UNIVERSITY OF EDUCATION, WINNEBA

ANALYSIS OF CONSTRUCTION WORKER'S PERCEPTION ON SAFETY OUTCOMES OF CONSTRUCTION SITES: A STUDY OF BUILDING PROJECTS IN THE ASHANTI REGION

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A Dissertation in the Department of Construction and Wood Technology Education, Faculty of Technical Education, submitted to the School of Graduate Studies, University of Education, Winneba in partial fulfilment of the requirements for award of the Master of Philosophy (Construction Technology) degree.

AUGUST, 2016

DECLARATION

STUDENT'S DECLARATION

I, STANLEY OWUOTEY BONNEY declare that this Dissertation with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE: ……..

DATE: ……

SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidance for supervision of Dissertation as laid down by the University of Education, Winneba.

NAME OF SUPERVISOR: NONGIBA ALKANAM KHENI (PhD)

SIGNATURE: …….....

DATE: ….....

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DEDICATION

I dedicate this dissertation to my father late Bright Benjamin Kojo Bonney

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ABSTRACT

Health and safety performance of construction sites is of great importance to many construction companies because of the social and economic implications of accidents. Many construction companies have safety culture that has positive impact on safety outcomes. Strengthening the safety culture of construction firms will go a long way to improve safety performance of construction sites. The aim of the study was to assess construction sites worker's unsafe behaviour and safety outcomes of construction sites in Ghana using selected building projects in the Kumasi Metropolis. The study adopted a quantitative research design involving the development and administration of survey questionnaires to a sample of 438 construction workers of 12 construction sites. The findings of the study revealed that the key determinants of safety climate on the construction sites studied were; safety management systems, commitment to health and safety, availability of health and safety information, health and safety awareness, effective communication of health and safety issues and safety performance. Also, the critical factors that influenced unsafe behaviours included; lack of management commitment, absence of rules and regulation, poor health and safety education, economic conditions and inadequate personal protective equipment. Furthermore, the findings of the study suggested that the dominant unsafe behaviours on the construction sites studied were; poor workers attitude, workers' non-compliance with safety procedures, bad practices of workers, wrong use/handling of equipment and tools and lack of rest causing fatigue, burnout or drowsiness. Additionally, the findings of the study revealed that unsafe behaviours that strongly correlate with safety outcomes of the construction sites studied included; lack of rest causing fatigue, burnout or drowsiness had significant negative correlation with best work practices; Secondly bad practices of workers had significant negative correlation with safety policies, procedures and training, thirdly lack of rest causing fatigue, burnout or drowsiness had significant negative correlation with safe practices at workplace and fourthly wrong use/handling of equipment and tools was significantly negatively correlated with top management involvement. It was concluded that unsafe behaviour negatively influences safety outcome of workers on construction sites in Ghana. Therefore, the study has recommended the strengthening of safety interventions such as safety inductions, training and toolbox aimed at addressing the aforementioned unsafe behaviours.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The construction industry plays an important role in the socio-economic development of Ghana. However, it is seen as one of the dangerous, risky and highly hazardous industries because of the disproportionately high incidence of accidents and fatalities that occur on construction sites around the world (Smallwood & Haupt, 2008; Ahmed, 2013; Fang & Wu, 2013). Often, due to unsafe working climate, construction workers are exposed to various forms of health and safety hazards and risks at construction sites (Kanaganayagam, Ogunlana & Fung, 2013), which lead to serious accidents and sometimes deaths. Therefore, safety in the construction industry has been considered an important issue, and has continued to receive increasing attention from both researchers and corporate organizations. This is especially so in developing countries (Coble and Haupt, 1999; Ofori, 2000) where, safety is a major concern because of the lack of Safety Acts (Larcher and Sohail, 1999). The lack of statutory regulations and legislation to protect construction workers, low standards in corporate systems and governance, high labour intensive character and inadequate infrastructure are other major factors that combine to work against safety in most developing countries (Mohamed, 2002).

The UK's Health and Safety Executive [HSE] (2002) in their paper "Revitalising Health and Safety in Construction" reported that "Despite countless health and safety initiatives and campaigns, the construction industry remains dangerous. What is even worse is that almost all of the deaths and injuries that occur are foreseeable and preventable. We have known for years how to prevent them, but they still happen – often in the same old ways. Perversely, this leads some people to think that they can't improve,

because the good are already good and the bad will never improve". This means that the construction industry across the world is notorious for its poor safety record when compared to other industries. The major causes of accidents in the industry have been identified, and can be directly attributed to unsafe design and site practices (Mohamed, 2002). Kartam (1997) asserts that accidents arise from different causes that can generally be classified as physical incidents posing hazardous situations, and behavioural incidents caused by unsafe acts.

