Safety Administration

OHSA: Occupational Health and Safety Authority

OHSAS: Occupational Health and Safety Assessment Series

PPE. Personal Protective Equipment

PWC. PriceWaterhouseCoopers

SABS: South African Bureau of Standards

SACPCMP: South African Council for Project and Construction Management Professions

SANS: South African National Standards

SAQA: South African Qualifications Authority

STATS SA: Statistics South Africa

UK. United Kingdom

US: United States

USA: United States of America

1.8 ASSUMPTIONS

The following assumptions exist:

- It is assumed that the study of types, causes and frequency of construction accidents affecting scaffold workers would highlight the frequency of construction accidents affecting scaffold workers.
- It is assumed that the stakeholders respondents are well versed as to what scaffold accidents entail.
- Scaffold contractors participate in the South African construction industry
- Experience and training are needed for being a scaffold worker

1.9 IMPORTANCE OF STUDY

Scaffold contractors play an indispensable role to any industry and more particularly to the construction sector. The importance of the research comes from the need to develop an understanding and investigate the construction scaffold accidents affecting scaffold workers in the South African construction industry. Notwithstanding its importance the scaffold work remains a high risk activity.

Because of the highly unacceptable accidents statistics and causes of accidents as described in the literature review to follow.

- It is envisaged that the study will make a meaningful contribution to the body of knowledge available regarding the types and causes of accidents of scaffold workers.
- This will further shed some light on the common incidents experienced during the erection, modification and dismantling of scaffolding.
- By undertaking this research it is to identify and partly analyse the accidents of scaffold workers and provide useful data which can be used to provide necessary insights into the types and causes of accidents associated with scaffold work.
- This will lead to reduction in the number of H&S related compensation claims and possible court disputes.
- To use the information obtained to assist and guide the scaffold construction contractors to help improve their health and safety.
- When accidents are prevented or reduced this will contribute to a safe and secure working environment and eventually improve the image of the construction industry at large.

1.10 PRIMARY RESEARCH AIM

The research main aim is to highlight the types, frequency and causes of accident experienced by the scaffold workers on South African construction sites. The study also intends to provide insights that will be critical for future studies. Given the exploratory - descriptive nature of the study, one will carry out quantitative research in order to highlight the frequency of construction accidents affecting scaffold workers.

1.11 SECONDARY RESEARCH OBJECTIVE

It is envisaged that the study will make a meaningful contribution to the body of knowledge available regarding the frequency, types and causes of accidents of scaffold workers. To also provide recommendations on how to prevent or reduce accidents of scaffolding contractors on construction sites and stimulate future research studies. Given the findings of the literature review a non-experimental survey is conducted among scaffold contractors. Objectives being to determine:

- The level of knowledge and awareness of scaffold contractors with regard to the types and causes of accidents.
- Perceptions with regard to construction accidents affecting scaffold workers.
- The current state of scaffold workers training and experience
- The scaffold contractor's potential contribution to the construction accidents.
- The hope is if factors are well identified, described, and understood, appropriate measures could be taken to prevent construction accidents.

1.12 OUTLINE OF THE PROPOSED TREATISE

The treatise is presented as follows:

1.12.1 CHAPTER ONE

The chapter introduces the background of study, statement of the problem, sub problems and hypotheses. It outlines the aim, secondary objectives, assumptions, delimitation, and importance of the study, the abbreviations, definitions of the key concepts and the outline of the proposed treatise.

1.12.2 CHAPTER TWO

The chapter reviews the existing literature on construction accidents within South African and International context. The chapter further discusses the types and causes of accident, Construction health and safety statistics, training and experience, health and safety legislations, International Labour Organisation, South African Council for Project and Construction Management Professions, management commitment to health and safety management systems and scaffold work.

1.12.3 CHAPTER THREE

The chapter describes the research methodology, research paradigm, various research approaches and also discusses the procedure of collecting, analysing, interpreting and presenting data.

1.12.4 CHAPTER FOUR

The chapter presents the descriptive results, data analysis and interpretation regarding construction accidents affecting scaffold workers.

1.12.5 CHAPTER FIVE

The chapter presents the sub-problems and testing of hypotheses regarding construction accidents affecting scaffold workers.

1.12.6 CHAPTER SIX

The chapter contains conclusions and recommendations that could be used to prevent construction accidents affecting scaffold workers. The treatise framework is presented in Figure 1.1 below.

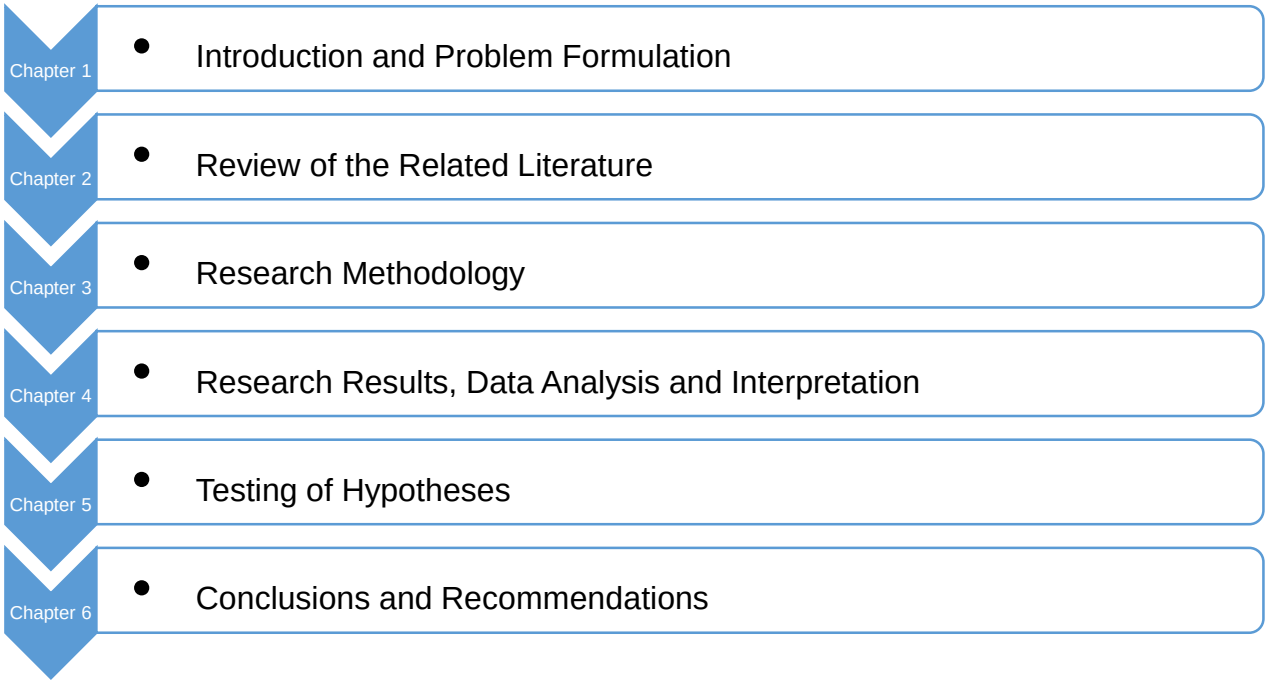


Figure 1.1 Structure of the treatise (Source, Author's view)

1.13 CHAPTER SUMMARY

This chapter presented an orientation to the problem under investigation and outlined the background and review of the literature. The role scaffold contractors play to the construction industry and the high accidents rate the construction industry experiences are presented. The chapter also discussed the aims, objectives, assumptions, delimitation, importance of the study and definitions of key terms and abbreviations. The chapter ended by giving an outline of the treatise. The next chapter discusses the review of the related literature used in this study with an aim to addressing main problem and sub-problems.

CHAPTER 2 THE REVIEW OF THE RELATED LITERATURE

2.1 INTRODUCTION

The chapter addresses the literature used in this study. Because of its ever changing activities the construction industry presents hazards to all workers regardless of the type of work they perform. The scaffold work exposes workers to many occupational accidents both fatal and non-fatal namely: falling from heights, being struck by falling objects, caught in, on, between and slips, scaffold collapse, trips and falls incidents. The literature review investigates various aspects of construction health and safety field relating to construction accidents that affect scaffold contractors. The literature starts by identifying the types of accidents, causes of accidents, construction health and safety statistics, health and safety legislations relative to the construction sector, training and experience, , International Labour Organisation, South African Council for Project and Construction Management Professions ,management commitment to health and safety management system and scaffold work.

2.2 TYPES/NATURE OF ACCIDENTS

Workers are the most important assets to all organisations and businesses. The significance of these assets should make them alone a resource which is high on the minds of the business leaders. This applies to all businesses including scaffolding contractors. Workers are essential human resources of the organisation and as such have to be protected (Gamage and Imbulana. 2013, p. 12; Smallwood. 2012, p. 55). Therefore, preventing workplace fatal and non-fatal injuries is not only important for organisation‘s health and safety performance, but it is critical for the sustainability of the organisation and global competitiveness of the country. Typical construction site accidents include crane overturn, mobile plant tipping over, construction vehicle collision, worker falling from heights, worker being struck by falling object, worker being caught by/between materials/equipment, machineries, , worker getting burnt, scaffold collapse, slip, trip and fall, falling into excavations, crashed by machinery/equipment, hit by construction vehicle and mobile plant, use of stepladders and electrocution.

Similarly, Farooqui et al (2008, p. 2) highlight few accidents which occur normally on construction sites such as equipment, machinery accidents, falls, strike from or against foreign objects, overexertion, fires, explosions, electrocutions and exposure to harmful substances. Grant and Hinze (2013, p. 14) reported that the use of stepladders contribute considerably to fatalities occurring in the construction industry. HSE (2010, p. 2) reports on the various tower crane incidents such as tower crane collapsing or colliding with another mobile plant and injuring the operator and workers around. It is at this point, the researcher thinks it is only appropriate that various definitions of accidents from various authors are discussed. According to International Labour Organisation (ILO) occupational accident is defined as ‘’ an occurrence arising out of, or in the course of work which results in a fatal or non –fatal injury’’ (ILO. 2015, P. iv).

Alternatively, Lexis Nexis (2014, p. 6) defines accident as “an event that results in unintended harm or damage’’. Similarly, according to SANS OHSAS 18001 (2011, p. 3) Accident is defined as any

incident which has resulted in injury, ill health or fatality. Meanwhile, NOSA (2016, p. 106) describes an accident as'' undesired event giving rise to death, injury, damage or any other form of loss". Therefore, it can be inferred that an accident causes some form of safety, health or environmental harm. Similarly, NOSA (2012, p. 47) refers to four consequences of incidents such as injuries, illness, business interruption and damage to the environment. However, for the purpose of this study accident is defined as an event arising out of or in the course of work which results in fatal or non-fatal injury or injuries. Ghosh and Bhattacharjee (2013, p. 6) noted that the construction industry account for the most severe and fatal occupational incidents and injuries. alternatively, FEMA (as cited in CIDB-Construction Health and Safety in South Africa –Status and Recommendation.2009, p. 4) identified caught in, on, between, struck by and falls on to different levels as the major causes of fatalities in the construction sector.

Similarly, Occupational Health and Safety Authority (OHSA) (as cited by Kumar & Bansal. 2013, p .34) reported that about 33% of fatalities in the construction sector were caused by falls, 22% were struck by incidents and 18% were caught in/between incidents. Falls accidents occurring while scaffold workers ascend / descend great heights and when moving from point A to point B while at elevated positions. Such falls from heights can lead to fractures, permanent disabilities and fatalities. HSE (2015, p. 4) also reported that 20 of 40 fatal fall injuries occurred in the construction sector in the Great Britain. Occupational Safety and Health Branch Labour Department (2014, p. 2) reports that while a scaffolder was climbing to another place of work, fell and suffered fatal injuries.

Similarly, while a scaffold worker was dismantling a scaffold, he fell to his death (Occupational Safety and Health Branch Labour Department. 2014, p. 4). Occupational Safety and Health Branch Labour Department (2014, p. 8) further reports that an untrained scaffold worker was erecting a scaffold when a scaffold overturned and he fell to his death. Falling injuries and problems among scaffold contractors are relevant because of the types of work activities involved. According to ILO (as cited by Benjamin. 2008, p. 3) an estimate of 2 million occupational fatalities occur every year in the world. It is believed that construction industry is hazardous and risky compared to other industries (Choi .2012, p. 151; Farouqui, et al. 2015, p. 2). Given the fact that scaffold workers have to spend most of the work day at elevated positions while performing their duties. The next section presents the causes of accidents as they relate to the construction industry.

2.3 CAUSES AND FREQUENCY OF ACCIDENTS

Records show that they were 97 fatal injury cases and 21 fatal injury cases out of 217 fatal injuries to workers which were caused by fall from heights and being struck by objects in the last five years 2010-2015 in the UK (HSE. 2015, p. 12). The Construction Chart Book (2013, p. 44) reported that falls from scaffold, staging and falls to lower level contributed about 14.6% and 6.1% to the causes of fatalities from falls in construction sector from 2008-2010 respectively.

According to Safe Work Australia (2013, p. 4) the construction industry accounted for 37% of falls related fatalities from 2008-2011. Safe Work Australia (2014, p. 10) further stated that they 24, 27 and 25 falls from working at height incidents in 2009-2010, 2010-2011 and 2011-2012 respectively. Similarly, in 2009-2010, 2010-2011 and 2011-2012 they were 18, 27 and 30 being hit by falling

objects incidents. Latief et al (2011, p. 82) Found that in 2010, 80 accidents were due to falling from heights and 641 were attributable to struck by incidents on the construction sites in Indonesia. Occupational Safety and Health Branch Labour Department (2014, p. 22) reports that 13 incidents were due to falls from scaffold while the workers were either erecting, dismantling, ascending or using the scaffold as safe working platform. The Construction industry (CI) employs more contract workers than permanent workers, this could be because the construction industry is project based. Benjamin (2008, p. 8) reports that contract workers are more likely to be involved in occupational accidents than permanent workers. Research done by Kadira et al. (2014, P. 69) found negligence as the major cause of accidents on Nigerian construction sites in Abuja.

The causes of construction accidents affecting scaffold workers depend on the number of factors namely: unsafe acts, unsafe conditions, job factors, personal factors and negligence. Unsafe acts and personal factors relate to the worker while unsafe conditions and job factors are attributed to the employer. Knowing the causes of accidents can help in preventing the workplace accidents (Zakaria et al. 2012, p. 76). Negligence can affect both the worker and employer. The next sub-sections provide a detailed discussion on the causes of accidents such as unsafe acts and conditions, personal and job factors.

2.3.1 UNSAFE ACTS

Unsafe acts are those acts which relate to the worker and they are easily detected and corrected (NOSA, 2012. p. 44). Unsafe acts such as operating equipment or machinery without authority, failure to wear personal protective equipment, failure to warn or to secure, and use of faulty equipment, placing materials improperly and taking short cuts (Kirsten. 2012. p. 93). Similarly, (NOSA, 2012. p. 44) identifies the following unsafe acts: operating at unsafe speed, taking wrong position, incorrect lifting, use of defective tools and working under the influence of drugs/alcohol.

Subramani and Lordsonmillar (2014. p. 117) contend that workplace accidents can be prevented by identifying and controlling unsafe acts. Occupational Safety and Health Branch Labour Department (2014, p. 24) states that the failure to use personal fall protection equipment by scaffolders and cleaners was the third highest cause of the main causes of accidents. Similarly, the results showed that seldom or not wearing personal protective equipment (PPE) was the main unsafe act committed by the construction workers (Hadikusumo and Aksorn. 2007, p. 22). Alternatively, Subramani and Lordsonmillar (2014, p. 117) argue that the unsafe acts remain the main cause of workplace accidents.

2.3.2 UNSAFE CONDITIONS

Hossenian and Torghabeh (2012, p. 59) refer to unsafe condition as workplace and its environment which do not conform to health and safety standard. Similarly, NOSA (2012, p. 44) refers to unsafe conditions as those that occur before the job and personal factors. Employer is responsible for unsafe conditions and those unsafe conditions are faulty equipment and tools, inadequate personal

protective equipment, bad lighting and ventilation, inadequate warning systems, exposure to hazardous work conditions (Kirsten, 2012. p. 93).

Similarly, (NOSA. 2012, p. 44) identifies the following unsafe conditions: poor housekeeping, limited work space, defective tools and equipment, bad lighting. Uneven surfaces, and inadequate ventilation.

2.3.3 JOB FACTORS

Job factors are those that relate to the job itself and are underlying, basic causes which allow the unsafe acts and conditions to exist (NOSA. 2016, p. 44). These usually precede the unsafe acts and conditions. Examples of job factors are inadequate leadership or supervision, inadequate engineering, inadequate purchasing, inadequate work standards and Wear and tear (NOSA. 2012, p. 38). Alternatively, HSE (2009, p. 15) describes job factors as the key factors to either the control of risks or causes of accidents in the workplace. HSE (2009, p. 15) further states that failure to identifying job, personal and organisational factors may lead to human error and accidents. Accidents records clearly show that the attitude of worker to working safe can contribute to the reduction of workplace accidents.

2.3.4 PERSONAL FACTORS

Personal factors are those that relate to the worker and are also underlying, basic causes which allow the unsafe acts and conditions to exist (NOSA. 2016, p. 44). Personal factors are all factors related to worker and other workers. These usually precede the unsafe acts and conditions such as, physical and mental stressors, lack of experience, lack of knowledge, and lack of skill and Improper motivation (NOSA. 2012, p. 37). One can conclude that knowing these personal factors can to some extent help in preventing workplace accidents and also designing training programme appropriate for the workers.

According to CIDB Report (2009, p. 22) Majority of the construction workers, site supervisors and managers do not possess the right health and safety education, training and experience. As a result of their inexperience and lack of training they become exposed to workplace accidents.

In summary, Construction accidents can be caused by one or combination of unsafe acts and unsafe conditions and job factors and personal factors. Section 8 of the Occupational Health and Safety (OHS) Act of No 85 of 1993 places an obligation on the employer to provide and maintain safe systems of work. While Section 14 of the OHS Act No 85 of 1993 requires the employee to cooperate, obey, report and look after their safety and that of those around them. According to Charehzehi and Ahankoob (2012, p. 304) working at height, worker negligence, using unskilled workers, using machinery or equipment without permission, poor supervision, lack of inspection, taking unsafe position and failure to using safety personal equipment can cause workplace accidents.

According to Heinrich (as cited by Hosseinian and Torghabeh. 2012, p. 54) report that 88 percent of accident are due to unsafe acts of workers, 10 percent due to unsafe conditions and 2 percent are accidents due to acts of God. Industrial accidents can be attributed to unsafe acts and unsafe conditions (Javaid et al. 2015, p. 111). It is noted from previous research that unsafe acts, unsafe conditions and worker negligence are not the only causes of workplace accidents (Khdair et al, 2011, p. 85). A review of construction health and safety statistics focusing on South African and international perspective is presented in the following section as background to the problem statement.

2.4 CONSTRUCTION HEALTH AND SAFETY STATISTICS

It is well documented that the reduction of workplace accidents and injuries are becoming a public safety concern, both in South Africa and around the world. 8.993 people died at construction workplaces in the United States which accounted for the highest of number of fatalities in comparison with other industries during 2003-2011 reported by the National Safety Council (as cited by Mahmoudi et al .2013, p. 125). The construction industry has the third number of fatalities per 100 000 workers and ninth highest number of permanent disabilities per 100 100 workers as per health and safety statistics: department of labour accident fund (as cited by CIDB. 2009, p.5). HSE (2015, p. 2) reported that there were 35 workers fatally injured in the construction sector during 2014/15 reporting period in the UK.

Similarly, Safe Work Australia (2014, p. 9) reported that they were 42 fatalities in 2011 – 2012 reporting period. British Safety Council (2009, p. 18) reveals that in general, workplace accidents statistics in South African and other developing countries are higher than those in developed countries such as UK, USA and Poland .CIDB (2009, p. 1) reported that construction sector remain to have poor health and safety record in the country and globally as well. In period between January – June 2014, construction sector accounted 57% of all workplace fatal injuries in Singapore (WSH Institute. 2014, p. 11). Similarly, According to the Safety & Rights (2015, p. 41) between January – December 2014, construction sector accounted for 40.6% of all workplace deaths in Bangladesh and there were 130 fatalities recorded by the construction.

2.4.1 SOUTH AFRICAN PERSPECTIVE ON WORKPLACE ACCIDENT STATISTICS

The following accident statistics exclude motor vehicle accidents. According to FEMA, which insure industry's workforce, the fatal accidents in 2007 recorded a total of 42 and in 2008 recorded 36 and over this period the industry experienced a decrease of 6 fatal accidents. In 2009 had 42 and in 2010 recorded 37 the industry experienced a decrease of 5 fatal accidents. In 2011 recorded 25 and in 2012, 34 over this period and the industry experienced an increase of 9 fatal accidents. In 2013 recorded 51 and in 2014 had 30 and the industry experienced a decrease of 21 fatal accidents. In 2015 recorded 38 and in 2016 had 24 and the industry experienced a decrease of 14 fatal accidents.

These illustrate a gloomy picture of the South Africa workplace accidents. The FEMA statistics report indicates that struck by incidents contribute a significantly to all fatal and non-fatal incidents.

The report shows that there is a lack of accurate workplace accidents statistics in South Africa (Jacobs. 2014, p. 473)

2.4.2 INTERNATIONAL PERSPECTIVE ON WORKPLACE ACCIDENT STATISTICS

SINGAPORE

According to Singapore Workplace Health and Safety Institute (2014, p. 7) workplace fatal injuries increased from 25 in Jan-Jun 2013 to 30 in Jan-Jun 2014 while major injuries increased from 273 to 279. It is noted that 57% of these fatal injuries were from construction sector (Singapore WHS Institute. 2014, p. 11). The Singapore construction has seen an increase in terms of workplace fatal injuries which increased from 9 in Jan-Jun 2012, 11 in Jan-Jun 2013 and to 17 in Jan-Jun 2014. The Singapore construction sector In Jan-Jun 2013 recorded 2 falls from heights incidents and increased to 6 in Jan-Jun 2014 (Singapore WHS Institute. 2014, p. 20). When you compare falls from heights incidents construction industry accounted for more incidents than any other industry in Singapore in the period under review.

HONG KONG

According to the Hong Kong Health and Safety Branch, Department of Labour (2014, p. 4) reported that the number of workplace fatalities in the construction sector was 24 in 2012 and 22 in 2013. The construction industry has seen a decrease of 2 workplace fatalities between 2012 and 2013. Similarly, the construction sector still accounts for the most workplace fatalities when compared with other industries (Health and Safety Branch, Department of Labour. 2014, p. 1).

UNITED STATES OF AMERICA

Bureau of Labor Statistics (2015, p. 5) reported that the construction fatalities were 828 in 2013 and 874 in 2014 which increased by 46 workplace fatalities. Similarly, construction sector accounted for the most workplace fatal injuries than any other industry (Bureau of Labor Statistics. 2010, p. 3). According to American Bureau of Labor Statistics (2013, p. 1) there were 180 occupational fatalities in between 2005-2013 reporting period. The report further points out that construction sector accounted for 21 percent of the whole statistics.

According to Washington State Department of Labor & Industry (2015, p. 7) construction industry is identified as the worst when it comes to work related fatalities by industry and further points out that from 2006-2008 the construction industry recorded the highest numbers of annual fatalities.

Falls incidents were the main cause of fatalities at workplace across all industries (Washington State Department of Labor & Industry. 2015, p. 8).

Washington State Department of Labor & Industry (2015, p. 12) point out that 9 fatalities were recorded in 2015 in the construction industry and of those 9 fatalities 6 were caused by falls. Similarly, according to the Alberta Government, the construction industry recorded 16 and 6 fatalities in 2014 and 2013 respectively (Safe Work Alberta. 2014, p. 2).

AUSTRALIA

Records show that from July 2003 – June 2011 about 232 workplace fatal injuries were caused by a fall from height (Safe Work Australia, 2013, p. 1). Similarly, Safe Work Australia (2013, p. 1) reports that they were 24 fatal injuries in 2003-2004 and 39 fatal injuries in 2006-2007 reporting periods. While in 2010-2011 about 29 fatal injuries were recorded because of a fall from height incidents. Alternatively, in 2003-2004 to 2010-2011 the construction sector recorded 86 fatal injuries due to a fall from height (Safe Work Australia, 2013, p. 5). Similarly, over the same period of 2003-2004 to 2010-2011 the construction skilled workers and labourers accounted for 47 and 24 fatal injuries respectively (Safe Work Australia, 2013. p. 9).

UNITED KINGDOM

According to HSE report statistics on fatal injuries in the workplace in Great Britain there were 43 fatalities in the construction industry between 2015 -2016 reporting period (HSE.2016, p. 4). Similarly, HSE (2015, p. 2) reveals that there were 35 fatal injuries in the construction sector in UK between 2014 – 2015 reporting period. Furthermore, HSE (2011, p. 2) reported that the construction industry experienced 41 worker fatalities in 2009 -2010 and 50 worker fatalities in 2010-2011 reporting period. The report further states that the construction industry recorded the highest number of worker fatalities comparing to other industries in the UK.

This report indicates that slip, trip and fall, struck by objects and fall from height are the main types of incidents contributing to the non-fatal injuries in the construction sector (HSE. 2015, p. 14). The report further highlights that fall from height and struck by object incidents contributed significantly to fatal injuries in the last five years and over 217 fatal injuries were recorded in 2010-2015 (HSE. 2015, p. 12).

Looking at the above workplace fatal and non-fatal statistics one can infer that construction industry is one of the most contributing industries to workplace fatal and non-fatal injuries worldwide. The next section presents arguments regarding the role of training and experience to a worker and organisational wellbeing.

2.5 TRAINING AND EXPERIENCE

2.5.1 JOB TRAINING AND EXPERIENCE

Adesola et al (2013, p. 109) defines training as ''activity which deliberately attempts to improve a person's skill at a task''. Similarly, Kirsten (2012, p. 99) states that training supplements the existing knowledge and sharpen the workers skills to perform better. Devi and Shaik (2012, p. 202) add that training improves the ability of the employee to perform effectively. Similarly, Shaheen et al (2013, p. 491) agree that an employee job development is achieved through training. According to previous studies training and development of employees is regarded as key factor in enhancing employee skill, knowledge, work experience and ability to perform the required task efficiently and professionally (Onyango & Wanyoike. 2014, p. 13).

Alternatively, Kirsten (2011, p. 55) states that having trained employees reduce company's risk exposure and contribute positively to the profitability of the company, this simply means that training benefits both the employee and organisation. Similarly, Weru et al (2013, p. 58) argue that maximisation of organisation profits can be achieved through proper training. Kirsten (2011, p. 56) regards training of employees as the most important component of the organisation business strategy. Similarly, Khan et al (2011, p. 10) suggest that trained employees are key component to the organisation's increased work performance and high productivity.

Similarly, Weru et al (2013, p. 58) are of the view that proper training influences productivity and reduction of workplace accidents. Similarly, NASC (2017, p. 3) considers training of scaffolding workers as an important tool to reducing occupational injuries and accidents in the scaffolding industry. Kirsten (2011, p. 2) argues that competence and performance can be enhanced through training. Similarly, Onyango and Wanyoike (2014, p. 13) state that training and development contribute to employee increased competence levels and job performance. It can be inferred that in order for employees to perform their various duties properly, training should be provided and opportunity created for them to gain the necessary experience.

Kadiri et al (2014, p. 69) identified labourers as the major contributor of accidents on Nigeria construction sites. Similarly, NASC (2014, p.3) states that new workers are more likely to suffer occupational injuries and accidents.This could well be because of lack of training or inexperience. Onyango and Wanyoike (2014, p. 13) argue that a lack of job knowledge and training lead to accidents. Alternatively, Onyango and Wanyoike (2014, p. 13) further argue that less supervision is required if the worker is properly trained on how to perform the job. Alternatively, Mbuvi et al (2015, p. 4) suggest that training of workers has a positive impact on the competence levels of the workforce.

The 2014 Construction Regulation 16 (1) of the Occupational Health and Safety Act No 85 of 1993 stipulates that all scaffolding workers need to be trained. It is noteworthy that this does not only increase the workers job competencies and H&S awareness, but also improves his/her prospects of promotion and ultimately bettering one's standard of living (Onyango and Wanyoike. 2014. p. 13).