Ibrahim (2012) claims that construction workers are at risk due to their exposure to unsafe behaviours and other safety hazards. In addition, when compared to other workers, He asserts that construction workers may also experience a higher proportion of early retirement due to illness and musculoskeletal disorders, losing over 24000 potential years of working life. However, controlling hazards that reduce injury rates is difficult in an industry such as construction where work is conducted under extreme condition an ever-changing physical environment and with variable workforce. Achieving change in this environment involves a widespread shift in safety culture because of the way in which work is conducted and the need to meet potentially competing imperatives such as client demands and trade specific time line (Ibrahim, 2012). This situation is even made worst by workers negative attitude and behaviours toward safety (Choudry & Fang, 2007). Occupational Safety & Health (OSH) issues in the construction industry are partly attributable to the fragmented nature in which the industry operates (Ringen et al. 1995).

According to Mohamed (1999), accidents on construction sites cause many human tragedies; de-motivate workers; disrupt site activities; delay project progress; and adversely affect the overall cost, productivity and reputation of the construction industry. In recognition of the problems above, countries all over the world have seen the necessity of improving occupational health and safety management on construction sites,

particularly to reduce the number of accidents on construction sites. Therefore, safety in the construction industry has been considered an important issue. This is especially so in developing countries like Ghana where safety is a major concern because of the lack of specific health and safety regulations.

However, it has been established that unsafe worker behaviour is intrinsically linked to workplace accidents. In their study titled "National culture and safe work behaviour of construction workers in Pakistan", Mohamed, Ali and Tam (2009) revealed that construction workers' attitudes towards safety are influenced by their perception of risk, management, safety rules and procedures. Mohamed et al. (2009) affirm that a positive correlation exists between workers' safe behaviour and safety climate within the construction environment. They found that majority of workers have a good degree of risk awareness and self-rated competence. In addition, it was revealed that workers operating in a collective and higher uncertainty environment are more likely to have safety awareness and beliefs, which can exhibit safer on-site behaviour.

In exploring factors affecting unsafe behaviours on construction sites, Oswald, Sherratt and Smith (2013) found that lack of experience/training, poor risk perception, risk taking, tiredness and poor safety culture were the factors with the highest contributory influence to on-site accidents. In addition, alcohol and drugs, and poor management style were factors with moderate influence, whilst thrill seeking and national cultural clashes had the lowest influence.

In a study conducted on "Safety climate in construction industry: The case of Gaza Strip", Ibrahim, Al Hallaq and Enshassi (2012) found that construction workers have positive attitude and perception towards safety climate and safe work behaviour. They concluded that there exist a positive relationship between safety climate and safe work behaviour. It must be emphasised that attitudes, values and norms are antecedents

to safety culture, which in turn influence safety behaviour (Håvold, 2007). The theory of risk homeostasis propounded by Wilde (1982) shows that safety culture can influence both how risks are perceived and how high an individual's target level of risk is set, thereby resulting in adjustments to an individual's behaviour.

1.2 Statement of the Problem

Occupational injury and death statistics confirm that the construction industry is over-represented compared to other industries. According to Armstrong (2006), thousands of people are killed at work every year and several hundred thousands more are injured. It is also estimated that apart from the pain and misery caused to those directly or indirectly concerned, the total cost to employers of work related injury and illness exceed £4 billion a year. Perceptions, behaviours and actions exhibited by Ghanaian construction workers on safety outcome have led to the serious accidents on construction sites. In view of this the perception of construction workers on safety outcome should be taken into consideration.

Despite a general agreement among researchers, regulatory bodies, and industry that these concepts are worthwhile concepts for research and application, little consensus has been reached over other important issues. For example, there are multiple definitions of the two concepts; safety climate and safety culture are often confused in the literature despite having distinct etymology (Cox & Flin, 1998); no clear model demonstrating the impact of safety climate and safety culture on bottom-line safety organizational performance has been developed; numerous methods covering different sets of factors have been used to measure the concepts, and many of the studies that have been reported suffer from methodological failings.