According to section 6 of South African National Standards (SANS) 10085 of 2004, the scaffolding training for scaffold workers focuses on handling, stacking, erection, modification, dismantling, inspection, certification, supervision and maintenance of scaffolds. The training also includes the use of safety harness. The SANS 10085 Identifies three trades: Scaffolding fixer/erector needs to have scaffold training module 2 with at least six months practical work experience, scaffolding team leader needs scaffold training with two years and six months practical work experience, scaffolding inspector needs scaffold training as outlined by SANS 10085.

According to section 16 of SANS 10085: Scaffold labourer is only required to perform handling and stacking activities. He is not allowed to erect, modify or dismantle scaffold. Scaffold fixer/erector is allowed to erect, modify and dismantle scaffolds. Scaffold team leader is responsible for leading the scaffolding team, Scaffold Inspector is responsible for inspecting and certifying the scaffold. HSE (a) (2007, p. 3) Lists key factors in the process of training: needs analysis, training objectives, training content, and evaluation of training and follow up. Needs analysis: includes clearly defining the tasks involved, their order and degree of importance and details of the steps necessary to attain them. Training objectives: The needs analysis provides the information to establish the objectives of the training programme and the required competence. Training design: Includes the knowledge or skill that the trainee must acquire to be able to meet the training objectives. Training evaluation: A process of collecting information that will be used to determine the effectiveness of the training.

Similarly, HSE (2009, p. 33) describes the process to be followed to ensure the effectiveness of the training which is designed to help the individual to acquire the right knowledge, experience and develop necessary skills to fulfil the job specifications. Onyango and Wanyoike (2014, p. 13) provide two ways in which training can be delivered: on the job training and off the job training. On the job training can be delivered while the employee is doing the job and in the normal working environment either by the supervisor or team leader. On the contrary, off the job training is provided by the external service providers or subject matter experts, this training takes place outside the work environment. Both on the job training and off the job training are aimed at improving worker job performance and awareness. The next sub-section presents training and experience as they relate to health and safety.

2.5.2 HEALTH AND SAFETY TRAINING AND EXPERIENCE

If any employee is given a job without undergoing health and safety training, the employee is likely to get involved in accident every time the employee performs the work. The Occupational Health and Safety Act No 85 of 1993, section 8 (e) elaborates on how the employer must provide health and safety training to any employee at work. Similarly, Sub-regulation 9(3) of the 2014 Construction Regulations of the Occupational Health and Safety Act No 85 of 1993 stipulates that all employees must be informed of health and safety hazards attached to the task before working on site. One of the basic method of preventing occupational accidents is through health and safety training. Health and safety training can take place through various means such as, annual Health and safety induction training, morning toolbox talk at workface, pre-start risk assessment discussion, showing H&S videos, H&S campaigns, poster rotation and worker and supervisor daily interactions.

Many studies have found that most of the incidents are caused by unsafe acts Heinrich (as cited by Hosseinian and Torghabeh. 2012, p. 54) , so if workers are trained to perform work in safe manner, use the right tools for the work, the researcher is of the view that most incidents can be prevented. Occupational Risk (2010, p. 16) argues that effective health and safety training play vital role in the reduction of accidents. According to NASC (2014, p. 3) providing new workers with health and safety training, skills knowledge and supervisory support help in preventing occupational injuries and accidents. Health and safety training of all involved in the construction is critical in order to remain relevant to the changes presented by new legislations, work environments, equipment, work practices and activities.

Health and safety Training further helps construction worker to acquire new skill and method of performing the task safely. Records show since the implementation of working at heights training they have been 24% reduction in the fall injuries (Workplace Safety & Prevention Services.2013, p. 1). Similarly, NASC (2017, p. 5) reports that since the publication of working at height guidlines aimed at improving fall prevention and safety, the industry experienced a significant improvement in the reduction of accidents. H&S training for construction workers is not only a legal requirement but also helps increase worker awareness about health and safety matters. This further improves worker's appreciation of the inherent hazards and risks associated with their jobs.

Similarly, Charehzehi and Ahankoob (2012, p. 306) argue that providing H&S training helps workers to learn to identify possible unsafe acts and conditions. Similarly, Mbuvi et al (2015, p. 4) argue that having workers who have the right health and safety job training and experience may help the organisation in reducing the workplace accidents. According to Agbola (2012, p. 160) on the study of impact of health and safety management on employee safety at the Ghana ports and harbor authority, 23% of the respondents did not have health and safety training.

Similarly, CIDB report on Construction Health and Safety in South Africa –Status and Recommendation (2009, p. 22) reported that it was recently determined that 34% of top management and 18% of site supervisors had no health and safety training of any kind. The study also reveals that 33% of site workers had received no health and safety training at all. Section 14 of the OHS Act no 85 of 1993 requires the employer to provide training, instruction, supervision and information to employees. The next section provides an overview of the various legislations, international organisation and professional bodies relative to construction industry.

2.6 HEALTH AND SAFETY LEGISLATIONS RELATIVE TO CONSTRUCTION INDUSTRY

CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA ACT NO 108 OF 1996

In terms of the Constitution, everyone living in South Africa has the right to experience quality of life. Clause 24 of the Constitution Act lays a solid foundation for the provision of the Occupational Health and Safety Act No 85 of 1993 and Mine Health and Safety Act No 29 of 1996. Bill of Rights Clause 24 states that ''everyone has the right (a) to an environment that is not harmful to their

health or well-being''. In an effort to guarantee these rights the government has enacted specific legislations to provide direction, guidance and enforcement.

2.6.1 OCCUPATIONAL HEALTH AND SAFETY ACT NO 85 OF 1993

The occupational health and safety at construction site is about securing the health, wellbeing and safety of people at work. According to South African Occupational Health and Safety legislations, the Employer needs to ensure that these rights and duties by identifying hazards, assessing risks, introducing control measures and more importantly protecting the workers and others from accidents and ill health arising out of construction activities (Smallwood. 2012, p. 58). Employers are further required by legislation to prevent workplace accidents. In South Africa the health and safety of employees is governed by Occupational Health and Safety Act No 85 of 1993. This Act was enacted in 1993 and the primary function is to provide for the protection and prevention of work related injuries and illness.

The Act was passed by the national assembly and signed by the state president. The Act has over fifty sections and twenty one regulations. The Act applies to most industries and more particularly to the construction sector. The South African Construction Regulations (2014) 12(2) and 16(1) of the Occupational Health and Safety Act No 85 of 1993 and SANS 085 require that the scaffold work to be constantly supervised and performed by competent workers and who are appointed in writing. The department of labour (DOL) is the statutory body mandated and authorized by law to enforce occupational H&S legislations in the workplace except in the mining industry, where the industry is governed by the Mining Health and Safety Act no 29 of 1996 and under the direction of department of mineral resources (DMR).

The department of labour is under the Ministry of labour which is led by Mrs M Oliphant (Department of labour Minister). The DOL is also authorized to issue improvement, contravention and prohibition notices if it deems such activity, machine or workplace as posing threat to the health and safety of workers and the public at large. Local government authorities are empowered to issue improvement and prohibition notices (HSE. 2014, p. 13). The Act furthers identifies the pivotal role of health and safety representatives and health and safety committees at work.

The employer is required to appoint health and safety representative if the workplace has more than 50 workforce and needs to appoint a committee if there is more than two health and safety representatives at workplace. Sections 18 and 20 of the Occupational Health and Safety Act No 85 of 1993 stipulate the following functions for health and safety representatives and committees respectively:

Health and safety representatives functions:

- Attend health and safety committee meetings
- Inspect the workplace
- Identify and report potential hazards and risks relating to health and safety of the employees
- Investigate complaints from worker on health and safety

- Form part of the incident investigations
- Complete health and safety representative inspection reports

Health and safety committees functions:

- Review the previous minutes of the health and safety committee
- Make recommendations on health and safety
- Discuss and review incident investigation reports
- Discuss any potential hazards reported to health and safety committee
- Review occupational hygiene reports, and
- Discuss and review health and safety representative completed inspections

COMPENSATION FOR OCCUPATIONAL INJURIES AND DISEASES ACT NO 130 OF 1993

The Compensation for Occupational Injuries and Disease Act (COIDA) provides for compensation to workers who have suffered occupational injuries and diseases. The Act also promotes the prevention of occupational health and safety injuries and diseases. According to Clause 27 of the South African Constitution Act No 108 of 1996 states that everyone has the right to social security. It provides for worker compensation if the worker, and suffers serious injuries regardless of the negligence or fault on the part of the worker. This Act stipulates the procedures for any workers who suffers any injury and contracts a disease while working at the workplace.

The Act also ensures that the injured receives medical attention, compensation, if necessary training and rehabilitation in order to accommodate and prepare the injured worker to return to fitness .This Act facilitates the recording and analysis of occupational incidents as reported by FEMA and DOL. Section 80 of this Act requires the employer to be registered with compensation fund and be furnished with valid letter of good standing. This helps the employer to enjoy the full benefits of the insurance in the event a worker suffers an occupational injury or disease.

2.6.2 LABOUR RELATIONS ACT NO 66 OF 1995

This Act makes provisions for core labour rights, economic development, social justice, collective bargain, employee participation and effective labour disputes resolution and among others. Section 5 of this Act provides protection of employees by allowing their participation in lawful activities. It does cover some social aspects relating to the construction sites. Section 23 (1) of the 1996 Constitution of the Republic of South Africa read together with sections 185 and 186 (2) of the Labour Relations Act no 66 of 1995 provides that everyone has the right to fair labour practice.

2.6.3 BASIC CONDITIONS OF EMPLOYMENT ACT NO 55 OF 1998

The Act provides a platform for promoting economic development and social justice by fulfilling primary objects as stipulated by section 2 of chapter two of the Basic Condition of Employment No 55 of 1998 and the Act also regulates among others working hours and leave . Most of scaffold workers work more hours which can place them at risk of suffering from fatigue, lack of centration and taking short cuts to complete the work. Even though the Act requires an employee to work 40 hours a week, given the nature of construction these hours are exceeded in order to reach project completion targets.

2.6.4 MINE HEALTH AND SAFETY ACT NO 29 OF 1996

The Mine health and Safety Act No 29 of 1996 (MHSA) empowers the mine manager to ensure health and safety of the employees at the mine. At the mines, the owner of the mine is considered to be the employer of every worker working at mine regardless of whether they work for contractors unlike the OHS Act. When it comes to training the requirements are similar to that of OHS Act. The manager needs to provide information, training, enforcement and supervision to the workers under section 11.5 of the Mine Health and Safety Act No 29 of 1996. The Act also facilitates the nomination, election and appointment of health and safety representatives and health and safety committees.

2.6.5 INTERNATIONAL LABOUR ORGANISATION (ILO)

International Labour Organisation (ILO) is an agency of the United Nations and it was established in 1919 by the League of Nations, its headquarters are in Geneva, Switzerland. ILO main activities are to develop international treatises known as conventions for use by governments as the basis for their national laws. While developing conventions, the ILO focuses on workplace issues such as occupational health and safety, social protection, labour issues, training, research development and labour statistics. In summary the ILO strives to promote equitability, security and human dignity preservation. The ILO has been advocating for occupational health and safety issues since 1919(Taswell and Wingfield. 2008, p. 1).

South Africa is a founding member of the international labour organisation (ILO) and has been a member since 1919. ILO has about 18 conventions that address the occupational health and safety issues. Convention No. 155 of 1981 on Occupational Safety and Health which provides guidelines on the reporting and recording occupational accidents and diseases and identifying causes and preventive measures. According to article 7 of the Convention No. 62 of 1937 on Safety Provisions (building) Convention every scaffold needs to be periodically inspected by a competent person.

Convention No. 176 of 1993 on Safety and Health in Mines which stipulates the duties of the mine workers regarding their own health and safety and that of others. Convention No.152 of 1979 Occupational Safety and Health in Doc Work provides guidelines for workers who are working on the shore as well as on ships.

Article 11 of ILO Convention No. 167 of 1988 on Safety and Health in Construction reinforces the provisions of Section 14 of the South African OHS Act No 85 of 1993 and Section 22 of the South African Mine Health and Safety Act No 29 of 1996. Conventions have no legal force are there to offer legal basis (ILO, accessed 29 November 2016).

2.6.6 SOUTH AFRICAN COUNCIL FOR THE PROJECT AND CONSTRUCTION MANAGEMENT PROFESSIONS (SACPCMP)

South African Council for Project and Construction Management Professions (SACPCMP) was established by the government in 1994 and its mandate is to regulate construction management and construction project management to protect the public. SACPCMP is a statutory body established under section 24 of the project and construction management professions Act No 48 of 2000. It fulfils its statutory mandate by registering construction and project management professionals and maintaining national register of professionals and developing a code of conduct for registered professionals among other functions. The members of this council are appointed by the Minister of Public Works under section 3 of Act no 48 of 2000. This council is supported by others councils for professionals rendering service to the construction industry such as:

- South African Council for the Architectural Profession (SACAP)
- Engineering Council of South Africa (ECSA)
- South African Institute of Electrical Engineers (SAEE)
- Council for the Built Environment (CBE)
- South African council for the Quantity Surveying Profession (SACQSP)
- South African council for the Property Valuers Profession (SACPVP) and
- South African Council for the Landscape Architectural Profession (SACLAP)

All these councils serve to protect the different professions according to their mandates and ensure that the industry receives high quality of service and ensure the wellbeing of the workforce. The Council for the built environment (CEB) is the main council responsible for overseeing and coordinating the activities of all the six Built Environment Councils (SACPCMP. 2011, p. 13). The next section elaborates on the management commitment as it relates to health and safety management system.

2.7 MANAGEMENT COMMITMENT TO HEALTH AND SAFETY MANAGEMENT SYSTEM

At the heart of any management system rests top management commitment to a coordinated and comprehensive effort. Top Management commitment is an important part of any health and safety management system. It helps top management to provide leadership, influence and direction on how the organisation intends to manage health and safety issues. Meanwhile, Yoon et al (2013, p. 207) found that there was a reduction of accident rates among the organisations which implemented the occupational health and safety management system (OHSMS). Similarly, HSE (2012, p. 38) argue that commitment to health and safety management system lead to low incidents

rates. Management commitment to H&S management systems can influence company H&S performance and overall business performance. HSE (2009, p. 14) illustrates the role of top management to successful implementation of health and safety management system of the organisation. Jayashree et al (2015, p. 2942) argue that top management commitment to any management system is essential for promoting worker participation.

Agbola (2012, p. 157) argues that African countries find it hard to manage health and safety. Similarly, Kheni (2006, p. 275) claim that developing countries have a high rate of workplace accidents than developed countries. It can be inferred that most developed countries use standard health and safety management systems to manage health and safety than in developing countries. The effectiveness of the health and safety management system depends on the level of top management commitment. Commitment of top management is required simply because of the authority and influence management have on the functioning of the organisation. CHE Hassan et al (2007, p. 272) suggested that more health and safety measures must be implemented to improve the current status of construction industry.

Supervisors are the key individuals in any health and safety programme because they are in constant contact with employees. Health and safety management system such as any other management system helps to bring structure and systematic method of managing occupational health and safety within the business. These management systems contribute enormously to the business performance. Many organisations in the country and even abroad have adopted the occupational health and safety management systems to identify, assess and control hazards and risks and to prevent workplace accidents.

Management commitment usually includes formulating organisational vision, leadership, and direction, and human resource, provision for training, supervision and prevention planning. In terms of section 7.1(a) and 8.2 (a) of the OHS Act No 85 of 1993 and MHS Act No 29 of 1996 which apply to the development of policies, procedures and employer 'duty of care to provide and maintain safe systems of work. Literature suggests that, having management who are committed to H&S management system contribute to the low rate of accidents. As a follow up to the above-mentioned debate three occupational health and safety management systems are presented.

2.7.1 OCCUPATIONAL HEALTH AND SAFETY ASSESSMENT SERIES 18001

Occupational Health and Safety Assessment Series (OSHAS 18001) is the specification standard for development, documentation, implementation, maintenance and improvement of occupational health and safety assessment system (British Standard Institution (BSI) .2007, p. 1). This standard is in line with other ISO Standards such as ISO 9001:2008 AND ISO 14001:2004. The OHSAS 18001 and 18002 standard are British based system not an ISO Standard. By introducing occupational health and safety management systems shows that an organisation is committed to preventing occupational accidents.

Summary of the major elements of Occupational health and safety assessment system (OHSAS):

- 4.1 General Requirements
- 4.2 OHS Policy
- 4.3 Planning
- 4.4 Implementation and Operation
- 4.5 Checking and
- 4.6 Management Review

2.7.2 NOSA FIVE STAR INTEGRATED HEALTH, SAFETY AND ENVIRONMENTAL MANAGEMENT SYSTEMS

National Occupational Safety Association (NOSA) (2012, p. 137) provides an overview of major elements of the NOSA Integrated health, safety and environmental management systems:

- Premises and Housekeeping
- Mechanical, Electrical and Personal Safeguarding
- Management of Fire and Other Emergency Risks
- SHE Incident Recording and Investigation and
- Organisational Management

2.7.3 ANSI Z10 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) FOR OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEMS

Summary of the major elements of ANSI Z10:

- Management Leadership and Employee Participation
- Planning
- Implementation of the OS&H Management System
- Evaluation and Corrective Action and
- Management Review

In summary, the above occupational health and safety management systems identify top management commitment to occupational health and safety as the most vital component to the successful implementation of the system. Ligade and Thalange (2013, p. 397) point out that top management commitment is key to successful implementation of occupational health and safety management system in any organisation and industry. (OHSAS 18001) OHS Policy element provides guidance on commitment of top management and similarly (NOSA System) organizational management element equally identifies commitment of top management and ANZI Z10 also addresses management commitment under management leadership and employee participation element.

All these occupational health and safety management systems are based on (PDCA) Plan, Do, Check and Act approach (Ligade and Thalange. 2013, p. 395). Kirsten (2012, p. 92) emphasizes the key role that health and safety policy plays in demonstrating management commitment to prevention of occupational accidents. Section 7.1 (a) of the OHS Act No 85 of 1993 and MHSA No 29 of 1996 section 8 require the employer to formulating a written policy regarding the protection of health and safety of the employees. The last section identifies the scaffold work, key players and the risk of working at heights.

2.8 SCAFFOLD WORK

It is common for scaffolding to be used by sheet metal workers, electrical, mechanical, structural, piping, civil, carpenter, painters, plasterers, cleaners, plumbers and many other disciplines. Scaffolding have been used on construction sites in South Africa and around the world. However accidents involving scaffold work still occur and some result in fatal injuries. From 1976 to 2016 the registered members of National Access and Scaffolding Confederation experienced over forty four (44) fatalities (NASC, p. 9). Scaffold workers are at risk of falling because they work on scaffold before ladders, guardrails and platforms are completely installed.

Although the provision of scaffolding by the scaffold workers play an important part in the construction, the hazards and risks associated with scaffolding erection, modification and dismantling lead to fatal construction accidents not only to those who build it but also to those who use the scaffold platforms. Safe Work Australian (2013, p. 17) indicate that over a period of July 2003 to June 2011 at least 19 fatal injuries were recorded and these were due to a fall from platform, 8 fatal injuries happened from a fixed scaffolding, 3 mobile scaffolds and 3 from suspended scaffolds.

According to 2014 Construction Regulations 16.2 of the Occupational Health and Safety Act No. 85 of 1993, only competent erectors, team leaders and inspectors should perform the scaffold work under the supervision of the appointed competent person. This underscores the fact that all the workers who are handling, erecting, modifying and dismantling scaffold should be experienced and trained and also need to be protected from falling hazards. Table 2.1 below illustrates fatal injuries experienced by the UK construction industry and its impact on the scaffolding contractors.

TABLE: 2.1 UK Construction Industry Fatality Statistics (adapted from NASC Safety Report (NASC. 2013, p.7)

	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
	Fatal Injuries	Fatal Injuries	Fatal Injuries	Fatal Injuries	Fatal Injuries	Fatal Injuries	Fatal Injuries	Fatal Injuries
Construction Industry General Statistics	71	69	60	79	72	53	42	50
Scaffolding Industry Fatalities Total	2	1	0	3	2	4	0	2

2.8.1 SCAFFOLD WORK PROCESS AND KEY PLAYERS

CLIENT/EMPLOYERS

Ensure that the scaffolding contractor is appointed and given a scope of work
Ensure that the human resource skills, equipment, machinery and financial means are allocated to the site
Ensure that job notification request is generated for every job done by the scaffold contractor
Ensure that the hand over certificate is issued once the scaffold has been erected
Ensure that only competent workers are appointed to erect, modify and dismantle scaffolds
Ensure that scaffolds are inspected and certified before the user can access the scaffold

SCAFFOLD CONSTRUCTION MANAGERS

Ensure that all work is performed by suitably trained and competent persons.
Ensure that all statutory appointments have been completed and all statutory requirements are met.
Arrange all the necessary components that will be required for the scaffolds and site run smoothly.
Ensure that discipline is enforced at the construction site at all times.
Ensure that the scaffold inspector has a training certificate which is in accordance with South African Qualifications Authority (SAQA)Unit Standard ID: 263205 (Module 5)
Ensure that the scaffold supervisor has a training certificate which is in accordance with SAQA Unit Standard ID: 263224 (Module 4)

Ensure that the scaffold team leader/charge hand has a training certificate which is in accordance with SAQA Unit Standard ID: 263245 (Module 3)
Ensure that the scaffold fixer/erector has a training certificate which is in accordance with SAQA Unit Standard ID: 263247 (Module 2)
Ensure that the scaffold general worker has a training certificate which is in accordance with SAQA Unit Standard ID: 261664 (Module 1)

SCAFFOLD CONSTRUCTION SUPERVISORS

Ensure that appropriate and complete work instructions are obtained from the relevant site personnel and are effectively communicated to subordinates.
Ensure that scaffold materials and erection teams are properly planned to speed up the work.
Instruct and guide employees relative to the safe use of tools, materials and equipment.
Provide toolbox talks to scaffold teams and conduct task risk assessments
Ensure that subordinates comply with the necessary quality, safety and client requirements.
Report any incidents or accidents, including any near misses to safety officer or immediate supervisor so that it can be investigated.
Ensure that team members wear and use the right personal proactive equipment for the task.

SCAFFOLD INSPECTORS

Inspect the floor/ground on which scaffold works are to be performed

Inspect and certify the scaffolds.

Always conduct inspection before modification and dismantling of scaffolds.

Conduct inspection after the scaffold has been erected

Complete a hand over certificate and issue it to the scaffold requestor (client).

Report any incidents or accidents, including any near misses to safety officer or immediate manager so that it can be investigated.

Wear and use the right personal proactive equipment for the task

SCAFFOLD TEAM LEADERS/CHARGE HANDS

Responsible for leading the scaffold team.

Arrange all the necessary components that will be required for the scaffolds.

Provide toolbox talks to scaffold team members and conduct task risk assessments

Erect, modify and dismantle scaffold as per quality standards, production and legal requirements

Incidents or accidents, including any near misses to safety officer or immediate supervisor so that it can be investigated.

Coach and mentor the scaffold team members

Wear and use the right personal proactive equipment for the task

SCAFFOLD FIXERS/ERECTORS

Always conduct visual inspection before erecting, modifying and erecting

Erect, dismantle and modify scaffolding as per SANS 10085 latest revision.

Arrange all necessary components which will be required for the scaffold.

Report any incidents or accidents, including any near misses to safety officer or immediate supervisor so that it can be investigated.

Ensure scaffold labourers do not erect, alter and dismantle scaffolds

Wear and use the right personal proactive equipment for the task

SCAFFOLD LABOURERS

Perform manual handling and stacking activities.

Maintain good stacking and storage of materials and general housekeeping at all times.

Report any incidents or accidents, including any near misses to safety officer or immediate supervisor so that it can be investigated. Wear and use the right personal proactive equipment for the task

Wear and use the right personal proactive equipment for the task

These key players come together to deliver the safe erection, modification and dismantling of scaffolding. As it is a fact that scaffold contractors are one of the few contractors which are the first to work on the construction site and also the last to leave the construction site. When the earthworks and civil contractors are working, they do need the scaffolding and also when the project owner tests the plant for its readiness, operability and efficiency, they do need scaffolding. This supports my argument that scaffold workers are exposed more to hazards and risks because of the work requirements.

WORKING AT HEIGHTS

Literature shows that falling from height has been considered as one of the main contributors to workers fatalities on construction. The risks and hazards associated with working at height are workers and objects falling. 2014 Construction Regulations 4.1 (b) of the Occupational Health and Safety Act No. 85 of 1993 requires that all construction sites where construction work will include working at height and where there is a risk of falling, the contractor needs to submit notification of construction work within seven days to the department of DOL before commencing with the construction work.

Construction Regulations 10.4 (b) of the Occupational health and safety Act no 85 of 1993, states that ''no person is required to work in a fall risk position, unless such work is performed safely as contemplated in sub regulation'' (2). The inherent design of scaffold work is that workers spend most of the time working at heights, which by being what it is, requires workers to use various engineering, administrative and personal protective equipment to perform the work. Safe Work Australian (2013, p. 4) points out that over 25% of all construction fatalities were due to a fall from height. According to Safe Work Australian (2013, p.7) over the period of 2008 -2011 workplace skilled workers and labourers were mostly affected by fatalities because of a fall from height accounting for 43 and 30 fatalities respectively.

Safety harnesses are safety device/personal protective equipment provided to safeguard a worker in the event of falling from heights. The use of safety harness helps worker to be able to work in a position where without the use of safety harness that activity would not be safely done. However, if safety harness has not been used properly and it increases the risk of falling among construction workers including scaffold workers. If the harness is not maintained and inspected regularly this can lead to it malfunctioning and resulting in someone getting injured. HSE (2007(b), p. 34) points out that pre-employment examination needs to be conducted for worker performing a ''safety critical job''.

This examination simply helps both the employer and employee to know exactly what factors may affect the employee capabilities to do the work safely. Similarly, Section 7 (8) of the 2014 Construction Regulations under the Occupational Health and Safety Act no 85 of 1993, requires that medical examination specific to employee construction work being conducted before any worker starts to work on construction site. A valid certificate should be issued by Occupational Health Practitioner registered with Health Professions Council of South Africa. Employers when identifying, assessing and controlling risks, need to take working time or hours into considerations. Those workers who have to work at height on construction sites have to undergo pre, periodic and exit medical examinations according to man job specifications or job requirements for each worker (Annexure 3 of 2014 Construction Regulations).

2.9 CHAPTER SUMMARY

The chapter provided a wide variety of the types, frequency and causes of accidents on the construction site. It further discussed the construction health and safety accidents statistics, health and safety legislations relative to the construction industry. The chapter also discussed the training and experience, scaffold work and management commitment to health and safety management system. The chapter ended with the key players in the management, supervision, inspection and building of scaffolding. The following chapter introduces the research paradigms, research methodology and research approaches used in this study with an aim of identifying the research method appropriate for this study.

CHAPTER 3 RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter addresses the methodology used in the empirical study. The research philosophy is discussed. It reviews the basic research approaches available, which includes quantitative, qualitative and mixed methods approach. The main research methodology focuses on a quantitative research approach using only quantitative research in order to solve the research problem. This is done in assessing the research problems, sub-problems and hypotheses to decide on the type of study, data required and how the data will be obtained, treated, analysed and presented (Scotland. 2012, p. 9).

There is wide range of international and South African research literature concerning the construction accidents however, there is little literature available regarding the types, causes and frequency of construction accidents that affect the scaffold workers. The justification of the chosen method is discussed. The validity and reliability concepts concerning the survey method and how they are dealt with are discussed.

3.2. RESEARCH PHILOSOPHY

Worldview or philosophical assumptions inform the research approach, methodology and the type of data collection method required (Antwi and Hamza. 2015, p. 217). According to Creswell (2009, p. 6) the worldview or paradigm is understood as "general orientation about the world and the nature of research that a researcher holds". Creswell (2009, p. 5) further argues that it is imperative for the researcher to know philosophical assumptions. Knowing philosophical assumptions influences the manner in which a research study is conducted. From the literature review two prominent philosophical assumptions are identified namely: ontology and epistemology. Ontology is a philosophical view about what is known, study of reality, Guba and Lincoln (as cited by Manjula and Karthikeyan. 2010, p. 99). Similarly, Bhattacherjee (2015, p. 18) refers to ontology as study of reality. Ontology focuses on both the objective reality that is external and subjective reality that is created in minds. The two notable ontological positions are positivism and subjectivism.