In addition, Guldenmund (2000) asserts that in the last two decades, empirical research on safety climate and safety culture has developed considerably but, unfortunately, the theoretical aspect has not been through a similar progression. According to him, although most of the research studies reported are conducted according to the familiar routines of social scientific, especially social and organisational psychological research, little consensus has been reached on the different aspects commonly associated with a concept within this scientific discipline. For instance, he argues that while most authors stress the importance of the concept of safety climate or culture, very few have attempted to support their claim by reporting an indication of its construct validity or predictive validity. Again, most efforts have not progressed beyond the stage of face validity, which means that basically, the concept still has not advanced beyond its first developmental stages (Guldenmund, 2000).

As a result of the confusion between the concepts of safety climate and safety culture and the indication that some of the research studies conducted on these concepts lack scientific underpinnings as indicated by Yule (2003); Guldenmund (2000), safety problems continue to exist on construction sites despite substantial efforts to ensure safer operations. It is against this backdrop, this study seeks to examine the construction sites worker's perception about safety outcomes of construction sites in Ghana.

1.3 Aim and Objectives of the Study

The aim of the study is to assess construction sites worker's unsafe behaviour and safety outcomes of construction sites in Ghana using selected building projects in the Kumasi Metropolis. In line with the aim of the study, the specific objectives are as follows:

i. Identify key determinants of safety climate of construction sites in Ghana.

ii. Identify factors that influence unsafe behaviour of workers on construction sites in Ghana.

iii. Identify unsafe behaviour exhibited by construction sites workers in Ghana.

iv. To find Relationship between unsafe behaviour and safety outcomes on construction sites

1.4 Research Questions

The following pertinent research questions have been developed based on the objectives of the study:

i. What are the key determinants of safety climate of construction sites in Ghana?

ii. What unsafe behaviours are exhibited by workers on construction sites in Ghana?

iii. What are the factors influencing unsafe behaviour of workers on construction sites in Ghana?

iv. What are the relationships between unsafe behaviour and safety outcomes of construction sites?

1.5 Significance of the Study

The study sought to examine the construction worker's perception on safety outcomes of construction sites in Ghana. Therefore, it will contribute to debate on the essence of ensuring the health and safety of casual workers and other construction workers on construction sites in Ghana. While the concept of safety culture continues to attract more attention in developed countries, the Ghanaian case is quite different. In Ghana, the issue of safety culture and its impact on safety outcomes of construction sites have remained unsystematic and fragmented. Therefore, the study will address these problems by synthesizing the existing literature on safety culture in order to develop a

better understanding of its nature, dimensions and impact on safety outcomes in the construction industry in Ghana. The presence of a positive safety culture is reflected significantly on better safe behaviours and lower injury rates. Therefore improving safety culture has the potential to save employees' health and lives, reducing hardship to employees and their families and reducing employer overhead costs. Again, the findings of the study will help in the designing of a positive safety culture framework to help reduce negative safety outcomes (i.e., workplace accidents) on construction sites. The study will give construction workers an insight into how their behaviour influences safety outcomes on construction sites. In addition, the study will expose factors that influence unsafe behaviour of workers on construction sites for the necessary actions to be adopted to prevent future occurrences. Finally, the study will add to the limited literature on construction sites worker's perception about safety outcomes of construction sites and serve a source of reference for future researchers in this area.

1.6 Limitations of the Study

The study was not without constraints even though the researcher tried to as much as possible to reduce these constraints to the barest minimum and make sure they do not affect the findings of the study. The number of construction firms selected for the study was limited to construction firms operating within the Kumasi Metropolis in Ghana because of time and financial constraints. In addition, a common constraint of using the questionnaire method for data collection is the difficulty in getting respondents to respond promptly to the questionnaire. Due to the nature of the construction work, it necessitates that the questionnaire should be left with the respondents to make time to answer them after which they will be collected later. This situation will therefore make it difficult for the researcher to ensure that there was no consultation among the

respondents during the process of answering the questions. If consultations were made between respondents, then the genuineness and fairness of the responses could be compromised hence, conclusions drawn may not be reliable. However, being aware of this possible constraint, the researcher triangulated the study by conducting a semi-structured interview in addition to the questionnaire.