Alternatively, epistemology is about what can be known or how we come to know the reality (Scotland. 2012, p. 9). Similarly, Bhattacherjee (2015, p. 18) refers to epistemology as the objective or subjective study of the nature of knowledge. Weber (as cited by Manjula and Karthikeyan. 2010, p. 100) identifies positivism and interpretivism as two notable epistemological positions. Similarly, Antwi and Hamza (2015, p. 219) state that positivism and interpretivism are two epistemological positions. Objective epistemology assumes that a world exists that is external while subjective epistemology assumes that without observations and interpretations it is impossible to have access to the external world. However, the use of these paradigms depends largely on the researcher viewpoint. The next sub sections provide assumptions about both paradigms.

3.2.1 POSITIVIST PARADIGM

Positivists believe that the world is external and that the reality can be discovered by one scientific method which is not influenced by many realities (Antwi and Hamza. 2010, p. 219). They take a structured approach to conducting the research by specifying in advance what type of data required for the research. Positivists deliberately remain detached from the participants of the study in order to maintain consistency, neutrality and objectivity. Scotland (2012, p. 10) points out that positivists achieve objectivity and independence by creating the distance between the researcher and respondents. Similarly, Positivist believes that the world is external and objective and the researcher is independent of what is being studied (Soiferman. 2010, p. 14). Numbers and statistics are essential to positivist research which promotes a structured approach to discovering single and objective reality.

Positivist researcher is limited to data collection and interpretation through structured and objective approach. Positivist holds the view that researcher has to focus on facts, descriptions and explanations (Scotland.2012, p. 10). Positivism focuses on using scientific and natural science methods for collecting social knowledge. Positivists' argument is that quantitative researchers are required to test hypotheses (Manjula and Karthikeyan. 2010, p. 100). Objectivism view is connected to positivism perspective in the sense that it argues that reality exists outside the researcher and the only way to discover it is to investigate it by applying rigorous and scientific processes (Scotland. 2012, p. 10). The positivist adopts deductive approach by formulating and testing hypotheses (Soiferman. 2010, p. 8). Therefore, the positivist paradigm is chosen for this study.

3.2.2 INTERPRETIVIST PARADIGM

Interpretivists believe reality is multiple, relative and idealistic (Dieronitou. 2014, p. 7). The author further indicates that it depends on how the participants interpret reality. Scotland (2012, p. 110) argues that the knowledge obtained by interpretivists is socially constructed. Thanh, C and Thanh, T (2015, p. 25) suggest that Interpretivists follow a more personal and flexible approach in gathering the data for the research. They live among the participants in order to observe and learn how participants form meanings of the phenomenon (Thanh, C and Thanh, T. 2015, p. 24). Interpretivist researcher believes in creating new knowledge by allowing participants to develop it. Interpretivists attempt to understand and interpret the phenomenon through the meanings of participants (Thanh, C and Thanh, T. 2015, p. 24).

Interpretivist researcher concentrates mainly on meanings, reasons and subjective experiences of the participants, noting that human interests are the main drivers of creation of new knowledge (Creswell. 2009, p. 8). Interpretivists argue that historical and cultural views that allow people to interact are important to knowledge creation (Scotland. 2012, p. 11). Subjectivism is linked to interpretivism which believes that truth and meaning do not exist in some external world (Scotland. 2012, p. 11).

Creswell (2009, p. 8) state that Interpretivists argue that there is no objective reality or truth out to be discovered, however believes that the truth is socially constructed rather than discovered. Interpretivists claim that people perceive the same phenomenon differently (Scotland.2012, p. 12). Similarly, interpretivists rely on meanings, understanding and interpretations. Epistemologically, interpretivism is linked to constructivism and subjectivism (Scotland. 2012, p. 13). Interpretivists do not believe that one method can be used for both natural reality and social reality, each needs different method. Interpretivist believes that meanings are constructed and researcher becomes part of what is studied (Bhattacherjee. 2012, p. 106).

Subjectivist adopts inductive approach to construct theories from the data collected (Soiferman. 2010, p. 7). Interpretivists believe people make own choices and that those choices are not connected to laws of science. With interpretivism, results are personal and rich in nature and cannot be generalised. Antwi and Hamza (2015, p. 219) claim that Interpretivists allow participants to develop their own beliefs and opinions about the studied phenomena. Interpretivists are concerned with how the participants interpret the phenomena. For collecting data, interpretivists usually use interviews, observations and document reviews as data collecting instruments (Antwi and Hamza. 2015, p. 219).

3.3 RESEARCH METHODOLGY AND DESIGN

Research methodology is a systematic process used by the researcher to investigate the problem or question (Antwi and Hamza. 2015, p. 220). Research methodology refers to logic to which the researcher bases their choice of methods (Leedy and Ormrod. 2010, p. 12). Methodology is the set of skills used by the researcher to solve the research problem (Jonker and Pennink. 2010, p. 17).

3.3.1 RESEARCH APPROACHES

The three main approaches to research are quantitative, qualitative and mixed method (Monfared and Derakhshan .2015, p. 1114). Similarly, Creswell (2009, p. 3) identifies three types of research designs: qualitative, quantitative and mixed method. He further observes that qualitative research is based on words and meanings, quantitative research is based on numbers and measurements, and mixed method is based on both words, context and numbers, and measurements.

3.3.2 QUANTITATIVE RESEARCH APPROACH

Creswell (2009, p. 12) argues that quantitative research has its own research types. Quantitative research studies include: Descriptive/survey or non-experimental research study which is used to describe the current condition or tells what is, Causal-comparative research study is used to explore relationship among variables that cannot be actively manipulated or controlled by the researcher, Correctional research study is used to determine the extent to which two or more variables are

statistically related, Experimental research study is used to establish cause and effect relationship between variables.

The scientific approach used is based on positivist view which leads the research to adopt the quantitative research approach (Antwi and Hamza. 2015, p 216). Tewksbury (2009, p. 44) argues that quantitative researcher ''inquires about if and how a person knows something and how that knowledge can be translated into a numeric value.'' The benefit of using quantitative method is that researcher is able to get wide number of people participating in the research and to be able to access a large amounts of data easily and be in position to draw conclusions from the collected data. Dieronitou (2014, p. 6) suggests that quantitative approach uses a deductive and objective approach to find out whether hypothesis is supported or refuted.

Quantitative research method is mainly based on two research methods such as experimental and non-experimental (Creswell. 2010, p. 12). For this study, non-experimental research is chosen. In experimentation, intervention and manipulation of respondents are produced by the researcher and for non-experimental no manipulation and randomization of sample is used (Castellan. 2010, p. 4). The benefit of using quantitative technique is that it obtains data from a large number of people using one set of questions (Higgins. 2009, p. 31). Comparisons and tabulations of the data can be done in order to present the results and possibly generalize the findings.

The positivists argue that the researcher adopting qualitative paradigm becomes both the researcher and participant at same time which can possibly reduce the level of objectivity on the part of the researcher. Quantitative research helps the researcher not to impose their interpretations on the participants rather than allow them to express their knowledge about scaffold accidents in a process ensuring independence and objectivity (Manjula and Karthikeyan. 2010, p. 100). For this study, quantitative strategy of inquiry is chosen over qualitative and mixed method approaches based on the justification presented in the type of study (3.4). The strengths and limitations of quantitative research follow.

Choy (2014, p. 101) identifies the strengths of quantitative research:

- Ability to produce consistent, precise and reliable data
- Relatively easy to analyse
- Tabulations and comparisons of data
- Findings can be generalised to the study population if sample is representative of study population

Choy (2014, p. 101) identifies the limitations of quantitative research:

- Data may not be detailed enough to explain complex issues
- Difficulties in understanding the context of a phenomenon
- Related secondary data is sometimes not available

3.3.3 QUALITATIVE RESEARCH APPROACH

Creswell (2009, p. 13) Identifies the following qualitative research studies: Phenomenology research study which is used to understand what an experience or phenomena means to a sample of people, Grounded theory research study is used to develop a theory where none exists in the literature relative to the sample. Ethnography research study aims to describe and interpret cultural or social group of people to another culture or group and Case study research aims to develop an in depth analysis of a single case.

Bhattacherjee (2015, p. 35) suggests that qualitative research technique follows inductive and interpretivist approach. Qualitative researcher focuses on interpretative and narrative evaluation of information collected through in- depth interviews, observations and document reviews (Soiferman, 2010. p. 10). In qualitative research methods specific cases are studied which provide general conclusions (Devetak, 2010. p. 78). Qualitative researcher rely on meanings, themes, patterns, coding and trends in interpreting the data (Tewksbury, 2009. p .43). A qualitative research data is more detailed and provides a deeper understanding of what is happening (Tewksbury, 2009. p. 50).

Similarly, Tewksbury (2009, p. 50) contends that the benefit of using the qualitative method is that it provides rich and detailed information and a great platform to interact with the participants. While quantitative research takes a logical, objective and positivist approach to social science, on the contrary, qualitative approach relies on inductive, interpretivist and subjective view of the social science (Manjula and Karthikeyan. 2010, p. 100).

As it is a fact that this study does not intend to find out how the participants interpret the scaffold accidents, so using qualitative research method would not be the most suitable (Soiferman, 2010. p. 11). In qualitative study, the researcher assumes two roles of serving as the researcher and participant which can possibly reduce the level of objectivity and independence on the part of the researcher (Tewksburg. 2009, p. 48; Antwi and Hamza. 2015, p. 221). While with quantitative method these issues do not play part as the researcher only distributes the survey questionnaire and does not need to establish face to face interactions with the respondents. The strengths and limitations of the qualitative research follow.

Atieno (2009, p. 16) Identifies the strengths of qualitative research:

- Rich and diverse information
- Flexibity
- Context and creativity
- Ability to probe
- Multiple methods for collecting data
- Validity is high

Atieno (2009, p. 17) identifies the limitations of qualitative research:

- Data collection is usually time consuming
- somewhat difficult to analyse
- findings usually cannot be generalised to the study population
- resource intensive
- lack of numeric data and frequencies
- Reliability is low

3.3.3 MIXED RESEARCH APPROACH

This method is a combination of both quantitative and qualitative research (Johnson et al. 2007, p. 113). Caruth (2013, p. 113) argues that using mixed method one can be able to expand and corroborate the results and offer a complete and confirmatory findings. Choy (2014, p 102) states that both quantitative and qualitative methods of enquiry have advantages and disadvantages such as objectivity versus subjectivity. Quantitative and qualitative research provide a different way of tackling the research problem, quantitative researcher relies on testing the hypotheses while qualitative researcher relies on providing new theories to solve the research problems (Choy. 2014, p. 100).

Qualitative research aims to produce rich information based on face to face knowledge and experience of individuals in their natural settings. In the mixed research validity is improved through data triangulation or cross validation (Zohrabi. 2013, p. 254). Researcher following a mixed method can use questionnaire, observation and interview to collect data (Zohrabi. 2013, p. 254).

In mixed method both inductive and deductive approaches are adopted. Researcher involved in mixed method follows either objective or subjective perspective depending on the aspect of the study. Creswell (2009, p.15) argues that a researcher following a mixed method research may use both open ended questions and close ended questions in gathering the data.

3.4 JUSTIFICATION OF THE CHOSEN TYPE OF STUDY

Sekara and Bougie (2013, p. 95) describe a research design as masterplan used to answer the research problems, questions and hypotheses by collecting and analysing data. Higgins (2009, p. 35) advances that the research problem, questions or hypotheses should be the basis for choosing one methodology over another. A non-experimental research design is used and the study is an exploratory-descriptive design (NIHR. 2009, p. 5). Factors such as time, resources and the type of respondents make non-experimental research more suitable (NIHR, 2009. p. 5). Survey method is quick and low cost as compared to observations and experimental method. The descriptive research objectives of the study is realized by means of a cross sectional survey method aimed at collecting quantitative data (Maureen. 2011, p. 16; NIHR, 2009. p. 5).

The primary quantitative research is based on survey research method evaluated by means of structured questionnaire surveys. Survey research strategy is chosen because researchers can collect different information from a large number of people on various locations (Soiferman. 2010, p 9; Higgins, 2009, p.31). The research survey identifies the degree of the problem (types of construction accidents that affect scaffold workers). The true experimental design is not appropriate because the study does not intend to manipulate or control the variables (Sousa et la. 2007, p. 505). For this research, data were collected without introducing any intervention or treatment.

Qualitatively speaking, ontology reality is viewed as being subjective and is depended on how the participants view it. Quantitatively speaking, ontology reality is viewed as being objective and it is out there for the researcher to discover. The quantitative research is well placed to answer what, when and who questions as compared to qualitative research which is best suited to answer how and why questions. Similarly, Moffatt (2015, p. 55) suggests that the purpose of quantitative research is to explain and predict, while the purpose of qualitative research is to understand and interpret phenomenon.

In keeping with these concepts, it is argued that the present study is going to highlight the types, causes and frequency of construction accidents that affect scaffold workers. For this research, the researcher is following positivist ontology and objective epistemology. It is positivist because the research problem is an objective social reality. Since the aim of the study is not to gain deeper understanding of participants lives through own experiences, interpretations and understandings. The aim of using this survey method is to describe the present existing situation and to describe the causes of particular phenomena (Williams. 2007, p .66; Pandey, P and Pandey. M. 2013, p. 5).

The research followed a quantitative analysis of the research problem to highlight the types, causes and frequency of accidents affecting the South African scaffold workers in the construction sector. The quantitative approach enables the researcher to collect numeric data on perception, attitudes and knowledge of a wide range of respondents (Maureen. 2011, p. 16). The choice of using quantitative research for this study was informed by the work of (Williams. 2007, p. 66).

3.5 TRIANGULATION

The aim of triangulation is to increase the validity and reliability of the research results. Denzin (as cited in Yeasmin and Rahman. 2012, p. 157) identifies forms of triangulation:

3.5.1 DATA TRIANGULATION

Refers to when data is collected at different times or from different sources. Despite the fact that data were obtained from different workers since they are all scaffold contractors and the collection was conducted within the same time period of the research. Therefore, the data triangulation is not applicable.

3.5.2 METHODOLOGICAL TRIANGULATION

Refers to using more than one method to gather data. Data were collected through literature review and two different questionnaires. The research process adopts the methodological triangulation.

3.5.3 INVESTIGATOR TRIANGULATION

The evaluation of the data obtained was done by a single researcher, therefore this type of triangulation does not apply.

3.5.4 THEORY TRIANGULATION

Refers to when different theories are used to interpret a set of data. The use of more than one theoretical position in interpreting the data. This is not applicable.

3.6 DATA COLLECTION INSTRUMENTS

3.6.1 STRUCTURED QUESTIONNAIRES

The questionnaire as instrument is chosen because the respondents are widely dispersed. Zohrabi (2013, p. 254) argues that questionnaire can be used in any study to collect data. For the purpose of the study the researcher used a questionnaire based on the health and safety literature and research problem. Questionnaires used are designed by the researcher. The questionnaire instrument is preferred over in depth interviews, observations and documents review because of the nature and significance of the study. Observations, unstructured interviews and documents review do not provide the freedom and openness that anonymous questionnaire permits.

A separate questionnaire was used for site management, site supervisors, health and safety practitioners and DOL health and safety inspectors and workers had their own questionnaire to complete. The questionnaire for site management was sent to all participants by hand and email. The scaffold workers questionnaire was given by hand and email sent to all participants and researcher provided translation where necessary. The aim is to obtain the knowledge and experience of scaffold workers accidents on those who manage, supervise, inspect, erect, modify and dismantle scaffolding. Closed ended question uses possible answers or pre written response

categories and the respondents are asked to choose among them. ILO (2015, p. 10) argues that closed ended questions may be used to establish facts.

NIHR (2009, p. 20) points out that open ended question allows the respondents to answer in their own words and this type of question form provides rich information from participants. Combination of both is when the researcher uses both closed ended and open ended questions to get answers from the respondents. Using closed ended questions gives a standardized answers unlike using open ended questions where the answers would be different depending on how the participants interpret the questions (NIHR. 2009, p. 20).

Moffatt (2015, p. 54) identifies two questionnaire surveys: structured and unstructured surveys. Structured survey uses formal lists of questions asked of all respondents in the same way (Moffat. 2015, p. 55; Bhattacherjee. 2012, p. 74). Unstructured surveys it is when the researcher asks respondents and guides the interviewees according to their answers, with the opportunity to probe answers (Moffatt. 2015, p. 55; Bhattacherjee. 2012, p. 74). Therefore for this study closed ended questions and structured questionnaire surveys were used.

3.6.2 VALIDITY AND RELIABILITY

Comparing both scaffold site management and scaffold site worker questionnaires allowed descriptive survey data validation. Workers questionnaire findings validated the statistical data obtained from the analysis of data obtained from site management questionnaire and literature review. The validation and reliability of the research were ensured by using different data collection instruments such as questionnaires for scaffold site workers and scaffold site management and literature reviews. Additionally, the reliability of the research findings was improved by cross checking the results of the site scaffold management questionnaires against scaffold workers questionnaire results.

Drost (2011, p. 106); Kirsten (2012, p. 5) state that reliability is about whether the data collection methods and procedures can be repeated with the same results. To improve reliability the research questionnaires were designed in such way that same questions were asked in different ways. Higgins (2009, p. 34) argues that quantitative research tends to produce more reliable results than qualitative research. The data obtained were checked for errors and normality for example, illogical responses and spoilt responses were discarded.

The scaffold workers questionnaires were administered to respondents utilizing email and by hand, where necessary face to face method to ensure validity of their responses. The statistical determination of validity and reliability of questionnaire was performed. In order to test the validity of the instrument used for this study, a pilot study was conducted to five respondents for both site management and worker questionnaires. To improve the validity of the questionnaires, the researcher drafted the questionnaires and presented them to the research supervisor to scrutinize them and determine if they measure what they intend to measure.

I also forwarded a copy of the drafted questionnaires to the Department of Statistics at the Nelson Mandela University in order for a competent statistician to scrutinise and provide professional advice. Comments and suggestions received from the research supervisor and statistician were implemented in making changes. Corrections and changes were implemented and the final questionnaires were produced. With this, the researcher was able to know whether the questionnaires measure what they claim to measure (Kirsten. 2012, p. 5). The questionnaires were administered during the same time period to all respondents and this enhanced reliability of the questionnaires. The validity of the data is improved by simply using secondary data obtained from literature review and primary data obtained from site scaffold worker and site scaffold management questionnaires.

3.6.2.1 OTHER TYPES OF VALIDITY ARE

3.6.2.1.1 INTERNAL VALIDITY

Drost (2011, p. 115) states that internal validity is about whether the conclusion that include a causal relationship between two or more items does exist.

3.6.2.1.2 EXTERNAL VALIDITY

External validity is about whether the research findings can be generalized or transferable to other populations of interest (Drost. 2011, p. 120; Zohrabi. 2013, p. 259)

3.6.2.1.3 FACE VALIDITY

Is a simple form of face validity, where a researcher asks few people to check if the tool covers all areas (Drost. 2011, p. 116). This was ensured by conducting pilot study to see if the tool addresses the desired outcome.

3.6.2.1.4 CONTENT VALIDITY

Drost .2011, p. 118; Kirsten .2012, p. 32; Zohrabi. 2013, p.258) state that content validity is about whether other people view the tool to be measuring what is says it does: by asking only renowned experts in the field of study to give their expert opinion on the validity of the tool . The researcher supervisor and NMU Statistician were given the questionnaires to comment and the researcher made necessary changes and unclear questions reviewed.

3.6.2.1.5 CRITERION VALIDITY

Criterion validity is measured using correlation coefficient and when the correlation is high, the tool can be considered valid (Drost. 2011, p. 118). Criterion validity is about how well the results of measuring instrument correlate with another, measuring similar characteristics (Kirsten. 2012, p 32).

3.6.2.1.6 CONSTRUCT VALIDITY

Describes the extent to which measuring instrument measures a characteristic that cannot be quantitatively measured or observed but assumed to be present based on behavior patterns. Such as honesty, race and gender prejudice and xenophobia (Drost. 2011, p. 116).

3.6.3 QUESTIONNAIRE DESIGN

3.6.3.1 SCAFFOLD SITE MANAGEMENT QUESTIONNAIRE DESIGN

According to Singh and Masuku (2014, p. 6) the questionnaire design should be in line with the research problem and objectives. In other words, the questionnaire needs to speak to the research main problem, sub-problems, hypotheses and objectives. The section A of the questionnaire deals with respondent demographics: Job title, work experience, level of education, gender, age, race and province of the construction site. Respondents are asked to answer section A by ticking the appropriate box.

The section B provides an opportunity to the respondents to share their knowledge and experience regarding the construction accidents affecting scaffold workers and also used to test the hypotheses. The relevant health and safety literature, FEMA statistics and the researcher experience are used to formulate questions. Questionnaire is used for the main research and is sent via email and by hand aimed at collecting primary data for the research. The first part of section B questions require the respondents to express their level of agreement by ticking the appropriate box when answering the questions. All of section B questions are closed ended on a five point Likert scale for respondents to rate their level of agreement from “strongly agree to strongly disagree”, “very frequent to never”.

Zohrabi (2013, p. 254) argues that closed ended questions may be used when collecting quantitative data and open ended questions used to collect qualitative data. An instruction on completing the questions is stated on each theme in order to avoid unnecessary response errors. An extensive review of literature on frequency of construction accidents and some affecting scaffold workers are conducted to complement the scaffold site management questionnaire and scaffold worker questionnaire. The reliability of the research findings was improved by cross checking the results of the site scaffold management questionnaires against scaffold workers questionnaire results. The overall themes of questionnaire examine the frequency of scaffold accidents, knowledge of scaffold accidents, type of accidents, causes of accidents, scaffold activity, scaffold workers, experience and training and management commitment to health and safety management system.

3.6.3.2 SCAFFOLD WORKER QUESTIONNAIRE DESIGN

The section A of the questionnaire deals with respondent demographics: Job title, work experience, level of education, gender, age, race and province of the construction site. The respondent are asked to tick appropriate box when answering both section A and section B.

The section B provides an opportunity to the respondents to share their knowledge and experience regarding the construction accidents affecting scaffold workers and also used to test the relevant hypotheses. Relevant health and safety literature, FEMA statistics and the researcher experience are used to formulate questions. Questionnaire is used for the main research and is sent via email and by hand aimed at collecting primary data for the research. The researcher was available to facilitate the answering of questionnaire with any respondents (scaffold workers) in order to facilitate and translate the questions in local languages where necessary.

All the questions are closed ended and the respondents are required to express their level of agreement by ticking the appropriate box when answering the questions where ''Yes'' or ''No'' option is provided. An extensive review of literature on frequency of construction accidents and some affecting scaffold workers conducted to complement the scaffold site worker questionnaire and scaffold site management questionnaire.

The questionnaire sought the opinions of the respondents on the frequency of accident of five types of accidents identified from health and safety literature. The overall themes of questionnaire examine the knowledge of scaffold accidents, frequency of scaffold accidents, causes of accidents, scaffold activity, management commitment to health and safety, scaffold workers, experience and training and use of safety harness.

3.7 RESEARCH POPULATION

The study took place in South African construction sites and targeted respondents were scaffold site management, site supervisors, health and safety practitioners, inspectors, charge hands, erectors/fixers, labourers who were on active construction sites and department of labour health and safety inspectors who had scaffold contractors on construction projects across the country.

3.7.1 INTRODUCTION

The study followed quantitative approach and a non-experimental research design was used. A non-probability sampling was chosen as the most suitable sampling strategy. A sample size of 400 was recommended for this study by NMU Statistician. A total of three hundred and seventy four (374) questionnaires were returned, representing ninety three percent (93%) overall response rate. Three hundred and fifty one (351) of the returned questionnaires were deem usable representing eighty eight percent (88%) of the questionnaires used for this study. Section 4.2 of chapter four provides more information regarding the response rate.

3.7.2 SAMPLING

Sampling is a subset or representatives of the population to be studied (Singh and Masuku. 2014, p. 3). Singh and Masuku .2014, p. 6) further state that the right sample size should be obtained in order to ensure valid and generalised conclusions. Higgins (2009, p. 28) argues that researcher using non-probability sampling should use large samples in order to generalize the results from their sample to the population. Then a sample of 200 respondents for site workers questionnaire and 200 respondents for site management questionnaire was recommended by the NMU Statistician. The method applied for the selection of respondents is purposive sampling. The respondents were selected largely because of their likely experience, knowledge and understanding of construction accidents that affect scaffold workers and their positions and role in the management of health and safety on construction sites.

This technique is used because Etikan (2016, p. 3) has stated that in purposive sampling, respondents are chosen on the basis of their abilities and having access to the kind of information the researcher requires. Choy (2014, p 99) provides an argument that a quantitative researcher can either use probability or non-probability when sampling. Similarly, according to Etikan et al (2016, p. 3) non-probability sampling such as convenience sampling and purposive sampling may be used in quantitative studies.

3.7.3 RESPONDENTS OF THE STUDY

Research population of this study consisted of scaffold workers and site management, site supervision, health and safety practitioners (scaffold site management) and DOL inspectors. It is hoped to provide insights that can be used for a future in depth qualitative studies.

3.7.4 PILOT STUDY

In order to test the validity of the instrument used for this study, a pilot study was conducted to five respondents for both site management and worker questionnaires. The answers were not used for the study and were only for testing purposes. Necessary changes were made on the drafted questionnaires based on the comments made by the respondents. A total of ten working days was used for pre testing the questionnaires. Four questionnaires were delivered personally to the respondents and while the remaining one questionnaire was forwarded via email. All the respondents were asked to return the questionnaire within a week from the date of receipt.

3.8 DATA COLLECTION

In order to collect the research data various scaffold contractors working on construction sites across the country were asked to participate in the study. Questionnaires were used for the main research and were sent via email and by hand aimed at collecting primary data of the research from

respondents. Moffatt (2015, p. 54) states that any measuring instrument can be used for the data collection purposes depending on the type of research. Scaffold site management questionnaire was hand delivered and sent by email, as presented in the form of Annexure 1, together with covering letter given to respondents. Respondents were asked to complete the attached questionnaire and return it via email or by hand.

Scaffold site worker questionnaire was hand delivered and sent by email. The researcher facilitated the completion of questionnaire as presented in the form of Annexure 2, with few scaffold workers in order to facilitate and translate the questions in local languages. Questionnaires are presented in plain and simple English so as to ensure understanding by non-English first language speakers and also to avoid incorrect completion of questionnaires. The data used in this research are primary and secondary data and a brief description is given below.

3.8.1 PRIMARY DATA

Primary data are data which are collected for the first time by the researcher (Smith and Albaum. 2012, p. 29). The researcher obtained primary data from the seven groups of respondents: scaffold labourers, scaffold fixers/erectors, scaffold charge hands/team leaders, scaffold inspectors, site supervision, site management, health and safety practitioners. The body of data collected by questionnaires formed part of the primary data and also helped to test the hypotheses. Data to be used in the study were acquired through two questionnaires for site scaffold management (site supervisors, site management, health and safety practitioners and DOL health and safety inspectors and site scaffold workers (scaffold labourer, scaffold fixer/erector, scaffold charge hand, scaffold inspector).

3.8.2 SECONDARY DATA

Secondary data are those which have already been collected and analysed by other researchers or experts (Smith and Albaum. 2012, p. 29). The secondary data were selected based on its relevance and significance to the research topic. Secondary data used in this study are obtained from various domestic and international publications including, amongst others articles from reputable construction, health and safety journals and books, proceedings of conferences, magazines, government publications and the internet providing the most recent information.

The search engines of Google, Microsoft Service Network (MSN) and the Electronic Journal of H&S, such as Science Direct, Emerald Insight, Nelson Mandela Metropolitan University (NMMU) Library Services, Construction, Business and Research Methodology is used to locate pertinent literature on the internet. However, I need to mention that most of the documents found on the Internet do not contain page numbers and this poses a concern for researcher in compiling an appropriate reference list.

3.9 DATA INTERPRETATION, ANALYSIS AND PRESENTATION

The research problems, sub- problems, objectives and hypotheses are linked with data collection, interpretation and analysis of the results. The data collected were quantified and analysed by examining the frequency of occurrences and significance of the problem. The responses of the questionnaire surveys were subjected to descriptive and quantitative analysis using simple pie chart, bar chart, tables and percentages (Soiferman. 2010, p. 6). The researcher conducted analysis of the findings by focusing on the trends, comparisons and drawing conclusions from the results. Appropriate tables and graphs were used to illustrate the diverse aspects of the data collected. The following section focuses on the data required, location of data, means of obtaining data, interpretation of data and the presentation of the data (Scotland. 2012, p. 9).

3.9.1 DESCRIPTION OF TREATMENT OF THE DATA FOR SUB-PROBLEMS

3.9.1.1 Data relative to the first sub-problem is to determine respondents' perceptions regarding whether scaffold workers have accidents and incidents frequently. Table 3.1 below.

TABLE: 3.1 The Treatment of the Data for Sub-problem One (Source, Author's view)

Data required	The location of data	Means of obtaining data	The interpretation of the data	The presentation of the data
Responses of the site scaffold workers, scaffold management, supervisors, and health and safety practitioners regarding knowledge of scaffold construction accidents. Responses of the site scaffold management, supervisors and health and safety practitioners regarding Frequency of accidents. Responses of the site scaffold workers regarding scaffold workers accidents rate	Data were obtained from scaffold workers, scaffold site management, supervisors and health and safety practitioners. Construction sites where scaffold contractors operate.	Data were obtained by distributing two questionnaires to the site scaffold workers and scaffold management, supervisors, and health and safety practitioners. Literature review	Percentage of total respondents that perceive scaffold workers as having accidents and incidents frequently.	Tables and texts

3.9.1.2 Data relative to the second sub-problem is to determine respondents' perceptions regarding whether scaffold workers lack skills and knowledge. Table 3.2 below.

TABLE: 3.2 The Treatment of the Data for Sub-problem Two (Source, Author's view)

Data required	The location of data	Means of obtaining data	The interpretation of the data	The presentation of the data
Responses of the site scaffold workers, scaffold management, supervisors and health and safety practitioners regarding experience and training of scaffold workers. Responses of the site scaffold workers regarding the use of safety harness.	Data were obtained from scaffold workers, scaffold site management, supervisors and health and safety practitioners. Construction sites where scaffold contractors operate.	Data were obtained by distributing two questionnaires to the site scaffold workers and scaffold management, supervisors and health and safety practitioners	Percentage of total respondents that perceive scaffold workers as lacking skills and knowledge. The mean score of the respondents who perceive scaffold workers as lacking skills and knowledge (only for site management questionnaire)	Tables and texts

3.9.1.3 Data relative to the third sub-problem is to determine respondents' perceptions regarding whether management is not committed to health and safety management systems. Table 3.3 below.

TABLE: 3.3 The Treatment of the Data for Sub-problem Three (Source, Author's view)

Data required	The location of data	Means of obtaining data	The interpretation of the data	The presentation of the data
Responses of the site scaffold workers, scaffold management, supervisors and health and safety practitioners regarding Management commitment to health and safety management systems	Data were obtained from scaffold workers, scaffold site management, supervisors and health and safety practitioner. Construction sites where scaffold contractors operate	Data were obtained by distributing two questionnaires to the site scaffold workers and scaffold management, supervisors and health and safety practitioners	Percentage of total respondents that perceive scaffold management as not committed to health and safety management systems. The mean score of the responses of the respondents. (only for site management questionnaire)	Tables and texts

3.8.1.4 Data relative to the four sub-problem is to determine respondents' perceptions regarding whether there is shortfall of experience among scaffold workers. Table 3.4 below.

TABLE: 3.4 The Treatment of the Data for Sub-problem Four (Source, Author's view)

Data required	The location of data	Means of obtaining data	The interpretation of the data	The presentation of the data
Responses of the site scaffold workers, scaffold management, supervisors and health and safety practitioners regarding experience and training of scaffold workers	Data were obtained from site scaffold workers, scaffold management, supervisors and health and safety practitioners. Construction sites where scaffold contractors operate	Data were obtained by distributing two questionnaires to the site scaffold workers and scaffold management, supervisors, and health and safety practitioners	Percentage of total respondents that perceive scaffold workers as not having training and experience. The mean score of the responses of the respondents (only for site management questionnaire)	Tables and texts

3.10 ETHICAL CONSIDERATIONS

Questionnaires made no mention to the name of the respondent, hence ensuring complete confidentiality and anonymity. The letter of invitation to participants formed part of the questionnaires and voluntary participation was encouraged and should the respondents wish to know the findings of the research, the faculty would gladly send them a summary of the results. The responses received were treated carefully, professionally and ethically regardless of the respondents' race, gender and social standing. Information collected is strictly accessible to the researcher, NMU statistician and research supervisor, and the information was stored safely and used only for the purposes of the research. All respondents in this study are anonymous.

3.11 CHAPTER SUMMARY

The chapter discussed the research philosophies, namely ontology, epistemology and positivism and interpretivism. The chapter also discussed three approaches to research, namely, the quantitative, qualitative and mixed method. This study chose to use non-experimental research method to achieve the research aims. The justification for using survey method, as the selected non-experimental research method was provided. The population, sampling and data collection instruments and procedure for finding respondents and for data collection, analysis and presentation were discussed. The validity and reliability were discussed as they relate to data collected. The five questions relating to the treatment of data were addressed. The chapter concluded with how ethical considerations were addressed. The next chapter presents the empirical findings from the two questionnaires of the study.

CHAPTER 4 RESEARCH RESULTS, DATA ANALYSIS AND INTERPRETATION

4.1 INTRODUCTION

This chapter presents the findings of the results from the collection of data through questionnaires on the types, frequency and causes of accident experienced by the scaffold workers on South African construction sites. The respondents included scaffold site management, supervisors, health and safety practitioners, charge hands, erector/fixer, inspector and labourers. The analysis of data was done by entering into Excel spread-sheet with the help of the Nelson Mandela University (NMU) Statistical Support Unit. The spread-sheet provided easy analysis of the descriptive statistics for the study. Testing of proportions was utilized to evaluate the statistical significance of the field data findings. The chapter includes the response rate, demographic profiles, data analysis of the questionnaires. This chapter also uses figures, texts and tables to present the results.

4.2 KEY RESULTS AND FINDINGS (DESCRIPTIVE STATISTICS)

RESPONSE RATES

The researcher consulted a statistician, who advised that for this study a sample size of 200 for site scaffold management and 200 for site scaffold workers would contribute to the validity of the study. A total of hundred and eighty (180) questionnaires from site scaffold management were returned representing ninety percent response rate (90%) of which hundred and seventy one (171) were deem usable representing eighty six percent (86%) of questionnaire used in this study. A total of hundred and ninety four (194) questionnaires from site scaffold workers were returned representing ninety seven percent response rate (97%) of which hundred and eighty (180) were deem usable representing ninety percent (90%) of questionnaire used in this study.

There were 9 ''spoilt'' site scaffold management questionnaires were more than one response was given for an indicator and incorrect information given such as respondent who is working outside the country completing the questionnaire and there were 14 ''spoilt'' site scaffold worker questionnaires were more than one response was given for an indicator and were some of the indicators were not completed. Spoiled responses were discarded and did not form part of the data analysis and presentation. The questionnaires were sent by email and a few were hand delivered to different scaffold contractors. The researcher allocated three months for the completion and return of the questionnaires. The researcher was advised to send out a follow up email in order to increase the response rate. The data analysis and testing of hypotheses took over a month to complete. The NMU Statistician provided an expert advice in testing the four hypotheses. For data analysis the following factors were noted:

It is recommended to use descriptive statistics that include a mode, median, standard deviation and percentages for variability. Likert type's items were used for management questionnaire and ''Yes

or No'' statements were used for worker questionnaire. As for the testing of hypotheses, chapter six provides more specific criteria for testing four hypotheses.

4.3 DEMOGRAPHIC PROFILE (SECTION A)

Section A of both questionnaires sought to profile the respondents' demographic details.

The demographic information is presented and discussed under the following headings: gender, job title, experience in the current position, age, race, province where construction site is situated and highest education qualifications. The respondents were asked to answer section A by ticking the appropriate box. The information to follow discusses both site scaffold management and site scaffold worker demographic profiles.

4.3.1 SITE SCAFFOLD MANAGEMENT DEMOGRAPHIC PROFILE

4.3.1.1 GENDER

Figure 4.1 below represents the gender of the respondents. When analysing the data, ninety four percent (94%) of the respondents are Males and only six percent (6%) of the respondents are Females. The highly disproportionate gender representation of the respondents is a possible reflection of the gender demographics in the construction industry.

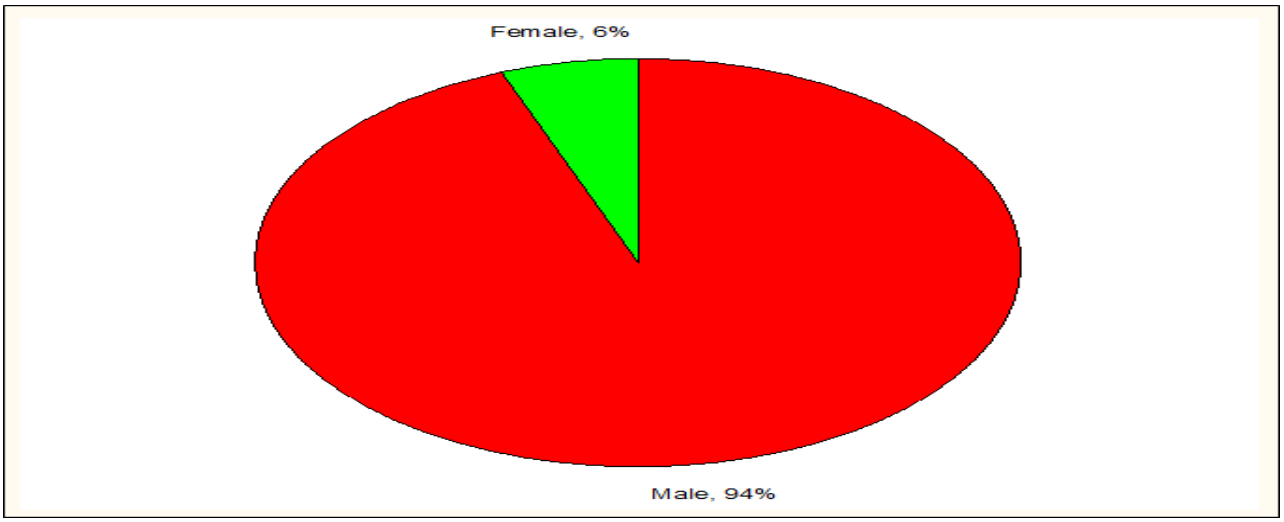


Figure 4.1: Percentage distribution of respondents by gender

4.3.1.2 ROLE ON THE PROJECT (JOB TITLE)

Figure 4.1 below represents the position that the respondents hold on the construction site. Twenty three percent (23%) of the respondents are Site Management. Forty nine percent (49%) of the respondents are Site Supervisors. Twenty seven percent (27%) of the respondents are H&S Practitioners. One percent (1%) of the respondent is other. The results reflect the correct site demographics in the sense that site supervisors are usually more than site management and H&S practitioners on construction sites.

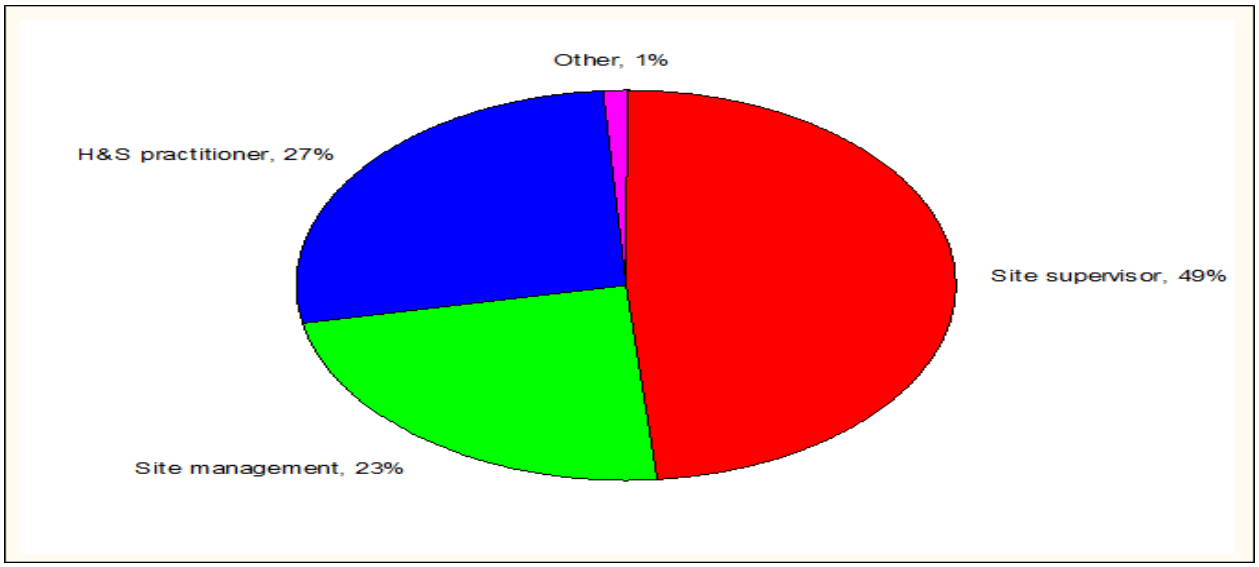


Figure 4.2: Respondents by job title

4.3.1.3 EXPERIENCE ON THE CURRENT POSITION

Figure 4.1 below indicates the number of years (experience) the respondents have in the current position on construction site. The experience is categorised into seven categories namely: less than two (2) years, two (2) to four (4) years, five (5) to seven (7) years, eight (8) to ten (10) years, and ten (10) years to fifteen (15) years, fifteen (15) to twenty (20) years and twenty (20) and more years. Thirty percent (30%) of the respondents have between eight (8) and ten (10) years' experience in the current position. Ninety percent (19%) of the respondents have between five (5) to seven (7) years in the current position. Sixteen percent (16%) of the respondents have between ten (10%) to fifteen (15) years' experience in the current position.

Fifteen percent (15%) of the respondents have between fifteen (15) to twenty (20) years' experience in the current position. Twelve percent (12%) of the respondents have between two (2) to four (4) years' experience in the current position. Five percent (5%) of the respondents have between zero (0) to two (2) years in the current position and four percent (4%) of the respondents have over twenty (20) years' experience in the current position. In summary, greater percentage of respondents (30%) is between eight and ten years' experience in the current position, illustrating that there is enough experience among the scaffold site management, site supervisors and health and safety practitioners.

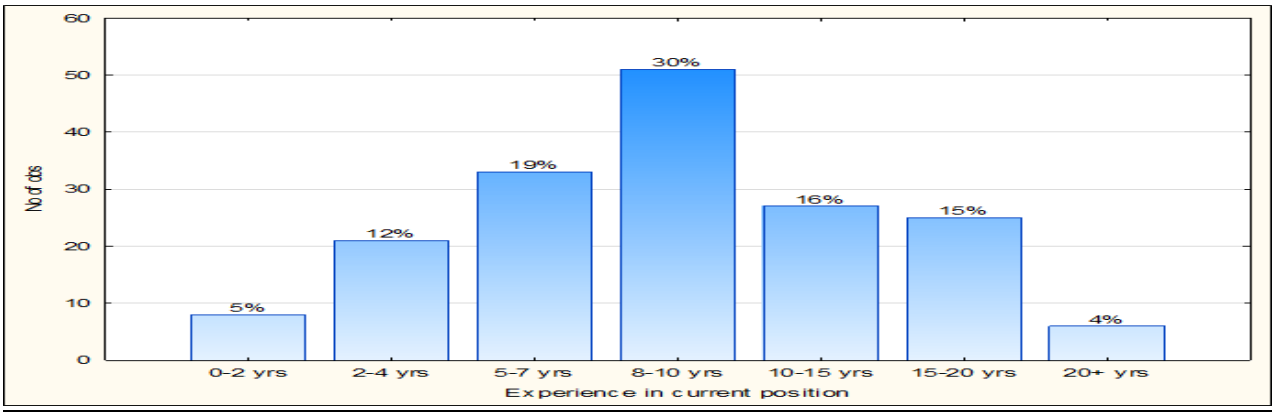


Figure 4.3: Respondents by number of years in the current position on construction site

4.3.1.4 AGE

Figure 4.4 below illustrates the ages of the respondents. Thirty eight percent (38%) of the respondents are between the ages of thirty six (36) years and forty one (41) years of age. Twenty eight percent (28%) of the respondents are between the ages of thirty (30) years and thirty five (35) years of age. Ninety percent (19%) of the respondents are between the ages of forty two (42) years and forty nine (49) years of age. Eight percent (8%) of the respondents are between the ages of twenty four (24) and twenty nine (29) years of age. Six percent (6%) of the respondents are between fifty (50) and more years of age. Two percent (2%) of the respondents are between eighteen (18) and twenty three (23) years of age. In summary, greater percentage of respondents (38%) is between thirty six (36) and forty one (41) years of age.

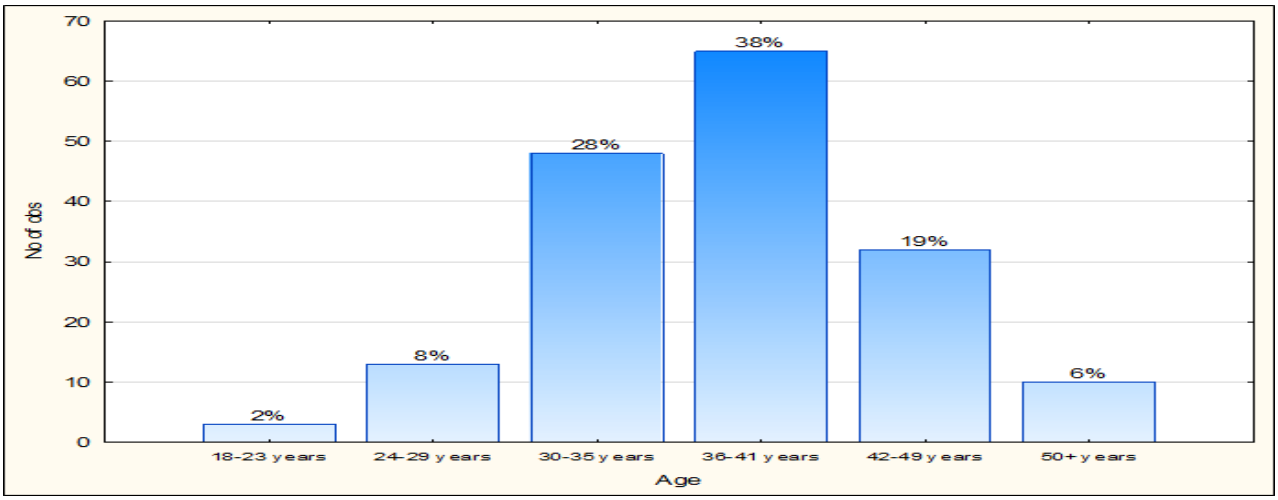


Figure 4.4: Age distribution of respondents

4.3.1.5 RACE

Figure 4.5 below represents the race of the respondents. Seventy five (75%) of the respondents are Black. Twenty two percent (22%) of the respondents are White.

Two percent (2%) of the respondents are Coloured. One percent (1%) of the respondents are Asian/Indian. The results reflected that most of the respondents were Blacks, followed by Whites.

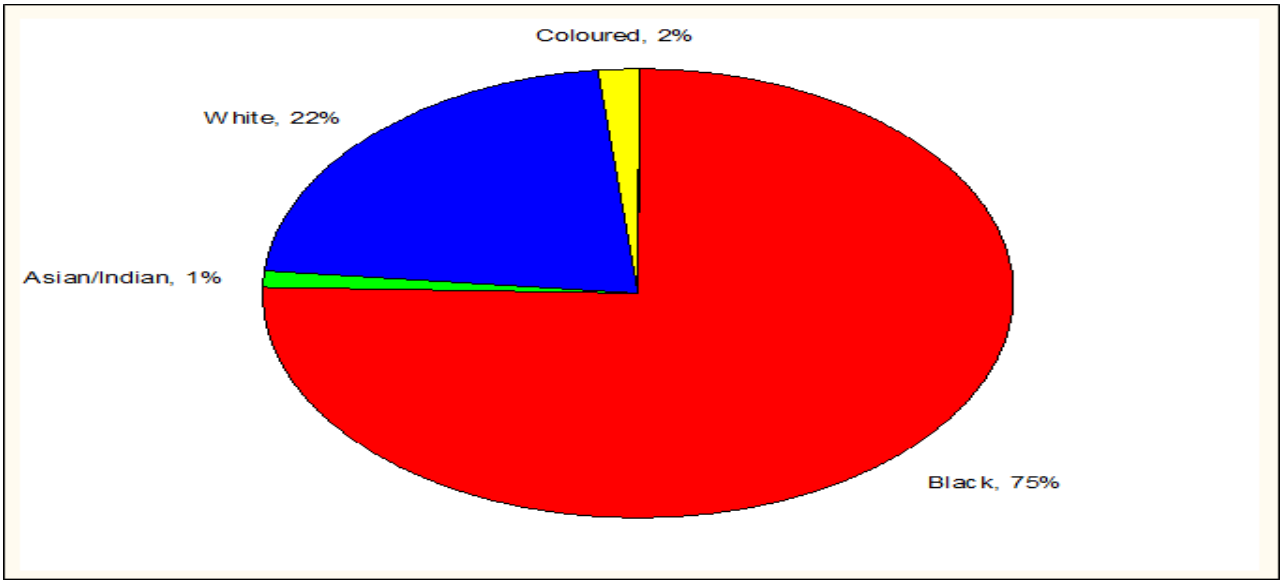


Figure 4.5: Respondents by race

4.3.1.6 PROVINCE

Figure 4.6 below represents the province where construction site is situated. Forty seven percent (47%) of the respondents are working on construction sites in Limpopo province. Thirty three percent (33%) of the respondents are working on construction sites in Mpumalanga province. Sixteen percent (16%) of the respondents are working on construction sites in Gauteng province. Two percent (2%) of the respondents are working on construction sites in Eastern Cape Province. One percent (1%) of the respondents are working in Free State and North West provinces. In summary, eighty percent (80%) of the respondents are working on the construction sites in Limpopo and Mpumalanga. This is possibly because of the construction of Medupi and Kusile Power Stations which are based in Limpopo and Mpumalanga respectively, and notably the construction of these Power Stations make use of four to five scaffold contractors employing many people to provide different skills and services to the client.

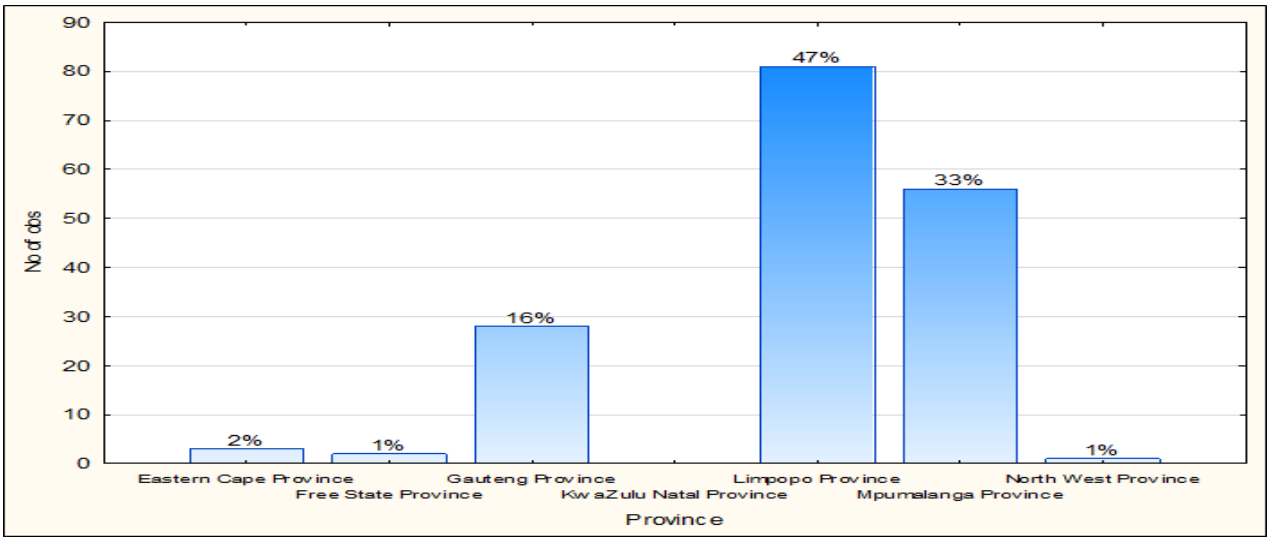


Figure 4.6: Respondents by province (location of construction site)

4.3.1.7 HIGHEST EDUCATION QUALIFICATIONS

Figure 4.7 below illustrates the academic qualifications of the respondents. Fifty seven percent (57%) of the respondents have Certificates. Twenty nine percent (29%) of the respondents have Matric Certificates. Nine percent (9%) of the respondents have less than Matric Education. Four percent (4%) of the respondents have National Diploma. One percent (1%) of the respondents have Honours/BTech/Degree, Master's Degree and Doctorate Degree. Notably only 4% of the respondents have a National Diploma and this presents a worrying signal about the lack of formal qualifications among the scaffold site management, site supervisors and health and safety practitioners.

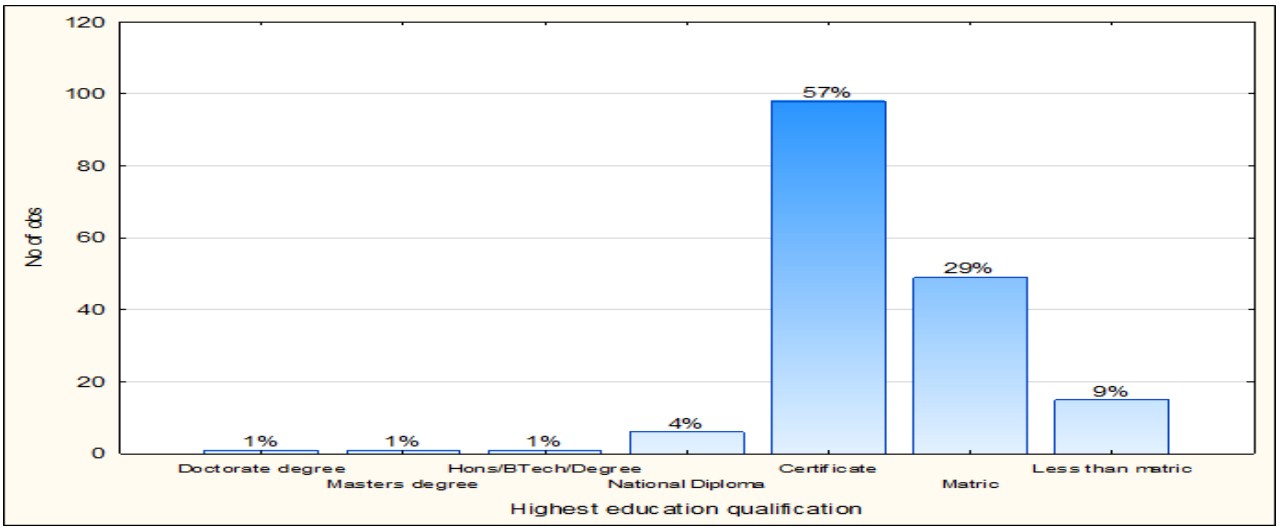


Figure 4.7: Respondents by highest qualification

4.3.2 SITE SCAFFOLD WORKER DEMOGRAPHIC PROFILE

4.3.2.1 GENDER

Figure 4.8 below represents the gender of the respondents. When analysing the data, ninety seven percent (97%) of the respondents are Males and only three percent (3%) of the respondents are Females. The highly disproportionate gender representation of the respondents is a possible reflection of the gender demographics in the construction industry. This supports the finding of scaffold site management that only six percent (6%) of the respondents are females.