1.7 Delimitations of the Study

i. The study was narrowed down to examine the construction sites worker's perception about safety outcomes of construction sites in the Kumasi Metropolis. The research participants used for the purpose of data collection were drawn from only registered construction firms belonging to the Association of Building and Civil Engineering Contractors of Ghana (ABCECG) in the Ashanti regions. The content scope of the study centered on four thematic areas outlined as follows: key determinants of safety climate of construction sites in Ghana, factors that influence unsafe behaviour of workers on construction sites in Ghana, relationship between unsafe behaviour and safety outcomes of construction site, and ways to improve workers behaviour on safety outcomes on construction sites in Ghana.

1.8 Definition of Terms

Safety culture: It refers to the extent to which individuals and groups will commit to personal responsibility for safety; act to preserve, enhance and communicate safety concerns; strive to actively learn, adapt and modify (both individual and organisational) behaviour based on lessons learned from mistakes; and be rewarded in a manner consistent with these values.

Safety climate: It refers to the perceived state of safety at a particular place at a particular time, is relatively unstable, and subject to change depending on the features of the current environment or prevailing conditions.

1.8 Organization of the Study

The research report is presented in six chapters. Chapter One is the introduction section of the research work and is devoted to principally to give an overview and justification of the study. It comprises the background of the study, statement of the problem, aim and objectives of the study, research questions, significance of the study, limitations of the study, delimitations of the study, definition of terms and the general layout of the research report.

Chapter Two presents an exhaustive but incisive review of relevant literature related to the study area. The literature review is geared towards justifying the specific objectives of the study, and the theoretical framework upon which the study is built. In addition, the identified gap in the related literature is highlighted in this chapter.

Chapter Three involves the research methodology adopted for the study. It outlines the research design and approach employed and their justification. It provides information on the participants and other objects of the study, by identifying the target population for the study as well as the sample size and the appropriate sampling techniques. In addition, the chapter describes the data collection instruments used in collecting primary data, pilot testing of instruments, validity and reliability of the instruments used, data collection procedures, data analysis and the relevant ethical considerations.

Chapter Four involves the presentation of the results of the study under suitable themes based on the pertinent research questions. The findings are presented in the form

of tables and figures as well as the analysis of the findings in the form of prose.

Chapter Five presents the discussion of the major findings of the study and the inferences made from such findings with reference to related prior studies. The major findings of the study are discussed under suitable themes developed from the pertinent research questions.

Finally, Chapter Six provides a summary of the major findings of the study, and the relevant conclusions drawn from the findings indicating how the study has contributed to knowledge. The necessary recommendations and suggestions for further research based on the findings of the study are also presented in this chapter.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Chapter two presents an exhaustive but incisive review of relevant literature related to safety culture, safety climate and worker behaviours on construction sites. The literature review is geared towards justifying the specific objectives of the study, and the theoretical framework upon which the study is built. In addition, the chapter highlights the identified gap in the review of prior literature. The review of literature pertaining safety of workers on constructions sites was presented under suitable topical headings/themes to enhance coherency and readability.

2.2 Overview of the Construction Industry in Ghana

The construction industry in Ghana plays a very important role in the socio-economic development of the country as in many other countries across the globe. Being among the top drivers of the Ghanaian economy, including agriculture, manufacturing and mining, its significant role in the economic development of Ghana since independence cannot be overemphasized. The activities of the construction industry have a lot of significance to the achievement of Ghana's socio-economic development goals of providing physical infrastructure such as the building of roads, ports, railways, bridges, dams, houses, hospitals, schools, offices, houses and other buildings and structures. It deals with all economic activities directed at the creation, renovation, maintenance/repair or extension of physical infrastructure in the form of buildings, roads, rails, ports and other structures of construction nature. In addition, the construction industry is a source of employment to a significant number of people both skilled and unskilled from engineers, architects, project managers and consultants to artisans and labourers. Again,

it involves a broad range of stakeholders and has wide ranging linkages with other areas of activity such as manufacturing and the use of materials, energy, finance, labour and equipment (Hillebrandt, 1985) and therefore provides a growth impetus to other sectors through backward and forward linkages (Osei, 2013).

The domestic construction sector happens to be one of the fastest growing sectors, with an impressive average growth of 7-8 per cent per annum and holds an immense potential for stimulating growth, boosting project exports and generating employment (Osei, 2013). Osei further asserts that the rapid expansion of infrastructure by both government and the private sector has triggered off construction activities and fuelled demand in many key sectors like cement, steel, paints and chemicals, glass, timber and earth moving equipment and machinery.