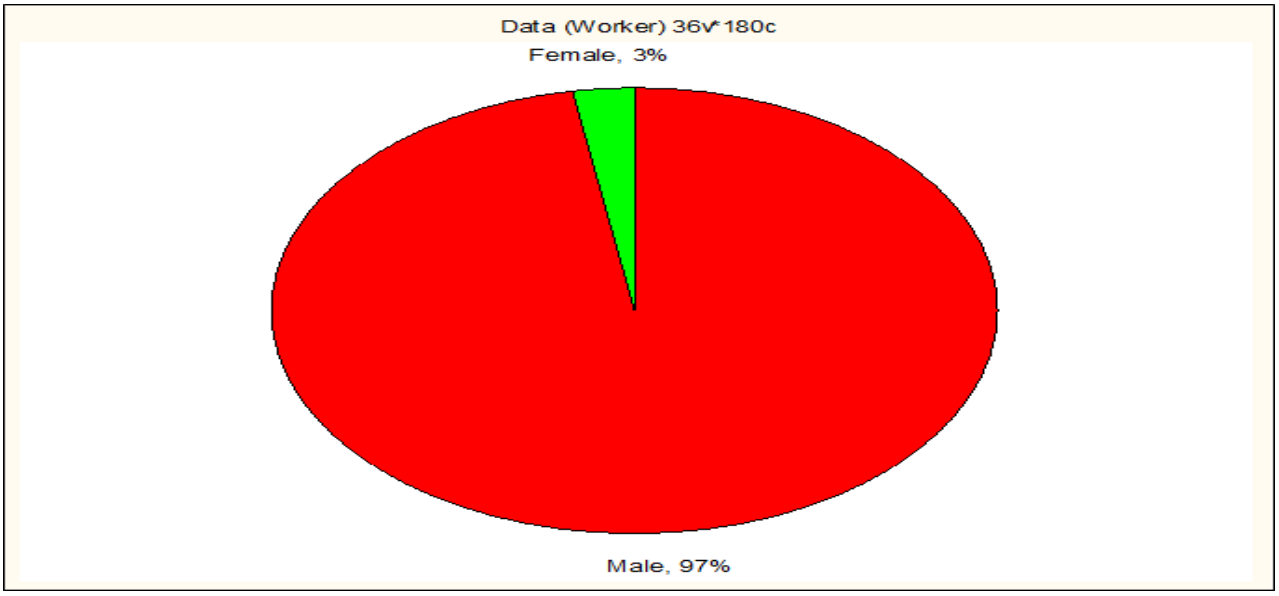


Figure 4.8: Percentage distribution of respondents by gender

4.3.2.2 ROLE ON THE PROJECT (JOB TITLE)

Figure 4.9 below represents the position that the respondents hold on the construction site. Thirty eight percent (38%) of the respondents are Scaffold Fixers/Erectors. Thirty four percent (34%) of the respondents are Charge hands /Team Leaders. Seventeen percent (17%) of the respondents are Scaffold Labourers. Eleven percent (11%) of the respondents are Scaffold Inspectors. The results indicate that more scaffold fixers and team leaders participated in the investigation and these are a group of workers who have hands on experience.

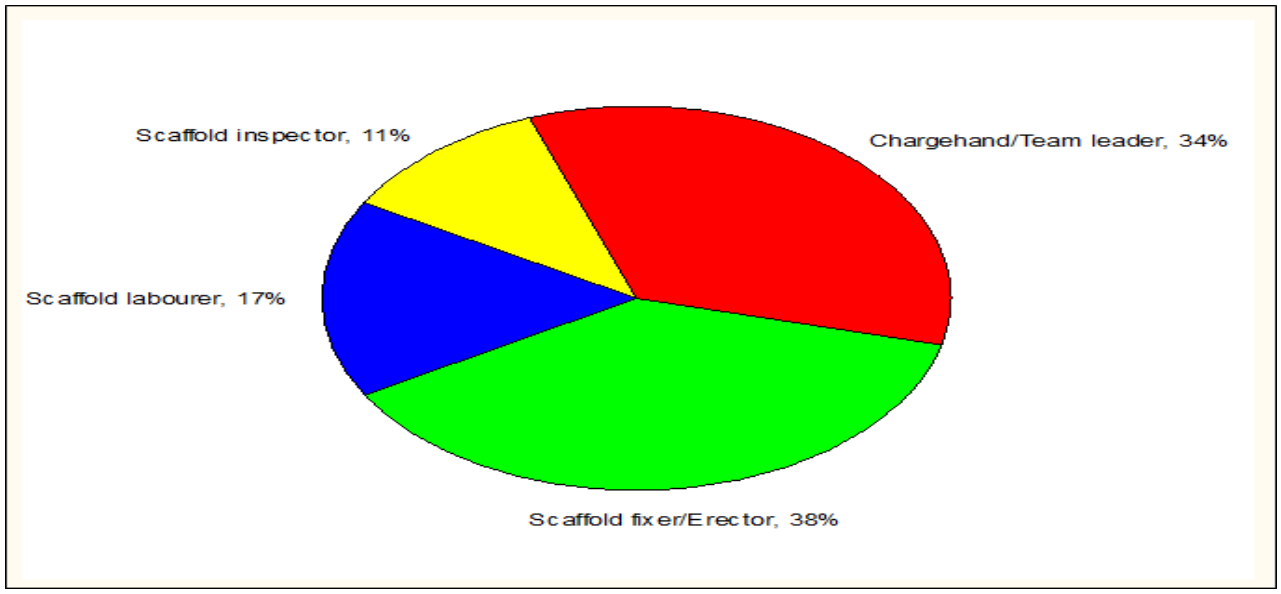


Figure 4.9: Respondents by job title

4.3.2.3 EXPERIENCE ON THE CURRENT POSITION

Figure 4.10 below indicates the number of years (experience) the respondents have in the current position on construction site. The experience is categorized into seven categories namely: less than two (2) years, two (2) to four (4) years, five (5) to seven (7) years, eight (8) to ten (10) years, and ten (10) years to fifteen (15) years, fifteen (15) to twenty (20) years and twenty (20) and more years. Twenty seven percent (27%) of the respondents have between five (5) and seven (7) years' experience in the current position. Twenty percent (20%) of the respondents have between zero (0) and two (2) years' experience in the current position. Ninety percent (19%) of the respondents have between two (2) and four (4) years' experience in the current position.

Seventeen percent (17%) of the respondents have between eight (8) to ten (10) years' experience in the current position. Seven percent (7%) of the respondents have ten (10) to fifteen (15) years' experience in the current position. Six percent (6%) of the respondents have fifteen (15) to twenty (20) years' experience in the current position. Four percent (4%) of the respondents have over twenty (20) years in the current position. In summary, greater percentage of respondents (27%) is between five and seven years' experience in the current position.

Experience is always needed for any occupation and is more useful in erecting and dismantling scaffolding. On average, the workers have five to seven years' experience on construction sites.

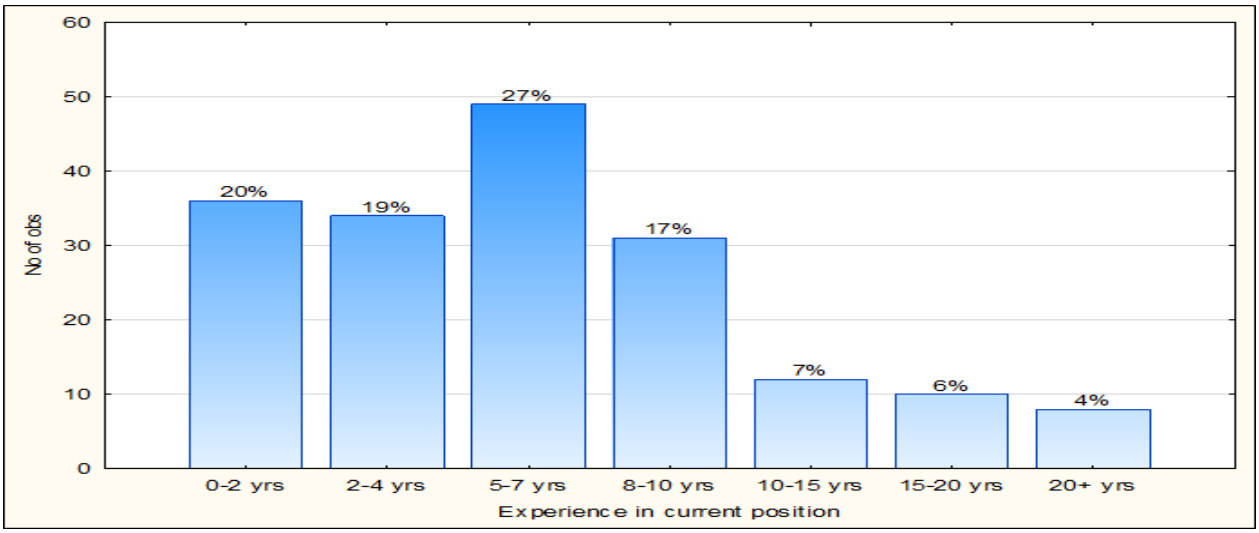


Figure 4.10: Respondents by number of years in the current position on construction site

4.3.2.4 AGE

Figure 4.11 below illustrates the ages of the respondents. Thirty six percent (36%) of the respondents are between the ages of thirty (30) years and thirty five (35) years of age. Twenty four (24%) of the respondents are between the ages of twenty four (24) years and twenty nine (29) years of age. Nineteen percent (19%) of the respondents are between the ages of thirty six (36) years and forty one (41) years of age. Eleven percent (11%) of the respondents are between the ages of forty two (42) years and forty nine (49) years of age. Eight percent (8%) of the respondents are between the ages of eighteen (18) years and twenty three (23) years of age. Three percent (3%) of the respondents are between fifty (50) years and more years of age.

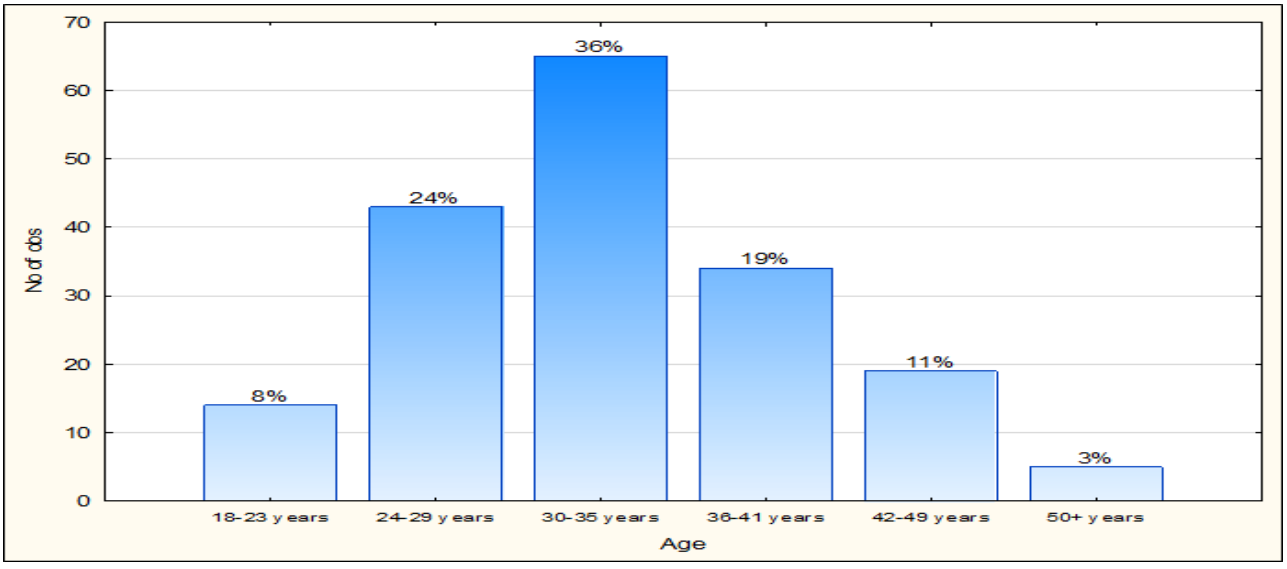


Figure 4.11: Age distribution of respondents

4.3.2.5 RACE

Figure 4.12 below represents the race of the respondents. Ninety eight percent (98%) of the respondents are Black. One percent (1%) of the respondents are Coloured, Asian/Indian and other.

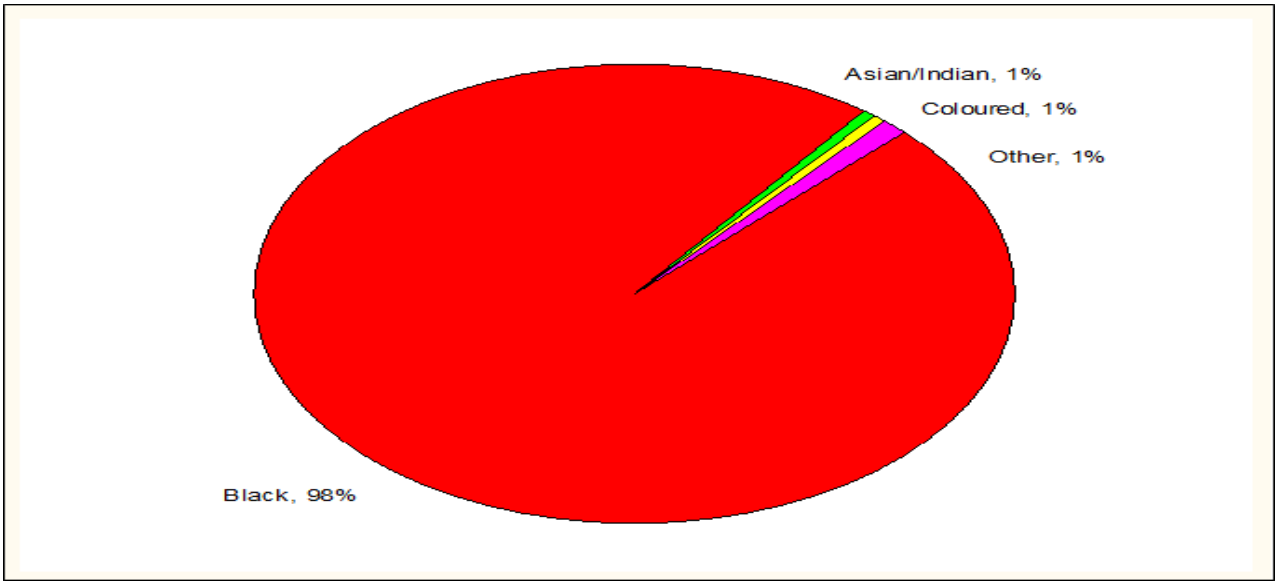


Figure 4.12: Respondents by race

4.3.2.6 PROVINCE

Figure 4.13 below represents the province where construction site is situated. Forty two percent (42%) of the respondents are working on construction sites in Mpumalanga province. Thirty nine percent (39%) of the respondents are working on construction site in Limpopo province. Six percent (6%) of the respondents are working on construction site in Kwa-Zulu Natal province. Three percent (3%) of the respondents are working on construction site in North West province. Two percent (2%) of the respondents are working on construction sites in Eastern Cape, Free State, Western Cape and Gauteng province.

One percent (1%) of the respondents are working on construction site in Northern Cape province. One percent (1%) of the respondents indicated that they were unsure. In summary, eighty percent (81%) of the respondents are working on the construction sites in Mpumalanga and Limpopo. This is possibly because of the construction of Kusile and Medupi Power Stations which are based in Mpumalanga and Limpopo respectively.

The results confirm the site management questionnaire which indicates that more respondents are working in Mpumalanga and in the province of Limpopo. Other provinces have smaller scale projects which do not have the large amount of workers in comparison to the Medupi and Kusile Power Stations.

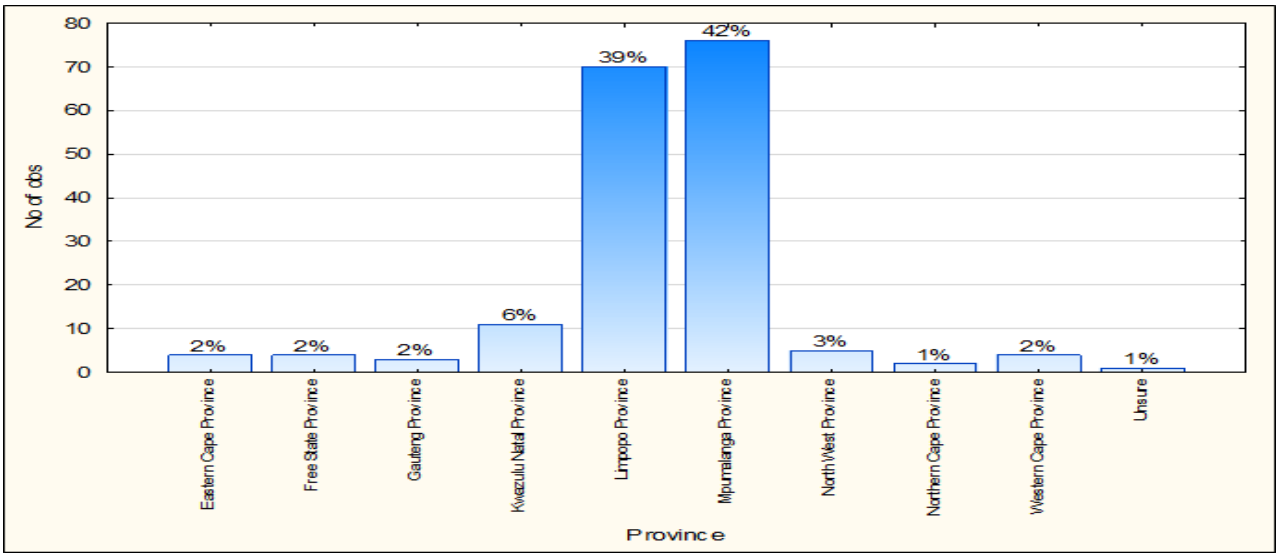


Figure 4.13: Respondents by province (location of construction site)

4.3.2.7 HIGHEST EDUCATION QUALIFICATIONS

Figure 4.14 below illustrates the academic qualifications of the respondents. Thirty nine percent (39%) of the respondents have Matric certificates. Thirty two percent (32%) of the respondents have less than Matric education. Twenty four percent (24%) of the respondents have Certificates. Four percent (4%) of the respondent have National Diplomas. One percent (1%) of the respondents have Doctorate Degree. The results confirm the scaffold site management findings which indicates that only 4% of the respondents hold National Diplomas. Surprisingly, 39% of the respondents hold Matric certificates while only 27% of the scaffold site management respondents hold a Matric certificate.

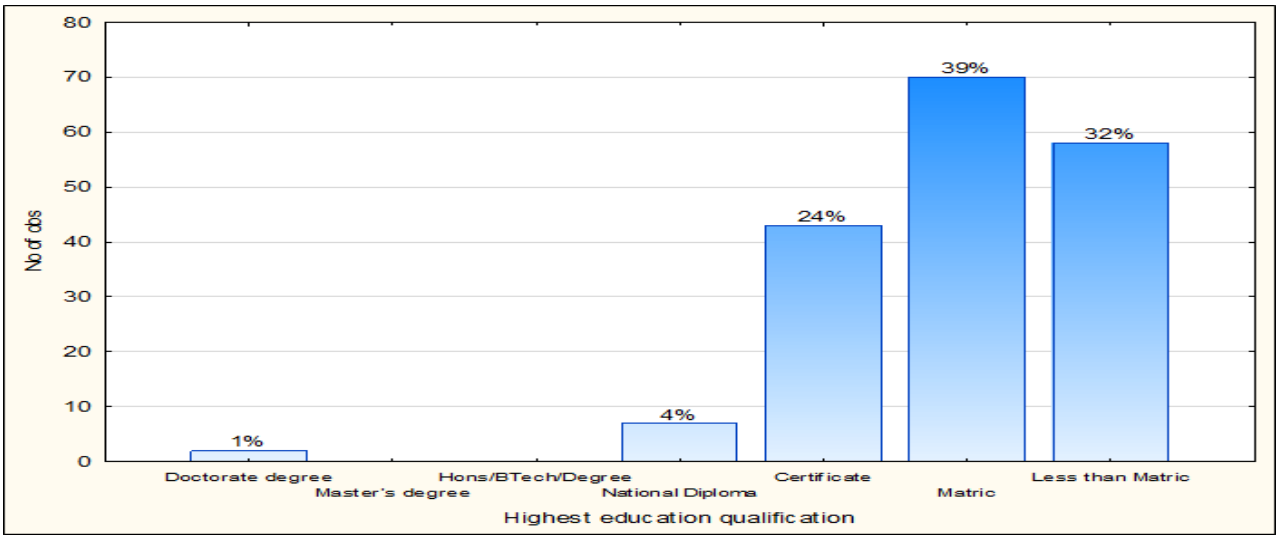


Figure 4.14: Respondents by highest qualification

4.4 QUESTIONNAIRES ANALYSIS (SECTION B)

This section presents data from the responses to the questionnaires. The respondents were asked to answer site worker questionnaire by ticking the appropriate box and they were also asked to answer the site management questionnaire by rating their level of the agreement by using the Five-point Likert-scale questionnaire that provides for very frequent, frequent, moderate, seldom and never. It also provides for strongly agree, agree, neutral, disagree and strongly disagree.

4.4.1 SITE MANAGEMENT QUESTIONNAIRE ANALYSIS

4.4.1.1 Knowledge of Construction Accidents

Questionnaire that provides for yes, no and I don't know option is used to examine the respondents' perceptions knowledge of construction accidents. Table 4.1 below shows that ninety three percent (93%) of the respondents know of a scaffold worker who suffered minor injury/injuries in the workplace. Seventy five percent (75%) of the respondents think scaffold workers are frequently involved in accidents in the workplace. Fifty three percent (53%) of the respondents know of scaffold worker who suffered serious injury/injuries while doing their work, whereas Fifty percent (50%) of the respondents have suffered minor injury/injuries in the workplace. It is notable that fifty (50%) percent of the respondents have not been involved in a serious accident in the workplace. The results indicate that the scaffold workers do suffer minor injuries rather than serious injuries. For more details refer to table 4.1 below.

TABLE: 4.1 Knowledge of Construction Accidents (KA)

Reference No	N Valid	Missing	Percentage for Yes	Percentage for No	Percentage for I don't know	Ranking
KAI	171	0	93.0	7.0	0	1
KA5	171	0	75.4	18.1	6.4	2
KA3	171	0	53.8	46.2	0	3
KA4	171	0	50.9	49.1	0	4
KA2	171	0	49.7	50.3	0	5

Where:

KA1: I know of at least one scaffold worker who suffered minor injury/injuries in the workplace

KA2: I have at least been involved in a serious accident in the workplace

KA3: I know of at least one scaffold worker who suffered serious injury/injuries while doing his/her work

KA4: I have at least suffered minor injury/injuries myself in the workplace

KA5: I think scaffold workers are frequently involved in accidents in the workplace

4.4.1.2 Types of Accidents

Five-point Likert-scale questionnaire that provides for very frequent, frequent, moderate, seldom and never is used to examine the respondents' perceptions of the types of accidents that affect scaffolding workers. Table 4.2 below indicates the perceptions of the respondents. Twenty six percent (26%) of Respondents think that slips, trips and falls incidents are very frequent, fifty one percent (51%) of the respondents think struck by/hit by objects incidents are frequent, sixty five percent (65%) of the respondents think caught in/between objects incidents are frequent, thirteen percent (13%) of the respondents think falling from heights incidents are frequent and seventy seven (77%) of the respondents think scaffold collapse incidents never occur on construction sites. NASC 2014 Safety Report (2014, p. 5; NASC (2014, p. 4) reveals that slips, trips and falls are main cause of injuries within scaffolding industry. The table 4.1 further shows that scaffold collapse is a least occurring incident affecting scaffold workers. It is important to note that majority of the respondents strongly disagree that scaffold collapse affect scaffold workers. The finding that scaffold collapse accidents are rare on construction site correlates with the finding that the majority of the respondents suffer minor injuries frequently. Table 4.2 below.

TABLE: 4.2 Types of Accidents (TA)

Reference No	N Valid	Missing	Mean	Median	Std. Deviation	Minimum	Maximum	Ranking
TA3	171	0	3.80	4.00	0.95	1.00	5.00	1
TA5	171	0	3.70	4.00	1.05	1.00	5.00	2
TA2	171	0	3.57	4.00	0.97	1.00	5.00	3
TA1	171	0	2.63	3.00	1.02	1.00	5.00	4
TA4	171	0	1.33	1.00	0.69	1.00	5.00	5

Where:

TA1: Falling from heights

TA2: Caught in/between objects

TA3: Struck by/hit by objects

TA4: Scaffold collapse

TA5: Slips, trips and falls

4.4.1.3 Causes of Accidents

Five-point Likert-scale questionnaire that provides for strongly agree, agree, neutral, disagree and strongly disagree is used to examine the respondents' perceptions of the causes of accident that affect scaffolding workers. Table 4.3 below indicates the perceptions of the respondents. fifty three percent (53%) of the respondents strongly agree that unsafe acts contribute to the scaffold construction accidents, forty four percent (44%) of the respondents strongly agree that unsafe conditions contribute to the scaffold construction accidents and however, only twenty two percent (22%) of the respondents strongly agree that personal factors contribute to the scaffold construction accidents and (4.1%) of the respondents strongly agree that job contribute to the scaffold construction accidents. This is in line with the findings that Industrial accidents can be attributed to unsafe acts and unsafe conditions (Javaid et al. 2015, p. 111). The least cause of scaffold accident appears to be job factors. Any cause of accidents may lead to minor or serious injuries, it is therefore important that all causes of construction accidents are treated seriously to prevent or avoid accidents in future. Table 4.3 below.

TABLE 4.3 Causes of Accidents (CA)

Reference No	N Valid	Missing	Mean	Median	Std. Deviation	Minimum	Maximum	Ranking
CA4	171	0	4.32	5.00	0.93	1.00	5.00	1
CA3	171	0	4.12	4.00	0.95	2.00	5.00	2
CA2	171	0	3.91	4.00	0.81	1.00	5.00	3
CA1	171	0	2.91	3.00	0.96	1.00	5.00	4

Where:

CA1: Job factors

CA2: Personal factors

CA3: Unsafe conditions

CA4: Unsafe acts

4.4.1.4 Scaffold Activities

Five-point Likert-scale questionnaire that provides for strongly agree, agree, neutral, disagree and strongly disagree is used to examine the respondents' perceptions of the scaffold activities that affect scaffolding workers. Table 4.4 below indicates the perceptions of the respondents. sixty seven percent (67%) of the respondents strongly agree that dismantling of scaffolding, fifty three percent (53%) of the respondents strongly agree that scaffolding manual handling, twenty seven percent (27%) of the respondents strongly agree that erection of scaffolding, twenty four percent (24%) of the respondents strongly agree that stacking and storage of scaffolding and eleven percent (11%) of the respondents strongly agree modification of scaffolding contribute to the most accidents. NASC (2015, p. 10) notes that almost ninety percent (90%) increase in injuries occurring during manual handling activity. This increase poses serious concern to how the scaffold workers handle materials. Notably, the majority of the respondents feel that most scaffold accidents occur during the dismantling and erection of manual handling activities. This indicates that scaffold workers spend most of their time handling materials, for example before they erect scaffold, they need to get scaffold materials.

When they dismantle, scaffold workers need to pass scaffold materials to each other and also when they modify scaffolding, scaffold workers need to handle scaffold materials. Table 4.4 below.

TABLE: 4.4 Scaffold Activities (SA)

Reference No	N Valid	Missing	Mean	Median	Std. Deviation	Minimum	Maximum	Ranking
SA3	171	0	4.56	5.00	0.74	2.00	5.00	1
SA4	171	0	4.37	5.00	0.76	2.00	5.00	2
SA5	171	0	4.11	4.00	0.73	2.00	5.00	3
SA2	171	0	3.70	4.00	1.05	1.00	5.00	4
SA1	171	0	3.26	3.00	1.00	2.00	5.00	5

Where:

SA1: Modification of scaffolding

SA2: Stacking and storage of scaffolding

SA3: Dismantling of scaffolding

SA4: Scaffolding manual handling

SA5: Erection of scaffolding

4.4.1.5 Scaffold Workers

Five-point Likert-scale questionnaire that provides for strongly agree, agree, neutral, disagree and strongly disagree is used to examine the respondents' perceptions about the scaffold workers who are mostly affected by the construction accidents. Table 4.5 below shows that seventy three percent (73%) of the respondents strongly agree that scaffold labourers, eleven percent (11%) of the respondents strongly agree that scaffold erectors/fixers, two point nine percent (2.9%) of the respondents strongly agree that scaffold team leaders/ charge hands and one point eight percent (1.8%) of the respondents strongly agree that scaffold inspectors are mostly affected by accidents. NASC 2014 Safety Report (2014, p. 12) shows that scaffold labourers contributed thirty three percent (33%) to the number of accidents experienced by the scaffold industry, while advanced scaffolders suffered seven percent (7%) and also supervisors contributed seven percent (7%). The scaffold inspectors are least affected by scaffold accidents. This points to the fact that scaffold inspectors do not erect, modify or dismantle a scaffolding. It can also be assumed that level of exposure is less than that of scaffold erectors, charge hands and labourers. The majority of the respondents indicate that scaffold labourers are mostly affected by scaffold accidents. Since scaffold labourers are not allowed to erect, modify and dismantle. Table 4.5 below

TABLE: 4.5 Scaffold Workers (SW)

Reference No	N Valid	Missing	Mean	Median	Std. Deviation	Minimum	Maximum	Ranking
SW1	171	0	4.65	5.00	0.64	2.00	5.00	1
SW2	171	0	3.88	4.00	0.67	2.00	5.00	2
SW3	171	0	3.54	4.00	0.81	1.00	5.00	3
SW4	171	0	2.03	2.00	1.16	1.00	5.00	4

Where:

SW1: Scaffold Labourers

SW2: Scaffold Erectors/Fixers

SW3: Scaffold Team Leaders/ Charge Hands

SW4: Scaffold Inspectors

4.4.1.6 Health and Safety Management Systems

Five-point Likert-scale questionnaire that provides for strongly agree, agree, neutral, disagree and strongly disagree is used to examine the respondents' perceptions about the site management commitment to health and safety management systems. The table 5.6 shows that respondents agree that site management are committed to health and safety management systems. It is notable that 9 Mean scores out of 9 identified factors were above the midpoint of 3.00, which indicates that the respondents can be deemed to agree with the factors. Majority of the respondents feel that site management are committed to the site health and safety issues. This finding also supports the perception that management showing commitment to health and safety management leads to a safe and healthy working environment. This also has a positive effect on the behaviour and attitude of workers. Table 4.6 below.

TABLE 4.6 Health and Safety Management Systems

Reference No	N Valid	Missing	Mean	Median	Std. Deviation	Minimum	Maximum	Ranking
HSMS1	171	0	4.81	5.00	0.49	1.00	5.00	1 =
HSMS9	171	0	4.81	5.00	0.40	4.00	5.00	1 =
HSMS6	171	0	4.80	5.00	0.51	1.00	5.00	2
HSMS5	171	0	4.67	5.00	0.69	1.00	5.00	3
HSMS2	171	0	4.63	5.00	0.77	1.00	5.00	4
HSMS4	171	0	4.59	5.00	0.82	1.00	5.00	5
HSMS3	171	0	4.36	4.00	0.68	1.00	5.00	6
HSMS7	171	0	4.32	5.00	0.86	1.00	5.00	7
HSMS8	171	0	4.29	4.00	0.66	1.00	5.00	8

Where:

HSMS1: Management appoints H&S personnel for the construction site

HSMS2: Management attends H&S meetings

HSMS3: Management provides H&S training to the workforce

HSMS4: Management participates in hazard identification and risk assessment

HSMS5:Management takes part in incident management processes

HSMS6: Organisation has a H&S management systems

HSMS7: Management leads emergency and evacuation processes

HSMS8: Management participates in H&S inspections and audits

HSMS9: Organisation has a H&S policy

4.4.1.7 Experience and Training

Five-point Likert-scale questionnaire that provides for strongly agree, agree, neutral, disagree and strongly disagree is used to examine the respondents' perceptions about whether scaffold contractors use experienced and trained scaffold workers. The Table 5.7 below shows that the respondents perceive scaffold workers as having scaffold experience, skill, knowledge and the table 4.7 further shows that eighty one percent (81%) of the respondents have scaffold training certificate while eighty percent (8%) of the respondents do not have scaffold training at all. It is worth noting that sixty four percent (64%) of the respondents strongly agree that site accidents are caused by scaffold workers who lack knowledge and skills. This finding points to the fact that knowledge and skills are important for the safe execution of the work. The finding that the majority of the respondents have scaffold training certificate shows that scaffold contractors are committed to providing quality services to clients and also ensuring that only trained scaffold workers are allowed to erect, modify and dismantle scaffolding on construction sites. Table 4.7 below.

TABLE: 4.7 Experience and Training (ET)

Reference No	N Valid	Missing	Mean	Median	Std. Deviation	Minimum	Maximum	Ranking
ET1	171	0	4.57	5.00	0.62	2.00	5.00	1
ET5	171	0	4.49	5.00	1.02	1.00	5.00	2
ET2	171	0	4.47	5.00	0.81	2.00	5.00	3
ET4	171	0	4.46	5.00	1.10	1.00	5.00	4
ET3	171	0	4.37	5.00	1.00	1.00	5.00	5

Where:

ET1: The site uses only knowledgeable and skilled scaffold workers

ET2: The site uses only scaffold workers who have scaffold experience and training

ET3: The site accidents are caused by lack of knowledge and skills among scaffold workers

ET4: I have scaffold training certificate

ET5: Scaffold are appointed to positions based on site scaffold work experience and relevant training

4.4.2 SITE WORKER QUESTIONNAIRE ANALYSIS

4.4.2.1 Knowledge of Construction Scaffold Accidents

Questionnaire that provides for yes, no and I don't know option is used to examine the respondents' perceptions knowledge of construction accidents. The table 4.8 below shows that sixty percent (60%) of the respondents know of a worker who have suffered minor injuries. It is notable that sixty nine percent (69%) of the respondents have not suffered minor injuries in the workplace. Furthermore, shows that seventy eight percent (78%) of the respondents do not know of scaffold worker who died because of scaffold accidents. The results show that the scaffold workers do not suffer minor injuries. On the contrary, the site management results indicate that more scaffold workers do suffer minor injuries. Furthermore, the results show that majority of respondents do not frequently know of scaffold workers who died due to scaffold accidents. Table 4.8 below.

TABLE: 4.8 Knowledge of Construction Scaffold Accidents (KCA)

Reference No	N Valid	Missing	Percentage for Yes	Percentage for No	Ranking
KCA1	180	0	60.0	40.0	1
KCA3	180	0	30.6	69.4	2
KCA2	180	0	21.1	78.9	3

Where:

KCA1: I know of at least one scaffold worker who suffered minor injury/injuries in the workplace

KCA2: I know of at least one scaffold worker who died because of scaffold accidents in the workplace

KCA3: I have suffered minor injury/injuries myself in the workplace

4.4.2.2 Causes of Scaffold Accidents

Questionnaire that provides for yes, no and I don't know option is used to examine the respondents' perceptions of the causes of accident that affect scaffolding workers. The table 4.9 below shows that ninety three percent (93.9%) of the respondents agree that taking short cuts cause scaffold accidents. Eighty nine percent (89%) of the respondents agree that lack of supervision causes scaffold accidents. Eighty eight percent (88%) of the respondents agree that bad housekeeping causes scaffold accidents. Seventy eight percent (78%) of the respondents agree that lack of skills and knowledge causes scaffold accidents. It is notable that the majority of the respondents concede

that unsafe acts, job factors, unsafe conditions and personal factors do cause scaffold accidents on construction sites. Table 4.9 below.

TABLE: 4.9 Causes of scaffold Accidents (CSA)

Reference No	N Valid	Missing	Percentage for Yes	Percentage for No	Percentage for I don't know	Ranking
CSA4	180	0	93.9	4.4	1.7	1
CSA1	180	0	89.4	8.3	2.2	2
CSA3	180	0	88.9	7.2	3.9	3
CSA2	180	0	78.3	18.3	3.3	4

Where:

CSA1: Lack of skills and knowledge cause scaffold accidents

CSA2: lack of supervision causes scaffold accidents

CSA3: Bad housekeeping causes scaffold accidents

CSA4: Taking short cuts causes scaffold accidents

4.4.2.3 Health and Safety Management Systems

Questionnaire that provides for yes, no and I don't know option is used to examine the respondents' perceptions about the site management commitment to health and safety management systems. Table 4.10 below shows that eighty eight percent (88%) of the respondents agree that site management shows commitment to H&S. Eighty six percent (86%) of the respondents agree that site management visits the work areas frequently. Eighty five percent (85%) of the respondents agree that site management follows H&S rules. It shows this in terms of percentage responses to ''Yes'' and ''No''. It is notable that three percentages were above eighty percent which indicates that the respondents perceive that management is committed to the health and safety management systems (HSMS). This finding also supports the perception that management showing commitment to health and safety management leads to a safe and healthy working environment. Table 4.10 below.

TABLE: 4.10 Site Management Commitment (MC)

Reference No	N Valid	Missing	Percentage for Yes	Percentage for No	Percentage for I don't know	Ranking
MC1	180	0	88.9	10.0	1.1	1
MC3	180	0	86.1	12.8	1.1	2
MC2	180	0	85.0	14.4	0.6	3

Where:

MC1: Site management shows commitment to health and safety

MC2: Site management visits the work areas frequently

MC3: Site management follows health and safety rules

4.4.2.4 Use of Safety Harness

Questionnaire that provides for yes and no option is used to examine the respondents' perceptions of the causes of accident that affect scaffolding workers. Table 4.11 below shows ninety eight (98%) of the respondents agree that they know how to use safety harness properly. Ninety five (95%) agree that they scaffold training course provided them with the knowledge and practical skill on how to use safety harness properly. Notably, Fifty one percent (51%) of the respondents agree that they learnt how to use safety harness by themselves. This could only be because of lack of safety harness training or respondents being allowed to work on site without first being provided with scaffold training which includes the use of safety harness. The majority of respondents feel that they know how to use a safety harness properly. Since scaffold erectors spend most of their time working at heights, it is important that effective training be provided on how to use the safety harness. Table 4.11 below.

TABLE: 4.11 Use of Safety Harness (USH)

Reference No	N Valid	Missing	Percentage for Yes	Percentage for No	Ranking
USH1	180	0	98.3	1.7	1
USH2	180	0	95.6	4.4	2
USH3	180	0	51.7	48.3	3

Where:

USH1: I know how to use safety harness properly

USH2: Scaffold training course provided me with the knowledge and practical skill on how to use safety harness properly

USH3: I learnt how to use safety harness by myself

4.4.2.5 Experience and Training

Questionnaire that provides for yes and no option is used to examine whether scaffold contractors use experienced and trained scaffold workers. Table 4.12 below shows that ninety seven percent (97%) of the respondents agree that they have knowledge and skills of scaffold work. Ninety seven percent (97%) of the respondents agree that they have scaffold training certificates. Ninety six percent (96%) of the respondents agree that they have scaffold training course before working as a scaffold workers. Ninety four percent (94%) of the respondents agree that they enough experience and proper training to do their work. Sixty three percent (63%) of the respondents have module three scaffold training certificates. Forty one percent (41%) of the respondents have module one scaffold training certificates. Thirty eight percent (38%) of the respondents have module two scaffold training certificates. Twenty five percent (25%) of the respondent have module five scaffold training certificates. Nine percent (9%) of the respondents have module four scaffold training certificates. Four percent (4%) of the respondents do not have any scaffold training certificates. It shows this in terms of percentage responses to ''Yes'' and ''No''. It is notable that five percentages were above ninety percent which indicates that the respondents agree that they received scaffold training and experience for the doing their work. The majority of the respondents have specific scaffold training certificates according to their job levels such as having module 2 for scaffold fixers and module 3 for scaffold team leaders and how training was provided before scaffold workers were allowed to work on site. Table 4.12 below.

TABLE: 4.12 Experience and Training (ET)

Reference No	N Valid	Missing	Percentage for Yes	Percentage for No	Ranking
ET3	180	0	97.8	2.2	1
ET5	180	0	97.8	2.2	1
ET2	180	0	97.2	2.8	2
ET4	180	0	96.1	3.9	3
ET1	180	0	94.4	5.5	4

Where:

ET1: I have enough experience and proper training to do my work

ET2: I have scaffold training certificate

ET3: I have knowledge and skills of scaffold work

ET4: I attended scaffold training course before working as a scaffold worker

ET5: The following is the scaffold training I have

4.4.2.6 Types of Accidents affecting Scaffold Workers

Questionnaire that provides for yes and no option is used to examine respondents' perceptions about the scaffold workers who are mostly affected by the construction accidents. Table 4.13 below shows that sixty five percent (65%) of the respondents know of scaffold worker who was hit by scaffold materials. fifty percent (50%) of the respondents know of scaffold worker who was caught in/between scaffold materials. Fifty eight percent (58%) of the respondents do not know of scaffold worker who fell from height. Notably, seventy five percent (75%) of the respondents do not know of a scaffold which collapsed. The majority of the respondents indicate that scaffold collapse accidents are rare on construction sites. Table 4.13 below.

TABLE: 4.13 Types of Accidents affecting Scaffold Workers (TAS)

Reference No	N Valid	Missing	Percentage for Yes	Percentage for No	Ranking
TAS2	180	0	65.6	34.4	1
TAS3	180	0	50.0	50.0	2
TAS1	180	0	41.7	58.3	3
TAS4	180	0	25.0	75.0	4

Where:

TAS1: I know at least of scaffold worker who fell from height

TAS2: I know at least of scaffold worker who was hit by scaffold materials

TAS3: I know at least of scaffold worker how was caught in/between scaffold materials

TAS4: I know at least of a scaffold which collapse

4.4.2.7 Scaffold Activities

Questionnaire that provides for yes, no and I don't know option is used to examine the respondents' perceptions about the scaffold activities that affect scaffolding workers. Table 4.14 below shows that eighty eight percent (88%) of the respondents agree that most scaffold accidents occur during dismantling of scaffold. Seventy seven percent (77%) of the respondents agree that most scaffold accidents occur during manual handling. Seventy four percent (74%) of the respondents agree that most scaffold accidents occur during erection of scaffolding. Sixty three percent (63%) of the respondents agree that most scaffold accidents occur during modification of scaffolding. Sixty percent (60%) of the respondents agree that most scaffold accidents occur during stacking and storage of scaffolding. Table 4.14 below. Notably, the majority of the respondents feel that most scaffold accidents occur during the dismantling, manual handling and erection of scaffolding activities. (77%) of respondents feel that more scaffold accidents occur during erection and modification of scaffold as opposed to only 27% of the scaffold site management respondents who strongly agree that scaffold accidents occur during erection of scaffolding and (11%) of the respondents who strongly agree that modification of scaffold contribute to scaffold accidents.

TABLE: 4.14 Scaffold Activities (S)

Reference No	N Valid	Missing	Percentage for Yes	Percentage for No	Percentage for I don't know	Ranking
S4	180	0	88.9	9.4	1.7	1
S1	180	0	77.2	20.6	2.2	2
S2	180	0	74.4	23.9	1.7	3
S5	180	0	63.9	34.4	1.7	4
S3	180	0	60.0	38.9	1.1	5

Where:

S1: Scaffold accidents occur mostly during scaffolding manual handling

S2: Scaffold accidents occur mostly during erection of scaffolding

S3: Scaffold accidents occur mostly during stacking and storage of scaffolding

S4: Scaffold accidents occur mostly during dismantling of scaffolding

S5: Scaffold accidents occur mostly during modification of scaffolding

4.4.2.8 Scaffold Workers Accidents Rate

Questionnaire that provides for yes, no and I don't know option is used to examine the respondents' perceptions about the scaffold activities that affect scaffolding workers. Table 4.15 below shows that fifty two percent (52%) of the respondents agree that scaffold works are often injured. Table 4.15 below. It is noteworthy that almost half of the respondents agree that scaffold workers are often injured while over (75%) of the scaffold site management respondents think scaffold workers are frequently involved in accidents in the workplace.

TABLE: 4.15 Scaffold Workers Accidents Rate (AR)

Reference No	N Valid	Missing	Percentage for Yes	Percentage for No	Percentage for I don't know	Ranking
AR1	180	0	52.2	43.9	3.9	1
Where: AR1: Scaffold workers are often injured						

4.5 CHAPTER SUMMARY

The data obtained are illustrated in the form of tables indicating various categories, means, medians, standard deviations, rankings, numbers and percentages. A summary of the results in the form of mean scores and percentages were tabled and discussed in this chapter. The questions were purposely developed around the sub-problems and hypotheses,

The next chapter presents the testing of the hypotheses.

CHAPTER 5 TESTING OF HYPOTHESES

5.1 INTRODUCTION

This chapter discusses the hypotheses relative to the sub-problems identified in Chapter one. The aim of this chapter is to assist in testing the four hypotheses from the empirical findings presented in Chapter four. A hypothesis is a proposition or tentative statement that can be tested for association or relationship by deducing logic and empirical evidence (Bhattacherjee.2012, p.13).

5.2 THE MAIN PROBLEM STATEMENT

THE LACK OF KNOWLEDGE AND FREQUENCY OF ACCIDENTS THAT AFFECT SCAFFOLD WORKERS IS SUB-OPTIMAL IN SOUTH AFRICAN CONSTRUCTION.

5.3 SUB-PROBLEMS

Scaffold workers have accidents and incidents frequently

Scaffold workers lack skills and knowledge

Management is not committed to health and safety management systems

There is shortfall of experience among scaffold workers

The following section addresses the testing of the four hypotheses. Each hypothesis is presented individually with the aim of obtaining and correlating conclusive evidence from the findings of both questionnaires in order to test each hypothesis. The first hypothesis is presented.

5.4 TESTING OF HYPOTHESIS ONE

Scaffold workers do not have accidents and incidents frequently (null hypothesis).

KA1 and KA5 of the Management questionnaire and KCA1, CSA1 and TAS2 of Worker questionnaire are used to test this hypothesis. The rationale is that if there is a high percentage of ‘’Yes’’ responses, it is an indication that there are frequent injuries.

‘’High percentage’’ in this case is defined as a percentage that is statistically significantly greater than 50% (0.50). The tables 5.1 and 5.2 below show the analysis of the results.

TABLE: 5.1 Scaffold site management: tests of a single sample proportion

Variable	% Yes	Constant	SE	Z	Critical z (5%)	Conclusion
KAI	0.930	0.50	0.019512	22.04	1.645	Reject null
KA2	0.497	0.50	0.038235	N/A	N/A	N/A
KA3	0.538	0.50	0.038125	1.00	1.645	Cannot reject null
KA4	0.509	0.50	0.03823	0.24	1.645	Cannot reject null
KA5	0.754	0.50	0.032935	7.71	1.645	Reject null

TABLE: 5.2 Scaffold site workers: tests of a single sample proportion

Variable	% Yes	Constant	SE	Z	Critical z (5%)	Conclusion
KCA1	0.600	0.50	0.036515	2.74	1.645	Reject null
KCA2	0.211	0.50	0.030417	N/A	N/A	N/A
KCA3	0.306	0.50	0.034348	N/A	N/A	N/A
CSA1	0.894	0.50	0.022945	17.17	1.645	Reject null
TAS1	0.417	0.50	0.036751	N/A	N/A	N/A
TAS2	0.656	0.50	0.035407	4.41	1.645	Reject null
TAS3	0.500	0.50	0.037268	0.00	1.645	Cannot reject null
TAS4	0.250	0.50	0.032275	N/A	N/A	N/A
AR1	0.522	0.50	0.037232	0.59	1.645	Cannot reject null

Only in cases, z > z (critical). This means that only for those questions the proportion that said 'Yes' is statistically significantly greater than 0.5 or 50%. Where the 'Yes' is less than 0.5 or 50% in the sample, the test cannot be done and is indicated by not applicable (N/A). Table 5.1 above shows that ninety three percent (93%) of the respondents know of a scaffold worker who suffered minor injury/injuries in the workplace. Seventy five percent (75%) of the respondents think scaffold

workers are frequently involved in accidents in the workplace. Both these percentages are statistically significantly greater than 50%.

Table 5.2 above shows that sixty percent (60%) of the respondents know of a worker who have suffered minor injuries. Eighty nine percent (89%) of the respondents agree that lack of supervision causes scaffold accidents. Table 5.2 shows that sixty five percent (65%) of the respondents know of scaffold worker who was hit by scaffold materials. These three percentages are statistically significantly greater than 50%.

Given that there is high percentage of ''Yes'' responses, it can be deduced that the scaffold workers do have accidents and incidents frequently.

Table 5.1 and 5.2 indicate that the hypothesis (that scaffold workers have accidents and incidents frequently) is supported in terms of the five related aspects.

Therefore, overall, the first hypothesis is partially supported.

5.5 TESTING OF HYPOTHESIS TWO

Scaffold workers have construction incidents because of lack of skills and knowledge.

This hypothesis is addressed by slightly different questions in the two questionnaires.

Management questionnaire (ET1): The site does not use knowledgeable and skilled scaffold workers (null hypothesis).

Management questionnaire (ET3): Site accidents are not caused by lack of knowledge and skills among scaffold workers (null hypothesis).

The rationale is that if there is a high percentage of ''Agree'' or ''strongly agree'' responses, it is an indication that the site only uses knowledgeable and skilled workers and accidents are caused by lack of knowledge and skills among scaffold workers.

''High percentage'' in this case is defined as a percentage that is statistically significantly greater than 50% (0.50).

TABLE: 5.3 Scaffold site management: tests of a single sample proportion

Variable	% Agree	Constant	SE	Z	Critical z (5%)	Conclusion
ETI	0.953	0.50	0.016184	27.99	1.645	Reject null
ET3	0.836	0.50	0.028316	11.87	1.645	Reject null

Worker questionnaire (USH1, USH3, and ET3): Scaffold workers do not have knowledge and skills of scaffold work (null hypothesis).

The rationale is that if there is a high percentage of ''Yes'' responses, it is an indication that the scaffold workers do have knowledge and skills of scaffold work.

TABLE: 5.4 Scaffold site workers: tests of a single sample proportion

Variable	% Yes	Constant	SE	Z	Critical z (5%)	Conclusion
USH1	0.983	0.50	0.009635	50.13	1.645	Reject null
USH3	0.517	0.50	0.037246	0.46	1.645	Cannot reject null
ET3	0.978	0.50	0.010933	43.72	1.645	Reject null

Table 5.3 above shows that ninety five percent (95%) of the respondents agree that site uses only knowledgeable and skilled scaffold workers. Eighty three percent (83%) of the respondents agree that site accidents are caused by lack of knowledge and skills among scaffold workers. Both these percentages are statistically significantly greater than 50%.

Table 5.4 above shows that ninety eight percent (98%) of the respondents agree that they know how to use safety harness properly. Ninety seven percent (97%) agree that they have knowledge and skills of scaffold work. Both these percentages are statistically significantly greater than 50%.

Given that there is high percentage of ''Yes'' or ''Agree'' responses, it can be deduced that the lack of skills and knowledge among scaffold incidents do not cause construction incidents and that the scaffold workers have knowledge and skills of scaffold work.

Table 5.3 and 5.4 indicate that the hypothesis is supported in terms of four related aspects.

Therefore, the second hypothesis is partially supported.

5.6 TESTING OF HYPOTHESIS THREE

Management is not fully committed to health and safety management systems (null hypothesis).

Reliability analysis of ''HSMS'' factor. Management questionnaire

Cronbach alpha: 0.87

Average inter-item corr.: 0.46

TABLE: 5.5 Health and Safety Management System: Cronbach alpha

	Item-Total Correl.	Alpha if deleted
HSMS1	0.57	0.87
HSMS2	0.75	0.85
HSMS3	0.46	0.87
HSMS4	0.76	0.85
HSMS5	0.80	0.84
HSMS6	0.65	0.86
HSMS7	0.56	0.87
HSMS8	0.57	0.86
HSMS9	0.5	0.87

Since Cronbach's Alpha is acceptable (>0.7), we can combine the nine variables into one score (e.g mean of the variables) which will then reflect the commitment of site management to HSMS. Since the score is the mean of the nine variables, its scale will be from 1 to 5 where low values indicate low commitment and high values indicate high commitment to HSMS.

To test the hypothesis that management is committed to HSMS, we test whether the mean HSMS score is statistically significantly greater than 3.0 (middle of the scale).

TABLE: 5.6 Scaffold site management: Test of means against reference constant (value)

	Mean	Standard Deviation	N	Reference Constant	t-value	Df	P	Cohen's d	Practical significant
HSMS score	4.59	0.47	171	3	43.93	170	0.0000	3.36	Large

Since $p < 0.05$, the sample mean is statistically significantly greater than 3.0.

Cohen's d is an effect size measure that indicates the practical significance of a finding. Its interpretation is:

< 0.50: Small

0.50 - 0.79: Medium

0.80+: Large

In the Worker questionnaire, MC1, MC2 and MC3 are used to test this hypothesis. The rationale is that if there is a high percentage of ''Yes'' responses, it is an indication that management is committed to HSMS.

TABLE: 5.7 Scaffold site workers: Test of a single sample proportion:

Variable	% Yes	Constant	SE	Z	Critical z	conclusion
MCI	0.889	0.50	0.23414	16.61	1.645	Reject null
MC2	0.850	0.50	0.026615	13.15	1.645	Reject null
MC3	0.861	0.50	0.025785	14.00	1.645	Reject null

Table 5.7 above shows that eighty eight percent (88%) of the respondents agree that Site management shows commitment to health and safety. Eighty five percent (85%) of the respondents agree that Site management visits the work areas frequently. Eighty six percent (86%) of the respondents agree that Site management follows health and safety rules. All three percentages are statistically significantly greater than 50%.

Given that the mean (management questionnaire) HSMS score is statistically significantly greater than 3.0 (Given that the mean score of 4.59 is > 3.00) and (worker questionnaire) there is high percentage of ''Yes'' responses, it can be deduced that management is fully committed to health and safety management systems.

Table 5.6 and 5.7 indicate that the hypothesis is supported in terms of twelve related aspects.

Therefore, the third hypothesis is supported.

5.7 TESTING OF HYPOTHESIS FOUR

Scaffold workers are inexperienced due to a lack of training (null hypothesis).

Reliability analysis of ET2, ET4 and ET5. Management questionnaire

Cronbach alpha: 0.74

Average inter-item corr.: 0.50

TABLE: 5.8 Experience and Training: Reliability analysis

	Item-Totl Correl.	Alpha if deleted
ET2	0.57	0.66
ET4	0.51	0.73
ET5	0.63	0.56

Since Cronbach's Alpha is acceptable (>0.7), we can combine the three variables into one score (e.g mean of the variables) which will then reflect whether only experienced scaffold workers are used. Since the score is the mean of the three variables, its scale will be from 1 to 5 where low values indicate low use and high values indicate high use of experienced scaffold workers.

To test the hypothesis that experienced scaffold workers are used, we test whether the mean ExpWrk_score is statistically significantly greater than 3.0 (middle of the scale).

TABLE: 5.9 Scaffold site management: Test of means against reference constant (value)

	Mean	Standard Deviation	N	Reference Constant	t-value	Df	P	Cohen's d	Practical significant
ExpWrk score	4.47	0.79	171	3	24.20	170	0.0000	1.85	Large

Since p < 0.05, the sample mean is statistically significantly greater than 3.0.

Cohen's d is an effect size measure that indicates the practical significance of a finding. Its interpretation is:

< 0.50: Small

0.50 - 0.79: Medium

0.80+: Large

USH2, ET1, ET2 and ET4 of the Worker questionnaire are used to test this hypothesis. The rationale is that if there is a high percentage of ''Yes'' responses, it is an indication that workers have experience.

''High percentage'' in this case is defined as a percentage that is statistically significantly greater than 50% (0.50).

TABLE: 5.10 Scaffold site workers: Test of a single sample proportion:

Variable	% Yes	Constant	SE	Z	Critical z	conclusion
USH2	0.956	0.50	0.015287	29.83	1.645	Reject null
ET1	0.944	0.50	0.017137	25.91	1.645	Reject null
ET2	0.973	0.50	0.012296	38.39	1.645	Reject null
ET4	0.961	0.50	0.01443	31.95	1.645	Reject null

Table 5.10 above shows that ninety five percent (95%) of the respondents agree that Scaffold training course provides the knowledge and practical skills on how to use safety harness properly. Ninety four percent (94%) of the respondents agree that they have enough experience and proper training to do their work. Ninety seven percent (97%) of the respondents agree they have scaffold training certificates. Ninety six (96%) of the respondents agree that they have right scaffold training certificates. All these percentages are statistically significantly greater than 50%.

Given that the mean (management questionnaire) ExpWrk score is statistically significantly greater than 3.0 (Given that the mean score of 4.47 is > 3.00) and (worker questionnaire) there is high percentage of ‘‘Yes’’ responses, it can be deduced that scaffold contractors use experienced scaffold workers.

Table 5.9 and 5.10 indicate that the hypothesis is supported in terms of all related aspects.