2.2.1 Structure of the Construction Industry

According to Kheni (2008), the construction industry of Ghana comprises two sectors, a formal sector and an informal sector. He asserts that the formal construction sector is modeled around the institutional structure and regulatory systems inherited from Britain, Ghana's colonial master. Although, the traditional mode of procurement inherited from the British system is the most popular form of procurement in the construction industry (Kheni, 2008), in recent times procurement in the public sector is guided by Public Procurement Act 2003 (Act 663). Currently, two government ministries namely the Ministry for Roads and Highways (MRH) and the Ministry for Water Resources, Works and Housing (MWRWH) have direct responsibility for overseeing the activities of construction firms/contractors and the implementation of state polices in the construction sector. Whilst the MRH is responsible for regulating the public road construction activities, the MWRWH is responsible for policy implementation in respect

of works, housing, water supply, sanitation, and oversees the activities of building contractors. Also, some non-governmental organisations and professional institutions play significant roles that have direct or indirect influence on the activities of the construction industry. Notably among these organizations or institutions are the Ghana Real Estates Developers Association (GREDA), Ghana Institution of Engineers (GhIE), the Institution of Engineering and Technology, Ghana (IETGh), the Chartered Institute of Building (CIOB), Ghana Institute of Construction (GIOC), Ghana Institution of Surveyors (GhIS), the Ghana Institution of Architects (GIA), trade unions, employers 'associations, private clients, donor agencies, and tertiary educational institutions.

On the other hand, the informal sector comprises project participants similar to the formal sector but with relationships between them typically informal. The informal sector includes small construction firms and clients who operate mainly in the building construction sector. They are involved in building housing units for individuals and family members and office, private organizations and churches on a small scale, would necessarily following the formal procedures and laid-down best practices in the construction industry. Firms in the informal sector usually rely on family labour and cheap labour from unskilled adults with the communities they operate. Construction activities in the informal sector are mainly labour intensive since no major engineering works are involved. According to Kheni (2008), the burden of having to provide the capital for the acquisition of heavy duty equipment and machinery is very high considering the difficulties contractors in the informal sector face in accessing credits for such items thus compelling many of them, particularly micro contractors, to specialize in labour-based construction methods.

In addition, the construction industry in Ghana is polarised between large and many small and medium-size domestic firms and with very few large multinational/

foreign construction firms. It must be emphasized that majority of the small and medium-sized construction firms are managed as self-employed businesses or family-run businesses (Addo-Abedi 1999). The domestic construction firms belong to either the Association of Road Contractors of Ghana (ASROC) or the Association of Building and Civil Engineering Contractors of Ghana (ABCECG). On the other hand, while domestic construction firms normally bid for smaller projects within the limits of their capacity, foreign construction firms generally undertake large infrastructure projects awarded by government or corporate organizations. Most foreign and multinational construction firms operating in the Ghanaian construction industry are subsidiaries of large international construction groups such as Taysec, Taylor Woodrow, Consar, Skanska and Sonitra.

2.2.2 Key Players in the Ghanaian Construction Industry

In his study titled "The construction industry and its linkages to the Ghanaian economy-polices to improve the sector's performance", Osei (2013) categorized the key players in the Ghanaian construction industry as comprising:

- The client community – both public and private sectors.
- The design community
- The supply chain – materials suppliers, machinery manufacturers, sub-assemblers.
- Main contractors and sub-contractors of every tier.
- Universities/technological institutions and professional associations.
- Economic drivers such as banks and other financial institutions
- Trade unions, including regulation and standards authorities.

2.2.3 Classification of Contractors in the Construction Industry

The two main umbrella institutions (ministries) under which the construction industry operates in Ghana namely the Ministry of Roads and Highways (MRH) and the Ministry of Water Resources, Works and Housing (MWRWH) have provided different classification schemes for contractors and construction firms who operate under them.

In Ghana, the agency responsible for the registration of contractors (i.e., building or civil contractors) is the Ministry of Water Resources, Works and Housing (MWRWH). Upon the registration of construction firms or contractors with the Registrar General's Department, contractors are classified based on factors such as plant/equipment holding, financial position of the firm, past experience and technical expertise. The two main classifications for contractors by the MWRWH are category 'D' for general building works and category 'K' for civil works. The contractors for the categories mentioned above are sub-divided into four classes, ranging from class D1, D2, D3, D4 for building contractors and K1, K2, K3, K4 for civil works. The D1K1 class of contractors are termed as larger firms, whereas D2K2 construction firms are medium and D3K3 and D4K4 are smaller firms (Edmonds et al., 1984). These classifications are further categorized based on financial strength of the construction firms as:

- Financial Class 1 – Lager firms capable of undertaking projects of any value,
- Financial Class 2 - Medium firms capable of undertaking projects up to US$500,000 or GH¢750,000.00,
- Financial Class 3 - Small firms capable of undertaking projects up to US$200,000 or GH¢ 300,000.00 or
- Financial Class 4 – Small firms capable of undertaking projects up to US$75,000 or GH¢112,500.00

According to Addo-Abedi (1999), the MRH, which has the responsibility of regulating the activities of road contractors and civil engineering firms, categorizes contractors into the following classes:

- Class A - Contractors are qualified to carry out road works, airports and related works;
- Class B - Contractors are qualified to undertake bridge construction, the construction

  of culverts and other drainage structures;
- Class C - Contractors are qualified to carry out labour based works;
- Class S - Contractors are qualified to construct structures; and
- Class M - Contractors are qualified for miscellaneous road related works.

These classifications are further divided into categories 1-4 depending on the number and qualifications of the contractor's permanent staff, equipment/machinery holding, previous experience and financial status (Kheni, 2008). For instance, a contractor can be designated as A1B1 or A2B2. The MRH classifies building contractors as belonging to one of classes D1 through to D4 depending on financial standing of the contractor, equipment holding and qualification and number of permanent employees (Dansoh, 2005).

2.2.4 Operators of the Construction Industry

Since independence, the government and state owned enterprises (with grants and/or loans from development partners) are the major investors in the construction industry (Osei, 2013). However, in the past few decades, private players such as property and real estate developers have provided both speculative and client specific developments by acting as agents and developers in the industry.

The major operators at the supply end of the construction industry in Ghana comprises traditional professional groups such as building contractors, structural/civil engineers, architects, mechanical and electrical engineers, settlement planners, quantity surveyors, and other suppliers of construction materials such cement producers (GHACEM, DIAMOND, Dangote, etc.), iron rod producer (Aluworks, Tema Steel Company, etc.), roofing sheets producers (Raincoat, DBS, Rocksters, Donyma Steel Company, etc.), transport companies, producers of painting and coating materials and hardware firms.

2.2.5 Clients and Customers of the Construction Industry

The central government is a major client and customer of the construction industry and mostly engages construction industry in the building of long-term physical infrastructure such as roads, bridges, dams, airports, ports, railways, schools, hospitals, stadia, offices and houses for public institutions. The next major client of the industry is the local government comprising Metropolitan, Municipal and District Assemblies (MMDAs). The MMDAs engages the construction industry in the provision of basic physical infrastructure such as schools, hospitals, bungalows, police stations, markets, offices, bridges, gutters and other building facilities in their area of jurisdiction.

The next major client of the construction industry other than the government sector is the private sector. Customers of construction products and services in the private sector include households and private individuals, real estate developers, private businesses and companies, private educational institutions, churches, foreign embassies and non-governmental and civil society organizations.

2.2.6 Construction Industry's Contribution to Ghana's Gross Domestic Product

The construction industry of contributes to the Ghanaian economy through the provision of infrastructure and employment which translates into money to the country. The construction industry's share of overall Gross Domestic Product (GDP) of Ghana has improved significantly over the past few decades. Osei (2013) reports that the industry's share as percentage of GDP was 7.6 per cent in 1996 and this improved to 8.5 per cent of GDP in 1997. He states that due to the overall improvement in the macroeconomic landscape of the country as a result of the implementation of good macroeconomic policies, the industry's contribution to GDP rose steadily to 9.1 per cent of GDP in 2005 from 8.8 per cent in 2004, and improved further from 9.3 per cent in 2006 to 9.8 per cent in 2007. Again, in recent times, the construction industry's contribution to the Ghana's overall GDP as of 2011 stood at economy picked up to 9.9 per cent (Osei, 2013). In addition, the construction industry's contribution to the overall industrial sector output increased from 35.6 per cent in 2004 to 36.3 per cent in 2005. In 2011, the industry's share of industrial output was 37.4%, an improvement in the 2010 figure of 36.9 per cent. According to Osei (2013), this remarkable performance of the construction industry in the overall industrial sector output was against the backdrop of an expanded credit to the sector by the domestic money banks.