Therefore, the fourth hypothesis that experienced scaffold workers are used is supported

The next chapter presents the conclusions and recommendations based on the empirical findings in Chapter 4.

CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter summaries the findings of the study and restates the aim and objectives. Conclusions drawn from the review of literature and analysis of empirical data. The chapter also presents the recommendations. The chapter highlights the limitations that were encountered during the survey research. The chapter ends with the contribution made by this study and provides directions for future research studies.

6.2 AIM AND OBJECTIVES

The aim of this study was to highlight the types, frequency and causes of accident experienced by the scaffold workers on South African construction sites.

Specific objectives were to determine:

- The level of knowledge and awareness of scaffold contractors with regard to the types and causes of accidents.
- Perceptions with regard to construction accidents affecting scaffold workers.
- The current state of scaffold workers training and experience.
- The scaffold contractor's potential contribution to the construction accidents and
- Recommendations on how to prevent or reduce accidents of scaffolding contractors on construction sites.

6.3 CONCLUSIONS

Based on many findings and subsequent analysis of the findings, a number of conclusions have made.

SUMMARY OF THE DEMOGRAPHIC DATA

The findings in chapter 4, indicate that the majority of the respondents for site scaffold management are males (94%) and (75%) are black,(49%) are Site supervisors between the ages 36-41 , (38%) have between 8 and 10 years' experience in the current position, (57%) possess certificates and(47%) are working on construction sites in Limpopo.

The findings in chapter 4, indicate that the majority of the respondents for site scaffold workers are males(97%) and (98%) are black, (38%) are scaffold fixers/erectors between the ages 30-35 , (27%)

have between 5 and 7 years' experience in the current position, (39%) possess matric certificates and(42%) are working on construction sites in Mpumalanga.

The demographics of the respondents reveal that majority of the site scaffold workers have matric certificates than site scaffold management. This is surprising, particularly because one would expect site management to have minimum matric education for them to be considered for supervision or management positions. The majority of the respondents were working on construction sites in Mpumalanga and Limpopo. This is to be expected because of the current construction of two Power Stations in Mpumalanga and Limpopo.

6.3.1 RESEARCH OBJECTIVE 1

The first research objective was to determine the level of knowledge and awareness of scaffold contractors with regard to the types and causes of accidents.

From the results obtained from the respondents, it is observed that the majority of the respondents think slips, trips and falls, caught in/between objects and struck by objects accidents are common among scaffold contractors on construction sites. The findings show that scaffold workers are not falling from heights very frequently. It is further revealed that majority of the respondents think that scaffold collapse never occur on construction sites. From the literature review it is found that slips, trips and falls are main causes of injuries within scaffolding industry (NASC. 2014, p. 5; NASC. 2014, p. 4). This study recommends that more effort should be made to address the construction sites conditions and worker behaviour causing slipping, tripping and falling hazards.

It also observed that according to the results, dismantling of scaffolding, manual handling and erection of scaffold are the main scaffold activities which contribute to most scaffold accidents affecting scaffold workers. However, modification of scaffold and stacking and storage of scaffolding are least contributors to scaffold accidents. NASC (2015, p. 10) confirms that almost ninety percent (90%) increase in injuries occur during manual handling activity. Buildsafe SA (as cited by Furter, 2013, p. 1) stated that a scaffold worker was hit by a standard when it slipped through the hands of worker who was above him, this happens during the dismantling of scaffold.

It is notable that majority of the respondents strongly think unsafe acts and conditions cause more scaffold accidents than personal and job factors. This is in line with previous studies which indicate that unsafe acts and conditions contribute considerably to construction accidents. From literature review it is found that Industrial accidents can be attributed to unsafe acts and unsafe conditions (Javaid et al. 2015, p. 111). The study acknowledges the impact unsafe acts and unsafe conditions have on scaffold contractors. From the results it can be concluded that respondents do have knowledge and awareness about the types and causes of scaffold accidents.

6.3.2 RESEARCH OBJECTIVE 2

The second research objective was to determine perceptions with regard to construction accidents affecting scaffold workers.

From the results obtained from the respondents, it is shown that scaffold workers suffer minor injuries and are frequently involved in the scaffold accident and majority of them do not know of a scaffold worker who has died because of scaffold accidents. However, minority of the scaffold workers do know of a scaffold worker who suffered serious injuries. It is concluded that scaffold workers in the main, are prone to minor injuries. It is worth noting that only minority of the scaffold workers have suffered minor injuries themselves. The study also concludes that scaffold workers are not experiencing high rates of fatal and serious injuries.

It is observed that scaffold labourers and scaffold erectors/fixers are mostly affected by the scaffold accidents. Scaffold team leaders/charge hands and scaffold inspectors are least affected by the scaffold accidents. NASC 2014 Safety Report (2014, p. 12) shows that scaffold labourers contributed thirty three percent (33%) to the number of accidents experienced by the scaffold industry, while advanced scaffolders suffered seven percent (7%) and also supervisors contributed seven percent (7%). It can be concluded that the scaffold inspectors suffer the least accidents than scaffold labourers and fixers/erectors because of the nature of work done. The scaffold inspectors inspect the erected scaffolding and seldom does the manual work.

6.3.3 RESEARCH OBJECTIVE 3

The third research objective was to determine current state of scaffold workers training and experience.

From the results obtained from the respondents, it is shown that majority of the respondents have scaffold training certificate, experience and training. It is further observed that scaffold workers are appointed based on scaffold work experience and relevant training. Findings indicate that eight percent (8%) of the site scaffold site management do not have scaffold training certificates at all while only three point five percent (3.5%) of the scaffold workers do not have scaffold training certificates. The conclusions indicate that scaffold training plays a key role in improving worker capability and skills.

Nevertheless, it is revealed that some of the scaffold workers learnt how to use safety harness by themselves, which indicates more effort has to be placed on the practical aspect of the training. This points to the ineffectiveness of a scaffold module one training to equip the scaffold workers with the necessary practical skills on how to use safety harness properly or the fact that scaffold workers are sometimes employed and sent to construction sites without having attended scaffold training module one. This training is meant to equip the new workers with the inspection and wearing of safety harness. According to Occupational Safety and Health Branch Labour Department (2014, p. 8) an untrained scaffold worker was erecting a scaffold when a scaffold overturned and he fell to his death. A

summary is made that in general scaffold training require regular review, evaluation and updating in order to improve the content of the training and also to sharpen the skills of the scaffold workers.

Majority of the respondents have between 8 to 10 years ((30%) of site management) and between 5 to 7 years ((27%) of site workers) experience on the current position. This indicates that scaffold workers have on average over five years work experience. It is concluded that most site scaffold workers have sufficient work experience and this assures the quality of work performed by these scaffold workers. Notably, the study concluded that scaffold site managers, supervisors and health and safety practitioners do not have scaffold specific training.

6.3.4 RESEARCH OBJECTIVE 4

The fourth research objective was to make recommendations on how to prevent or reduce accidents of scaffolding contractors on construction sites.

Appointments of scaffold team leaders or charge hands as mentors to guide scaffold labourers.

Adding the requirement of matric certificates for all site scaffold management appointees

Providing formal scaffold training to all site scaffold management (site supervisors, health and safety practitioners and site managers.

And more recommendations to follow in the recommendations section (6.5) below.

6.4 LIMITATIONS

The literature review reveals that limited research, regarding the scaffold accidents relative to South African construction, has been conducted in the South African construction industry.

Previous studies have focused mainly on the general construction industry accident not specifically scaffold contractors' accidents.

Some challenges faced during the research was to get the respondents to participate in the study. For instance, some of the respondents thought the information provided would be used by their own organisations and this might disadvantage them.

Another limitation was that the Department of Labour Health and Safety Inspectors did not respond to the questionnaire.

A further limitation was the use of purposive sampling technique. This technique advocates only for respondents who because of their likely experience, knowledge and understanding of construction accidents that affect scaffold workers.

6.5 RECOMMENDATIONS

Based on the many findings and the subsequent analysis of the findings, the study makes the following recommendations.

6.5.1 SCAFFOLD CONTRATORS

From the research findings and conclusions, it is clear that the South African scaffold contractors need to review module one scaffold training to emphasis the need of practical use of harness safety during training.

The scaffold contractors together with the training service providers need to review all scaffold training modules to ensure that the practical aspect of using safety harness is included and implemented.

The scaffold contractors to establish national access and scaffolding association which will set the safety standard among scaffold contractors. (One of its functions being to record all accidents affecting scaffold contractors)

It is recommended that appropriate scaffold training certificate requirement be met before any scaffold worker is appointed into either scaffold labourer, scaffold fixers/erectors, team leaders/ charge hands or scaffold inspectors positions.

It is recommended that scaffold contractors develop a system where unsafe acts and conditions are captured and analysed to prevent possible accidents.

It is recommended that all scaffold workers need to receive scaffold refresher training after every two years in order to keep abreast with latest technological, industry, specialist and legislative developments.

6.5.2 DEPARTMENT OF LABOUR

The department of labour needs to categorise the occupational injuries and illnesses occurring on construction sites in terms of discipline such as producing general accident data and more specific accident data: for example, scaffold contractors accident data, civil contractors accident, mechanical contractors accidents and so forth. This will be useful in determining which discipline contributes more construction accidents.

Department of labour to publish construction occupational fatalities, injuries and illnesses on annual basis.

6.5.3 CONSTRUCTION INDUSTRY

The construction industry at large must engage scaffold contractors to create a construction industry occupational accident register and an incident database focusing on construction scaffold contractors. This will be useful for incident analysis and accident prevention purposes.

It is proposed that the Institute for Work at Height (IWH) need to consider registering occupational injuries, illness and fatalities for all registered working at heights organisations (This will be the same function that NASC performs in the United Kingdom).

6.6 CONTRIBUTION MADE BY THIS STUDY

The research brings forth the types and causes of accidents that affect scaffold workers on construction sites.

The study reveals the type of scaffold workers which are mostly affected by the scaffold construction accidents.

It further reveals the type of scaffold activities which contribute to the most scaffold accidents.

6.7 DIRECTIONS FOR FUTURE RESEARCH

Future studies should focus on why scaffold labourers suffer injuries and why most scaffold accidents occur during dismantling, manual handling and erection of scaffolding.

Study to investigate the effectiveness of scaffold training for scaffold labourers and scaffold fixers/erectors.

An in-depth qualitative research approach may be adopted to investigate why scaffold labourers suffer injuries and why most scaffold accidents occur during dismantling, manual handling and erection.

REFERENCE LIST

Adesola, M.A., Oyeniyi, K.O & Adeyeni, M.A. 2013. Emperical Study of the Relationship between Staff Training and Job Satisfaction among Nigeria Banks Employees. International Journal of Academic Research in Economics and Management Sciences. November 2013. Vol. 2. No. 6. (online) Available from: http:// www. hrmars.com/ journals. [accessed 6 October 2016]. ISSN: 2226-3624.

Agbola, M.R. 2012. Impact Health and Safety Management on Employee Safety at the Ghana Ports and Harbour Authority. Developing Country Studies. Vol. 2. No. 9. online) Available from: http:// www. Iiste.org. [accessed 26 October 2016]. ISSN: 2225-0565.

Antwi, K.S & Hamza, K. 2015. Qualitative and Quantitative Research Paradigms in Business Research: A Philosophical Reflections. European Journal of Business and Management. Vol. 1. No. 3. (online) Available from: http://www.iiste.org [accessed 29 November 2016}. ISSN 2222-2839.

Atieno, P.O. 2009. An Analysis of the Strengths and limitation of Qualitative and Quantitative Research Paradigms. Problems of Education in the 21st Century. Vol. 13 . (online) Available from: http://www.wust.ac.ke [accessed 10 January 2017}.

Bhattacherjee, A. 2012. Social Science Research: Principles, Methods and Practices. 2th edition. Textbooks collection. University of South Florida. (online) Available from: http://www scholarcommons.usf.edu/oa-textbooks.[accessed 10 January 2017}.

Benjamin, O.A. 2008. Fundamental Principles of Occupational Health and Safety. 2nd Edition. International Labour Office. Geneva. ILO.

British Safety Council. 2009. The Causes and Incidence of Occupational Accidents and ill health across the Globe. Active Research. Karen Pearson. BSC Copyright.

British Safety Industry. 2007. Occupational Health and Safety Management Series. BSI. ISBN 9780580594045

Bureau of Labor Statistics. 2010. News Release: National Census of Fatal Occupational Injuries in 2009 (Preliminary Results). U.S. Department of Labor.

Bureau of Labor Statistics. 2013. Annual Census of Maine's Fatal Occupational Injuries. U.S. Department of Labor.

Bureau of Labor Statistics. 2015. News Release: National Census of Fatal Occupational Injuries in 2014 (Preliminary Results). U.S. Department of Labor.

Caruth, D.G. 2013. Demystifying Mixed Methods Research Design: A Review of Literature. Mevlana International Journal of Education. Vol 3. No 2, pp. 112-122.

Castellan, M.C. 2010. Quantitative and Qualitative Research: A View for Clarity. International Journal of Education. Vol 2. No 2. Macrothink Institute.

Charehzehi, A & Ahankoob, A. 2012. Enhancement of Safety Performance at Construction Site. International Journal of Advances in Engineering and Technology. ISSN: 2231-1963.

CHE Hassan, C.R., Basha, W.H & Wan Hanafi, W.H. 2007. Perception of Building Construction Workers towards Safety, Health and Environment. Journal of Engineering Science and Technology, 2(3), pp.271-279.

Choi, D.S. 2015. Aging Workers and Trade-Related Injuries in the US Construction Industry. Safety and Health at Work. 6, pp.151-155.

Choy, T.L. 2014. The Strengths and Weakness of Research Methodology: Comparison and Complimentary between Quantitative and Qualitative Approaches. Journal of Humanity and Social Science. Vol 19. Issue 4. pp. 99-104. (online) Available from: http:// www.iosrjournals.org. [accessed 6 October 2016].

Construction Industry Development Board (CIDB). 2009. Construction Health and Safety in South Africa: Status and Recommendations. (online). South Africa. Available from: http://www.cidb.org.za [accessed 29 April 2016).

Creswell, W.J. 2009. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. Third Edition. Los Angeles. Sage publications. (online). Available from http//www. sagepublicaitons.com [Accessed 03 December 2016].

Department of Higher Education and Training. 2013b. Organising framework for occupations: Version 2012. Pretoria. DHET . (online) Available from: http:// www. dhet.gov.za/publications/OFO Guideline-2012 [accessed 6 March 2017].

Devetak, I., Glazar, A.S & Vogrinc, J. 2010. The Role of Qualitative Research in Science Education. Eurasia Journal of Mathematics, Science & Technology Education. 6 (1). pp 77-84. (online) Available from: http:// www.ejmste.com. [accessed 6 October 2016].

Devi, R.V & Shaik, A.N. 2012. Training & Development – A Jump Starter for Employee Performance and Organisation Effectiveness. International Journal of Social Science & Interdisciplinary Research. Vol.1. Issue. 7. ISSN 2277-3630.

Dieronitou, I. 2014. The Ontological and Epistemological Foundations of Qualitative and Quantitative Approaches to Research: With Particular Reference to Content and Discourse Analysis of Textbook. International Journal of Economics Commerce and Management. Vol. 11. Issue. 10. (online) Available from: http:// www. ijecm.co.uk. [accessed 6 December 2016].

Drost, A. E. 2011. Validity and Reliability in Social Science Research. Journal Education Research and Perspective. Vol. 38. No. 1

Etikan, I., Musa, A.S & Alkassim, S. 2016. Comparison of Convenience Sampling and Purposive Sampling. American Journal of Theoritical and Applied Statistics. Vol.5.1. No 1.4 (online) Available from: http:// www.sciencepublishingroup.com/j/ajtas. [accessed 6 October 2016].

Farouqui, U., Ahmed, M.S & Azhar, S. 2008. Implementing a Pedestrian Safety System on Construction Work Sites. Sixth LACCEI International Latin American and Caribbean Conference for Engineering and Technology (LACCEI 2008)''Partnering to Success: Engineering Education, Research and Development''June 4-June 6 2008, Tegucigalpa, Honduras.

FEMA. 2016. Federated Employer's Mutual Assurance Company Limited. Homepage (online) Available from: http// www. Fema.co.za. about fem/accident statistics. [Accessed 01 August 2016].

Furter, E. 2013. Scaffolding dismantling injury, response and law: Health and Safety Article (online). Available from: http// www. Sheqafrica.com. 7 October. [Accessed 01 August 2016].

Gamage, N.P & Imbulana, L. 2013. Training and Development and Performance of Employees: Evidence from SRI Lanka Telecom. International Journal of Marketing, Financial Services & Management Research . Vol 2. No. 9. September (online). ISSN 2277-3622. Available from: http// www. Indianresearchjournal.com. [Accessed 01 November 2016].

Ghosh, S & Bhattacharjee, S. 2013. A Systematic Review of Research Papers on Construction Education and Research: 2000-2011, 49th ASC Annual International Conference Proceedings. The Associated Schools of Construction.

Grant, A & Hinze, J. 2013. Underlaying Causal Facts associated with Construction Worker Fatalities involving Stepladders. Australasian Journal of Construction Economics and Building 13(1). pp. 13-22.

Hadikusumo, W.H.B & Aksorn. 2007. The Unsafe Acts and the Decision-to-Err Factors of Thai Construction Workers. Journal of Construction in Developing Countries. Vol 12. No 1.

Health and Safety Executive (HSE). 2007(a). Manual Handling Training: Investigation of current practices and development of guidelines.RR583 Research Report. London. Health and Safety Laboratory. Health and Safety Executive.

Health and Safety Executive (HSE). 2007 (b). Occupational Health Standards in the Construction Industry RR584 Research Report. London. Health and Safety Laboratory. Health and Safety Executive.

Health and Safety Executive. (HSE). 2009. Successful Health and Safety Management. London. Health and Safety Executive. ISBN 9780717612765

Health and Safety Executive. (HSE). 2010. Tower Crane Incidents Worldwide. RR 820 Research Report. London. Health and Safety Executive.

Health and Safety Executive. (HSE). 2011. Workplace Fatal Injury Statistics 2010/11. Health and Safety Executive Board: HSE/11/49. London. Health and Safety Executive.

Health and Safety Executive. (HSE). 2012. A Review of the Literature on Effective Leadership Behaviours for Safety. RR 952 Research Report. London. Health and Safety Executive.

Health and Safety Executive (HSE). 2014. Press Release (online): scaffolding boss jailed for worker death: Available from http//www.HSE.gov.uk [Accessed 01 August 2016].

Health and Safety Executive (HSE). 2014. Statistics on Fatal Injuries in the Workplace in the Great Britain, 2014/2015. London. Health and Safety Executive.

Health and Safety Executive (HSE). 2015. Health and Safety Construction Sector in the Great Britain, 2014/2015. London. Health and Safety Executive.

Health and Safety Executive (HSE). 2015. Kinds of Accidents in the Great Britain, 2014/2015. London. Health and Safety Executive.

Health and Safety Executive (HSE). 2015. Statistics on Fatal Injuries in the Workplace in Great Britain: Full year details and technical notes. London. Health and Safety Executive.

Health and Safety Executive (HSE). 2016. Statistics on Fatal Injuries in the Workplace in Great Britain 2016: Full year details and technical notes. London. Health and Safety Executive.

Higgins, E.G. 2009. Quantitative versus Qualitative Methods: Understanding why Qualitative Methods are Predominant in Criminology and Criminal Justice. Journal of Theoretical and Philosophical Criminology. Vol. 1 (1).

ILO. 2015. Investigation of Occupational Accidents and Diseases: (online): A Practical Guide for Labour Inspectors. Geneva. International Labour Organisation. (online) Available from http//www.ilo.org/publns. {Accessed 27 November 2016}.

Jackson, S.E., Schuler, R.S & Werner, S. 2009. Managing Human Resources. 10th Edition. South Western. Cengage Learning.

Jacobs, A. 2010. Health and Safety in South African Construction: Status Quo. Proceedings 5th. Built Environment Conferences. Durban. ISBN 978-0-620-467032.

Javaid, V.M., Isha, N.S.A., Shazali, Z & Langove, N. 2015. Psychosocial Stressors in Relation to Unsafe Acts. International Review of Management and Marketing.

Jayashree, S., Malaruizhi, A. C., Mayel, S & Rasti, A. 2015. Significance of Top Management Commitment on the Implementation of ISO 14000 EMS towards Sustainability. Middle-East Journal of Scientific Research.Vol 23. No. 12: ISSN 1990 – 9233.

Johnson, B.R., Onwvegbuzie, J.A & Turner, A.L. 2007. Toward a Definition of Mixed Methods Research. Journal of Mixed Methods Research. Vol. No. 2. (online) Available from: http// www. mmr.sagepub.com/cgi/content/abstract/11/2/112 [Accessed 01 August 2016].

Jonker, J & Pennink, B. 2010. The Essence of Research Methodology: A Concise Guide for Master and PHD Studies in Management Science. Springer. Heidelberg. e-ISBN: 978—71659-4.

Kadiri, Z.O., Nden, T., Aure, G.K., Oladipo, T.O., Edom, A & Samuel, P.O. 2014. Causes and Effects of Accidents on Construction Sites: A Case Study of Some Selected Construction Firms in Abuja F.C.T Nigeria. Journal of Mechanical and Civil Enginnering.11 (5), pp. 66-72.

Khan, G.A.R., Khan, A.F & Khan, A.M. 2011. Impact of Training and Development on Organisation Performance. Global Journal of Management and Business Research. Vol 11. Issue No. 7. USA. Global Journals Inc.

Khdair, A.W., Shamsudin, M & Subramanim, M.F. 2011. Improving Safety Performance by Understanding Relationship Between Management Practices and Leadership Behavior in the Oil and Gas Industry in IRAQ: A Proposed Model. International Conference on Management and Artificial Intelligence. IPEDR. Vol.6. IACSIT Press. Bali. Indonesia.

Kheni, N.A., Gibb, A.G.F & Dainty, A.D.F. 2006. Management of Construction Site Health and Safety by Small and Medium Sized Construction Business in Developing Countries: A Ghana Case Study. Boyd, D (Ed) Procs 22th Annual Arcom Conference, 4-6 September 2006. Birminghan. UK, Association of Researchers in Construction Management. 273-282.

Kirsten, H.W. 2011. Human Resource Training N6: A Practical Approach for Colleges in South Africa. 4th Edition. Braamfontein. South Africa. Future Managers. ISBN 9781919786117.

Kirsten, H.W. 2012. Human Resource Management- N5. 7th Edition. Braamfontein. South Africa. Future Managers. ISBN 9781919740249.

Kumar, S & Bansal, V.K. 2013. Construction Safety Knowledge for Practitioners in the Construction Industry. Journal of Frontiers in Construction Engineering.2 (2), pp. 34-42.

Latief, Y., Suraji, A., Nugroho, S.Y & Arifuddin, R. 2011.The Nature of Fall Accidents in Construction Projects: A Case of Indonesia. International Journal of Civil & Environmental Engineering. 11 (05), pp. 80-84.

Leedy, D.P & Ormrod, E.J. 2010. Practical Research: Planning and Design. 9th Edition. New York. Pearson. ISBN: 0-558-65200-X.

Lexis Nexis. 2014. Training Manual. Incident Management IH-I DayIMAC. 1st Edition. Durban. Lexis Nexis.

Lexis Nexis. 2015. Occupational Health and Safety No 85 of 1993 and Regulations. 14th Edition. Durban. Lexis Nexis. ISBN 97804091236570.

Ligade, A.S & Thalange, S.B. 2013. Occupational Health and Safety Management System (OHSMS) Model for Construction Industry. International Journal of Research in Engineering and Technology. (online) Available from: http// www. ijret. org. [Accessed 01 October 2016].

Manjula, K.A & Karthikeyan, P. 2010. Research Framework: Paradigms in Information Science Research. Global Journal of Management and Business Research. Vol.10. Issue. 5.

Mahmoudi, S., Ghasemi, F., Mohammadfam, I & Soleimani, E. 2014. Framework for continuous assessment and improvement of occupational health and safety issues in construction companies. Safety and Health at Work. Vol 5. pp. 125-130.

Maureen, S. 2011. Researching Intuition: Quantitative, Qualitative or Mixed Method: JOE Journal of Epistemology. Vol. 1. Issue. 2. (online) Available from: http//www.joe.org. [accessed 29 November 2016}.

Mbuvi, M.I., Kinyua. R & Mugambi, F. 2015. Near Miss Incident Management, The Root for an Effective Workplace Safety is determined by the Management Commitment. International Journal of Scientific Research Publications. Vol. 5. Issue. 19. (online) Available from: http// www. ijsrp. org. [Accessed 25 October 2016].

Media Club South Africa. 2013. South Africa's Economy: Key Sectors. Article (online). Available from http//www.mediaclubsouthafrica.com [Accessed 03 August 2016].

Moffatt, S. 2015. Contextualizing Scientific Research Methodology. Journal of Research & Method in Education. Vol. 5. Issue. 6. Pp. 52-57. Article (online). Available from http//www. iosrjournals.org. [Accessed 03 November 2016]. ISSN 2320-7388.

Monfared, H.J & Derakhshan, H. 2015. The Comparison of Qualitative and Quantitative Research. Indian Journal of Fundamental and Applied Life Sciences. Vol.5. Issue. 2. Pp. 1111-1117. Available from: http://www.cibtech.org/sp-ed/jls [accessed 28 November 2016). ISSN 2231-6345.

NASC. 2013. Safety Report 2013. Maintaining High Standard in Scaffolding. online). Available from http//www.nasc.org.uk/…/NASC_Safety_Report_2013 [Accessed 30 December 2016].

NASC. 2014. Safety Report 2014. Maintaining High Standard in Scaffolding. online). Available from http//www.nasc.org.uk/…/NASC_Safety_Report_2014 [Accessed 30 December 2016].

NASC. 2017. Safety Report 2017. Maintaining High Standard in Scaffolding. online). Available from http//www.nasc.org.uk/…/NASC_Safety_Report_2017 [Accessed 30 December 2016].

National Institute for Health Research (NIHR). 2009. Surveys and Questionnaires. The NINR Research Design Service for the East Midlands. (online). Available from http//www. rds-eastmidlands.nihr.ac.uk [Accessed 30 December 2016].

National Safety Council. 2012. ANSI/ASSE American National Standard for Occupational Health and Safety Management Systems. (online) . Available from: http://www.ncs.org/ANSI-ASSE-215-1-2012-p383 [accessed 28 November 2016).

NOSA. 2012. Incident Commander: Incident Investigation Level Three. 4st edition. PM 30003. NOSA. NOSA (PTY) LTD.

NOSA. 2016. Participant manual: Root cause analysis training. 1st edition. NOSA. NOSA (PTY) LTD.

Occupational Risk. 2010. Health, Safety & Environment. 3SMedia. Vol 1, No 11. June 2010.

Occupational Safety and Health Branch Labour Department. 2014. A Casebook of Fatal Accidents Related to Work- at- Height.online .Available from: http://www.labour.gov.hk/eng/public/content2-8d. htm. {accessed 28 November 2016}.

Okorie, V., Emuze, F., Smallwood, J & Van Wyk, J. 2014. Qualitative Review of Health and Safety Leadership Roles of Managers in South African Construction. Journal of Construction Project Management and Innovation. 4(2). pp. 950-965.

Onyango, W.J & Wanyoike, M.D. 2014. Effects of Training of Employee Performance: A Survey of Health Workers in Siaya County Kenya. European Journal of Medical Sciences. Vol. 1. No. 1. Pp 11-15. (online) Available from: http// www. ea-journals. org. [Accessed 01 August 2016].

Pandey, P & Pandey, M.M. 2015. Research Methodology: Tools and Techniques. Romania. Bridge Center. ISBN. 978-606-93—502-7-0.

Pwc. 2013. SA Construction: highlighting trends in the South African construction industry. First edition. (online). South Africa. Available from: https://www.pwc.co.za. [Accessed 02 August 2016].

Safe Work Australia. 2013. Work- Related Injuries and Fatalities Involving a Fall from Height. (online) Australia. October 2013. Available from: http// www. saw.gov.au/…/documents/812/falls-from-height [accessed 01 August 2016].

Safe Work Australia. 2014. Key Work Health and Safety Statistics, Australia. (online) . Available from: http// www. swa.gov.au/…/documents/812/falls-from-height [accessed 29 November 2016].

Safety & Rights. 2015. Workplace Deaths in Bangladesh in 2014: Including National Occupational Health and Safety Policy 2013. Safety and Rights Society. (online) Available from: http// www. Safetyand rights.gov [accessed 19 December 2016].

SABS. 2004. SANS 10085. The Design, Erection, Use and Inspection of Access Scaffolding. 1st Edition. Pretoria. SABS Standards Division.

SABS. 2011. SANS OHSAS 18001. Occupational health and safety management systems-Requirements. 1st Edition. Pretoria. SABS Standards Division. ISBN 9780626253363.

SACPCMP. 2013. Registration Rules for Construction Health and Safety Agents in terms of Section 18 (1) c of the project and construction management professions Act, Act No 48 of 2000. Midrand.

SACPCMP. 2011. Annual Report: 2010/11. South African Council for the Project and Construction Management Professions. Midrand.

Scotland, J. 2012. Exploring the Philosophical Underpinnings of Research: Relating Ontology and Epistemology to the Methodology and Methods of the Scientific, Interpretive and Critical Research Paradigms. English Language Teaching. Vol. 5. No. 9. Canadian Center of Science and Education. (online) Available from: http//www.ccsenet.org/elt. [accessed 29 November 2016}. ISSN 1916 – 4742.

Sekara, U & Bougie, R. 2013. Research Methods for Business: A Skill Building Approach. 6th edition. Chichester. John Wiley & Sons Ltd.

Shaheen, A., Naqui, H.M.S & Khan, A.M. 2013. Employees Training and Organizational Performance: Mediation by Employees Performance Interdisciplinary. Journal of Contemporary Research in Business. (online) Available from: http// www. Ijcrb. webs.com. [accessed 19 December 2016].

Singh, A.S & Masuku, M.B. 2014. Sampling Techniques & Determination of Sample Size in Applied Statistics Research: An Overview. International Journal of Economics, Commerce and Management. Vol II. Issue. 11. (online) Available from: http// www. ijecm. co.uk [accessed 19 December 2016]. ISSN 23480386.

Smallwood, J.J. 2012. Construction H&S: The future. Kwazulu-Natal. Master Builders Association. Durban. South Africa. (online) Available from: http// www.masterbuilders.co.za/.../KZNMB_OH_S_Forum_110612_Smallwood. [accessed 19 December 2016].

Smith, M.S & Albaum, S.G. 2012. Basic Marketing Research: Volume 1. Handbook for Research Professionals. ISBN 9780984932871.

Soiferman, K. L. 2010. Compare and Contrast Inductive and Deductive Research Approaches. Inductive and Deductive Research Approaches. University of Manitoba.

Sousa, D.V., Driessnack & Costa Mendes, A.L. 2007. An Overview of Research Designs Relevant to Nursing: Part 1: Quantitative research designs. The University of Iowa's institutional repository (online).). Available from http//www. Uiowa. Edu [Accessed 07 October 2016].

Statistics South Africa. 2014. Gross Domestic Product: Second Quarter. Statistical Release P0441. Pretoria: Statistics South Africa. (online) Available from http//statssa.gov.za/publications/P0441/P0441ndQuarter2014. {Accessed 27 November 2016}.

Statistics South Africa. 2013. Quarterly labour force survey: Fourth Quarter. Statistical Release P0211. Pretoria: Statistics South Africa. (online) Available from http//statssa.gov.za/publications/P0211/P0211ndQuarter2014. {Accessed 27 November 2016}.

Statistics South Africa. 2014. Quarterly labour force survey: Fourth Quarter. Statistical Release P0211. Pretoria: Statistics South Africa. (online) Available from http//statssa.gov.za/publications/P0211/P0211ndQuarter2014. {Accessed 27 November 2016}.

Subramani, T & Lordsonmillar. 2014. Safety Management Analysis in Construction Industry. Journal of Engineering Research and Application. Vol. 4. Issue. 6. Pp. 117-120. (online) Available from: http//www.ijera.com. [accessed 29 November 2016}. ISSN 2248-9622.

Taswell, K & Wingfield-Digby, P. 2008. Occupational Injuries Statistics from Household Surveys and Establishment Surveys: An ILO Manual on Methods. Geneva. International Labour Organisation. (online) Available from http//www.ilo.org. {Accessed 27 November 2016}.

Tewksburg, R. 2009. Qualitative versus Quantitative Methods: Understanding why qualitative methods are superior for criminology and criminal justice. Journal of Theoretical and Philosophical Criminology. Vol 1 (1), pp. 38-55.

Thanh, C.N & Thanh, T.T. 2015. The Interaction between Interpretivist Paradigm and Qualitative Methods in Education. American Journal of Educational Science. (online).). Available from http//www. aiscience.org/journal/ajes [Accessed 07 January 2017].

The Construction Chart Book. 2013. The U.S Construction Industry and Its Workers. Fifth edition. The Center of Construction Training and Research (CPWR) April 2013. Available from http://www.cpwr.com/resources-publicatins/construction-chart-book. [Accessed 02 August 2016].

The Republic of South Africa; Basic Condition of Employment Act No 55 of 1998. Government Printer, Pretoria. (online) Available from http//www. gpw.gov. [Accessed 07 August 2016].

The Republic of South Africa; Compensation for Occupational Injuries and Diseases Act No 130 of 1993. Government Printer, Pretoria. (online) Available from http//www. gpw.gov. [Accessed 07 August 2016].

The Republic of South Africa; Constitution of Republic of South Africa 1996. Government Printer, Pretoria. (online) Available from http//www. gpw.gov. [Accessed 07 August 2016].

The Republic of South Africa; Labour Relations Act No 66 of 1996. Government Printer, Pretoria. (online) Available from http//www. gpw.gov. [Accessed 07 August 2016].

The Republic of South Africa; Mine Health and Safety Act No 29 of 1996. Government Printer, Pretoria. (online) Available from http//www. gpw.gov. [Accessed 07 August 2016]

The Republic of South Africa; Occupational Health and Safety Act No 85 of 1993. Government Printer, Pretoria. (online) Available from http//www. gpw.gov. [Accessed 07 August 2016].

Umeokafor, N., Umeadi, B & Issac, D. 2014. Determinants of Compliance With Health and Safety Regulations in Nigeria's Construction Industry. Journal of Construction Project Management and Innovation. 4 (s1), pp. 882-899.

Washington State Department of Labor & Industry. 2015. Work Related Fatalities Report. (online) Available from: http// www.ini.wa.gove/safety/research. SHARP@Lni.wa.gov. Publication No: 93-01-2016. [Accessed 01 August 2016].

Weru, W.J., Iravo, M.A & Sakwa, M. 2013. The Relationship between Training and Development on Performance of State Owned Corporations. International Journal of Academic Research in Business and Social Sciences. Vol. 3. No. 9. ISSN: 2222-6990. (online). Available from: http// www.hrmars.com. September 2013. [Accessed 09 January 2017].

Wiliams, C. 2007. Research Methods. Journal of Business & Economic Research. Vol 5. No 3.

Workplace safety and health Institute. 2014. Workplace Health and Safety Report National Statistics. (online). Available from http//www. wshI. Gov. [Accessed 07 October 2016].

Workplace Safety & Prevention Services. 2013. Articles. (online). Available from: http// www.wsps.com. 09 March. [Accessed 01 August 2016].

Work Safe Alberta. 2014. Workplace Incident Fatalities Investigated in 2014. Alberta Government. (online). Available from http//www. wsa. gov. [Accessed 28 October 2016].

Yoon, S.J., Lin, K.H., Chen.G., Yi.S., Choi.J & Rui, Z . 2013. Effects of Occupational Health and Safety Management System on Work-Related Accident Rate and Differences of Occupational Health and Safety Management Systems Awareness between Managers in South Korea's Construction Industry. Safety and Health at Work Journal .Vol 4. pp. 201-209.

Zohrabi, M. 2013. Mixed Method Research: Instruments, Validity, Reliability and Reporting Findings. Theory and Practice in Language Studies. Vol. 3. No. 2. Pp. 254-262. Academy Publisher. ISSN 1799-2591.

ANNEXURE 1: SCAFFOLD SITE MANAGEMENT QUESTIONNAIRE

• PO Box 77000 • Nelson Mandela Metropolitan University
• Port Elizabeth • 6031 • South Africa • www.nmmu.ac.za

Nelson Mandela Metropolitan University
for tomorrow

DEPARTMENT OF CONSTRUCTION MANAGEMENT

April 2017

ANNEXURE 1

TO WHOM IT MAY CONCERN

Dear Sir. / Madam. / Dr. / Prof

LETTER OF INVITATION FOR RESEARCH SURVEY

We invite you to take a few moments of your time to assist with this research project. Please find together with this letter, a questionnaire that we would like you to complete. The current research forms part of a MSc Degree Study being conducted in the Faculty of Engineering, Information Technology and Built Environment at Nelson Mandela Metropolitan University. This research is under the supervision of Dr F. Geminiani. The research topic is." **Scaffold Accidents Relative to South African Construction".**

As part of the research aims, we would appreciate your comments / reply's in terms of the types, causes and frequency of construction accidents which affect scaffold workers. This questionnaire has been designed based on the Researcher and health and safety literature review indicators. We would value your inputs. Your contributions will add value to the expansion of knowledge and importantly to the South African construction industry and the economy in general. Your participation is voluntary and anonymous.

The questionnaire is designed towards site scaffold supervisors, site scaffold management, site scaffold health and safety practitioners and health and safety inspector who have pertinent information regarding frequency of scaffold accidents on construction sites. The answering of the questionnaires will take approximately 20 minutes.

You are assured of complete confidentiality and privacy. A copy of the findings of the study will be available once completed. Please answer the questions so as to help us improve construction health and safety performance.

Thanking you in advance

Mr Ndaleni Rantsatsi
MSc Degree Scholar
Cell Number : 0769008906
Email Address : s217106285@nmmu.ac.za or rphinias123@gmail.com

Dr. Franco Geminiani: Supervisor
Dept. Building and Human Settlement Development
Phone Number : 041 504 3203
Fax Number : 041 504 9023
Email Address : franco.geminiani@nmmu.ac.za

SCAFFOLD ACCIDENTS RELATIVE TO SOUTH AFRICAN CONSTRUCTION

We would like to invite you to take part in this research project, please complete the following questionnaire. The current research is an MSc Degree Study being conducted in the Faculty of Engineering, Information Technology and Built Environment at Nelson Mandela Metropolitan University.

SECTION A (BACKGROUND OF THE RESPONDENT)

Please tick the appropriate box when answering the questions.

1. What is your role on site?

Site supervisor		Site management		Health and safety practitioner		Health and safety inspector		other	

2. What is your experience in the current position?

0-2 year /years		2-4 years		5-7 years		8-10 years		10-15 years		15-20 years		20 years and over	

3. What is your gender?

Male		Female	

4. What is your age?

18-23 years		24-29 years		30-35 years		36-41 years		42-49 years		50 years and over	

5. What is your race?

Black		Asian/Indian		White		Coloured		Other	

6. Where is your construction site situated? (Please tick only one province)

Eastern Cape Province		Mpumalanga Province	
Free State Province		North West Province	
Gauteng Province		Northern Cape Province	
KwaZulu Natal Province		Western Cape Province	
Limpopo Province		unsure	

7. What is your highest education qualification? (Please tick only the highest you have)

Doctorate degree		Certificate	
Masters degree		Matric	
Honours/B Tech/ Degree		Less than matric	
National Diploma			

SECTION B:

1 .Knowledge of Construction Accidents. (Please tick the appropriate box)

KA1. I know of at least one scaffold worker who suffered minor injury/injuries in the workplace.

YES		NO	

KA2. I have at least been involved in a serious accident in the workplace.

YES		NO	

KA3. I know of at least one scaffold worker who suffered serious injury/injuries while doing his/her work.

YES		NO	

KA4. I have at least suffered minor injury/injuries myself in the workplace.

YES		NO	

KA5. I think scaffold workers are frequently involved in accidents in the workplace.

YES		NO		I DO NOT KNOW	

2. The following construction accidents occur on my site affecting scaffold workers. (Please tick only one option for each statement)

Frequency of Accident		Very frequent	Frequent	Moderate	Seldom	Never
Type of Accident(TA)						
TA1	Falling from heights					
TA2	Caught in /between objects					
TA3	Struck by / hit by objects					
TA4	Scaffold collapse					
TA5	Slips, trips and falls					

3. The following causes of accident mostly contribute to the scaffold construction accidents. (**Please tick only one option for each statement**)

Knowledge of Accident		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Causes of Accident (CA)						
CA1	Job factors					
CA2	Personal factors					
CA3	Unsafe conditions					
CA4	Unsafe acts					

4. The following scaffold activities contribute to the most accidents. (**Please tick only one option for each statement**)

Knowledge of Accident		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Scaffold Activity (SA)						
SA1	Modification of scaffolding					
SA2	Stacking and storage of scaffolding					
SA3	Dismantling of scaffolding					
SA4	Scaffolding manual handling					
SA5	Erection of scaffolding					

5. The following scaffold workers are mostly affected by the accidents. (**Please tick only one option for each statement**)

Knowledge of Accident		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Scaffold Workers (SW)						
SW1	Scaffold Labourers					
SW2	Scaffold Erectors/Fixers					
SW3	Scaffold Team Leaders / Charge hands					
SW4	Scaffold Inspectors					

6. Site management commits to health and safety management systems. (**Please tick only one option for each statement**)

Site Management Commitment		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Health and Safety Management Systems (HSMS)						
HSMS1	Management appoints health and safety personnel for the construction site					
HSMS2	Management attends health and safety meetings					
HSMS3	Management provides health and safety training to the workforce					
HSMS4	Management participates in hazard identification and risk assessment					
HSMS5	Management takes part in incident management processes					
HSMS6	Organisation has a health and safety management systems					
HSMS7	Management leads emergency and evacuation processes					
HSEMS8	Management participates in health and safety inspections and audits					
HSEMS9	Organisation has a health and safety policy					

7. The organisation uses experienced and trained scaffold workers. (**Please tick only one option for each statement**)

Experience and Training		Strongly agree	Agree	Neutral	disagree	Strongly disagree
Experience and Training (ET)						
ET1	The site uses only knowledgeable and skilled scaffold workers					
ET2	The site uses only scaffold workers who have scaffold experience and training					
ET3	The site accidents are caused by lack of knowledge and skills among scaffold workers					
ET4	I have scaffold training certificate					
ET5	Scaffold workers are appointed to positions based on site scaffold work experience and relevant scaffold training					

ANNEXURE 2: SCAFFOLD SITE WORKER QUESTIONNAIRE

• PO Box 77000 • Nelson Mandela Metropolitan University
• Port Elizabeth • 6031 • South Africa • www.nmmu.ac.za

Nelson Mandela Metropolitan University
for tomorrow

DEPARTMENT OF CONSTRUCTION MANAGEMENT

April 2017

ANNEXURE 2

TO WHOM IT MAY CONCERN

Dear Sir. / Madam. / Dr. / Prof

LETTER OF INVITATION FOR RESEARCH SURVEY

We invite you to take a few moments of your time to assist with this research project. Please find together with this letter, a questionnaire that we would like you to complete. The current research forms part of a MSc Degree Study being conducted in the Faculty of Engineering, Information Technology and Built Environment at Nelson Mandela Metropolitan University. This research is under the supervision of Dr F. Geminiani. The research topic is." **Scaffold Accidents Relative to South African Construction".**

As part of the research aims, we would appreciate your comments / reply's in terms of the types, causes and frequency of construction accidents which affect scaffold workers. This questionnaire has been designed based on the Researcher and health and safety literature review indicators. We would value your inputs. Your contributions will add value to the expansion of knowledge and importantly to the South African construction industry and the economy in general. Your participation is voluntary and anonymous.

The questionnaire is designed towards site scaffold labourers, site scaffold erectors/fixer, site scaffold charge hands/team leaders and site scaffold inspector who have pertinent information regarding frequency of scaffold accidents on construction sites. The answering of the questionnaires will take approximately 15 minutes.

You are assured of complete confidentiality and privacy. A copy of the findings of the study will be available once completed. Please answer the questions so as to help us improve construction health and safety performance.

Thanking you in advance

Mr Ndaleni Rantsatsi
MSc Degree Scholar
Cell Number : 0769008906
Email Address : s217106285@nmmu.ac.za or rphinias123@gmail.com

Dr. Franco Geminiani: Supervisor
Dept. Building and Human Settlement Development
Phone Number : 041 504 3203
Fax Number : 041 504 9023
Email Address : franco.geminiani@nmmu.ac.za

SCAFFOLD ACCIDENTS RELATIVE TO SOUTH AFRICAN CONSTRUCTION

We would like to invite you to take part in this research project, please complete the following questionnaire. The current research is a MSc Degree Study being conducted in the Faculty of Engineering, Information Technology and Built Environment at Nelson Mandela Metropolitan University.

SECTION A (BACKGROUND OF THE RESPONDENT)

Please tick the appropriate box when answering the questions.

1. What is your role on site?

Chargehand/Team leader		Scaffold Fixer/ Erector		Scaffold Labourer		Scaffold Inspector		Other	

2. What is your experience in the current position?

0-2 year /years		2-4 years		5-7 years		8-10 years		10-15 years		15-20 years		20 years and over	

3. What is your gender?

Male		Female	

4. What is your age?

18-23 years		24-29 years		30-35 years		36-41 years		42-49 years		50 years and over	

5. What is your race?

Black		Asian/Indian		White		Coloured		Other	

6. Where is your construction site situated? (**Please tick only one province**)

Eastern Cape Province		Mpumalanga Province	
Free State Province		North West Province	
Gauteng Province		Northern Cape Province	
Kwazulu Natal Province		Western Cape Province	
Limpopo Province		unsure	

7. What is your highest education qualification? (**Please tick only the highest you have**)

Doctorate degree		Certificate	
Master's degree		Matric	
Honours/B Tech/ Degree		Less than Matric	
National Diploma			

SECTION B:

Please tick the appropriate box when answering the questions.

1. Knowledge of Construction Scaffold Accidents

KCA 1. I know of at least one scaffold worker who suffered minor injury/injuries in the workplace.

YES		NO	

KCA 2. I know of at least one scaffold worker who died because of scaffold accidents in the workplace.

YES		NO	

KCA 3. I have suffered minor injury/injuries myself in the workplace.

YES		NO	

2. Causes of Scaffold Accidents

Do you agree with the following statements?

CSA1. Lack of skills and knowledge cause scaffold accidents.

YES		NO		I DO NOT KNOW	

CSA2. Lack of supervision causes scaffold accidents.

YES		NO		I DO NOT KNOW	

CSA3. Bad housekeeping causes scaffold accidents.

YES		NO		I DO NOT KNOW	

CSA4. Taking short cuts causes scaffold accidents.

YES		NO		I DO NOT KNOW	

3. Site Management Commitment to Health and Safety Management Systems

Do you agree with the following statements?

MC1. Site management shows commitment to health and safety.

YES		NO		I DO NOT KNOW	

MC2. Site management visits the work areas frequently.

YES		NO		I DO NOT KNOW	

MC3. Site management follows health and safety rules.

YES		NO		I DO NOT KNOW	

4. Use of Safety Harness

USH1. I know how to use safety harness properly.

YES		NO	

USH2. Scaffold training course provided me with the knowledge and practical skills on how to use safety harness properly.

YES		NO	

USH3. I learnt how to use safety harness by myself.

YES		NO	

5. Experience and Training

ET1. I have enough experience and proper training to do my work.

YES		NO	

ET2. I have scaffold training certificate.

YES		NO	

ET3. I have knowledge and skills of scaffold work.

YES		NO	

ET4. I attended scaffold training course before working as a scaffold worker.

YES		NO	

ET5. The following is the scaffold training I have. (**Please tick only the highest you have**).

Module 1		Module 2		Module 3		Module 4		Module 5		If other, please specify	

6. Type of Accident affecting Scaffold Workers

TAS1. I know at least of scaffold worker who fell from height.

YES		NO	

TAS2. I know at least of scaffold worker who was hit by scaffold materials.

YES		NO	

TAS3. I know at least of scaffold worker who was caught in, between scaffold materials.

YES		NO	

TAS4. I know at least of a scaffold which collapsed.

YES		NO	

7. Scaffold Activities

Do you agree with the following statements?

S1. Scaffold accidents occur mostly during scaffolding manual handling.

YES		NO		I DO NOT KNOW	

S2. Scaffold accidents occur mostly during erection of scaffolding.

YES		NO		I DO NOT KNOW	

S3. Scaffold accidents occur mostly during stacking and storage of scaffolding.

YES		NO		I DO NOT KNOW	

S4. Scaffold accidents occur mostly during dismantling of scaffolding.

YES		NO		I DO NOT KNOW	

S5. Scaffold accidents occur mostly during modification of scaffolding.

YES		NO		I DO NOT KNOW	

8. Scaffold Workers Accidents Rate

Do you agree with the following statement?

AR1. Scaffold workers are often injured.

YES		NO		I DO NOT KNOW	

ANNEXURE 3: DATA CAPTURING

ANNEXURE 3 DATA CAPTURING: SCAFFOLD SITE MANAGEMENT QUESTIONNAIRE ANALYSIS

Statistics

		TA1	TA2	TA3	TA4	TA5
N	Valid	171	171	171	171	171
	Missing	0	0	0	0	0
Mean		2.63	3.57	3.80	1.33	3.70
Median		3.00	4.00	4.00	1.00	4.00
Std. Deviation		1.02	0.97	0.95	0.69	1.05
Minimum		1.00	1.00	1.00	1.00	1.00
Maximum		5.00	5.00	5.00	5.00	5.00

Statistics

		CA1	CA2	CA3	CA4
N	Valid	171	171	171	171
	Missing	0	0	0	0
Mean		2.91	3.91	4.12	4.32
Median		3.00	4.00	4.00	5.00
Std. Deviation		0.96	0.81	0.95	0.93
Minimum		1.00	1.00	2.00	1.00
Maximum		5.00	5.00	5.00	5.00

Statistics

		SA1	SA2	SA3	SA4	SA5
N	Valid	171	171	171	171	171
	Missing	0	0	0	0	0
Mean		3.26	3.70	4.56	4.37	4.11
Median		3.00	4.00	5.00	5.00	4.00
Std. Deviation		1.00	1.05	0.74	0.76	0.73
Minimum		2.00	1.00	2.00	2.00	2.00
Maximum		5.00	5.00	5.00	5.00	5.00

Statistics

		SW1	SW2	SW3	SW4
N	Valid	171	171	171	171
	Missing	0	0	0	0
Mean		4.65	3.88	3.54	2.03
Median		5.00	4.00	4.00	2.00
Std. Deviation		0.64	0.67	0.81	1.16
Minimum		2.00	2.00	1.00	1.00
Maximum		5.00	5.00	5.00	5.00

Statistics

		HSMS 1	HSMS 2	HSMS 3	HSMS4	HSM S5	HSMS 6	HSMS 7	HSMS 8	HSMS 9
N	Valid	171	171	171	171	171	171	171	171	171
	Missing	0	0	0	0	0	0	0	0	0
Mean		4.81	4.63	4.36	4.59	4.67	4.80	4.32	4.29	4.81
Median		5.00	5.00	4.00	5.00	5.00	5.00	5.00	4.00	5.00
Std. Deviation		0.49	0.77	0.68	0.82	0.69	0.51	0.86	0.66	0.40
Minimum		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	4.00
Maximum		5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

Statistics

		ET1	ET2	ET3	ET4	ET5
N	Valid	171	171	171	171	171
	Missing	0	0	0	0	0
Mean		4.57	4.47	4.37	4.46	4.49
Median		5.00	5.00	5.00	5.00	5.00
Std. Deviation		0.62	0.81	1.00	1.10	1.02
Minimum		2.00	2.00	1.00	1.00	1.00
Maximum		5.00	5.00	5.00	5.00	5.00

KCA1

		Frequency	Percent
Valid	Yes	108	60.0
	No	72	40.0
	Total	180	100.0

KCA2

		Frequency	Percent
Valid	Yes	38	21.1
	No	142	78.9
	Total	180	100.0

KCA3

		Frequency	Percent
Valid	Yes	55	30.6
	No	125	69.4
	Total	180	100.0

CSA1

		Frequency	Percent
Valid	Yes	161	89.4
	No	15	8.3
	Don't know	4	2.2

	Total	180	100.0

CSA2

		Frequency	Percent
Valid	Yes	141	78.3
	No	33	18.3
	Don't know	6	3.3
	Total	180	100.0

CSA3

		Frequency	Percent
Valid	Yes	160	88.9
	No	13	7.2
	Don't know	7	3.9
	Total	180	100.0

CSA4

		Frequency	Percent
Valid	Yes	169	93.9
	No	8	4.4
	Don't know	3	1.7
	Total	180	100.0

MC1

		Frequency	Percent
Valid	Yes	160	88.9
	No	18	10.0
	Don't know	2	1.1
	Total	180	100.0

MC2

		Frequency	Percent
Valid	Yes	153	85.0
	No	26	14.4
	Don't know	1	0.6
	Total	180	100.0

MC3

		Frequency	Percent
Valid	Yes	155	86.1
	No	23	12.8
	Don't know	2	1.1
	Total	180	100.0

USH1

		Frequency	Percent
Valid	Yes	177	98.3
	No	3	1.7
	Total	180	100.0

USH2

		Frequency	Percent
Valid	Yes	172	95.6
	No	8	4.4
	Total	180	100.0

USH3

		Frequency	Percent
Valid	Yes	93	51.7
	No	87	48.3
	Total	180	100.0

ET1

		Frequency	Percent
Valid	Yes	170	94.4
	No	10	5.6

	Total	180	100.0

ET2

		Frequency	Percent
Valid	Yes	175	97.2
	No	5	2.8
	Total	180	100.0

ET3

		Frequency	Percent
Valid	Yes	176	97.8
	No	4	2.2
	Total	180	100.0

ET4

		Frequency	Percent
Valid	Yes	173	96.1
	No	7	3.9
	Total	180	100.0

ET5

		Frequency	Percent
Valid	Module 1	41	22.8
	Module 2	38	21.1
	Module 3	63	35.0
	Module 4	9	5.0
	Module 5	25	13.9
	Other	4	2.2
	Total	180	100.0

TAS1

		Frequency	Percent
Valid	Yes	75	41.7
	No	105	58.3

	Total	180	100.0

TAS2

		Frequency	Percent
Valid	Yes	118	65.6
	No	62	34.4
	Total	180	100.0

TAS3

		Frequency	Percent
Valid	Yes	90	50.0
	No	90	50.0
	Total	180	100.0

TAS4

		Frequency	Percent
Valid	Yes	45	25.0
	No	135	75.0
	Total	180	100.0

S1

		Frequency	Percent
Valid	Yes	139	77.2
	No	37	20.6

	Don't know	4	2.2
	Total	180	100.0

S2

		Frequency	Percent
Valid	Yes	134	74.4
	No	43	23.9
	Don't know	3	1.7
	Total	180	100.0

S3

		Frequency	Percent
Valid	Yes	108	60.0
	No	70	38.9
	Don't know	2	1.1
	Total	180	100.0

S4

		Frequency	Percent
Valid	Yes	160	88.9
	No	17	9.4
	Don't know	3	1.7
	Total	180	100.0

S5

		Frequency	Percent
Valid	Yes	115	63.9
	No	62	34.4
	Don't know	3	1.7
	Total	180	100.0

AR1

		Frequency	Percent
Valid	Yes	94	52.2
	No	79	43.9
	Don't know	7	3.9
	Total	180	100.0

ANNEXURE 4: CONFIRMATION OF STATISTICAL SUPPORT

ANNEXURE 4

---------- Forwarded message ----------
From: **Eastwood, Kirstie (Ms) (Summerstrand Campus South)**
<Kirstie.Eastwood@nmmu.ac.za>
Date: Tue, Mar 28, 2017 at 4:43 PM
Subject: USC17-0313 Consultation
To: "Fgeminiani01@gmail.com" <Fgeminiani01@gmail.com>, "rphinias123@gmail.com"
<rphinias123@gmail.com>, "Rantsatsi, Ndaleni, (Mr) (s217106285)"
<s217106285@live.nmmu.ac.za>

Dear Dr Geminiani & Mr Rantsatsi

I have received your application for statistical support.

Please send through any data that you currently have as well as your research proposal.

Once I have received this, a meeting can be scheduled to discuss particulars.

Kind Regards,

Kirstie Eastwood

Nelson Mandela Metropolitan University

Department of Statistics

South Campus

Port Elizabeth

Tel: +27(0)41 504 2846