2.2.7 Characteristics of the Construction Industry

The processes and activities of the construction industry in Ghana are similar to the characteristics other developing countries in terms of the adoption of technology, construction methods, cultural environments and regulations (Kheni, 2008). In 2007, the African Development Bank (AfDB) reported that the fragmented nature of the construction industry in developing countries, its transient nature and especially the

fluctuating nature of jobs execution makes it unattractive for contractors to keep a lot of permanent workers, making construction firms rely enormously on the use of casual workers. The majority of the domestic construction firms in Ghana are Small and Medium-scale Enterprises (SMEs) (Addo-Abedi, 1999) operating in the informal sector. Furthermore, the Ghanaian construction industry is characterized with challenges such as shortfalls in materials handling, lack of credit facilities, poor planning and supervision, low mechanisation, unsafe worker behaviours and practices, low quality of work, delay in payments, intermittent design changes and variations, and low morale of artisans (Amoah, Ahadzie & Dansoh, 2011).

2.3 The Concept of Safety Culture

According to Yule (2003), the concept of safety culture has its origin in the social and behavioural psychology of the 1950's and 1960's that came to the fore in the organizational psychology, organizational behaviour, and management literature of the 1980's. However, the term safety culture was first used in the INSAG's (1988) report titled 'Summary Report on the Post-Accident Review Meeting on the Chernobyl Accident' after the occurrence of the 1986 Chernobyl nuclear disaster in the former Soviet Union. The report revealed the fact that the disaster happened because of the employees' and organisation's lack of knowledge and understanding of risk and safety (Bahari, 2011). It must be emphasized that after the occurrence of the Chernobyl disaster, the issue of safety culture in the nuclear, manufacturing, mining and construction industries have received a lot of attention across the globe. This is because the report on the disaster highlighted the importance of safety culture and its impact on managerial and human factors on the outcome of safety performance (Flin, Mearns, O'Conner &Bryden, 2000; IAEA, 1991).

Cox and Flin (1998) assert that after the Chernobyl disaster, poor safety culture was reported to be a prominent factor or root cause of other subsequent major disasters in various industrial sectors. Concurring with Cox and Flin, Yule (2003) posits that since the Chernobyl accident report, there have been several other public inquiry reports that have implicated poor safety culture within operating companies as a determinant of several high-profile accidents such as the explosion on the Piper-Alpha oil platform in the North Sea; the fire at King's Cross underground station; the sinking of the Herald of Free Enterprise passenger ferry, and the passenger train crash at Clapham Junction, London, to mention but a few. Therefore, the relevance of safety culture to safe operation in industrial firms is important than ever (Cox & Flin, 1998).

Since the release of the Chernobyl disaster report, various researchers and research institutions have propounded a number of definitions of concept of safety culture. I991, the International Atomic Energy Agency (IAEA) defined safety culture as 'the assembly of characteristics and attitudes in organizations and individuals which established that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance' (IAEA, 1991; p.1). The Health and Safety Commission's (HSC) Advisory Committee for Safety in Nuclear Installations (ACSNI), endorsed the position of IAEA and defines the concept of safety culture as 'the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organization's health and safety management' (HSC, 1993; p. 23). The HSC posits that 'organizations with a positive safety culture are characterised by communications founded on mutual trust, by shared perceptions of the importance of safety, and by confidence in the efficacy of preventative measure'.

Hale (2000) defines safety culture as "the attitudes, beliefs and perceptions shared by natural groups as defining norms and values, which determine how they act and react in relation to risks and risk control systems". Guldenmund (2000) proposes that safety culture is "[the] aspects of the organizational culture which will impact on attitudes and behaviour related to increasing or decreasing risk" (p. 251). Okolie and Okoye (2013) describe the overall safety culture can be describe as a set of beliefs, norms, attitudes and social technical practices that are concerned with minimizing the exposure of individuals, within and beyond an organization, to conditions considered dangerous or injurious. Furthermore, a review of literature on safety culture by Bust (2010) highlighted eight definitions of safety culture with common characteristics focusing on the way people think and/or behave in relation to safety. Bust concluded based on the careful analysis of the various definitions that safety culture is something an organization 'is' rather than something an organization 'has'. It is interesting to note that, among the various safety culture definitions found in prior literature, there have not been a consensus on the characteristics or constructs that make up the concept of safety culture. Pidgeon (1998) critiqued past research on safety culture for being 'unsystematic, fragmented and in particular under-specific in theoretical terms'. Cooper (2000) affirms the position of Pidgeon by stating that it is logical to suggest that the creation of a standardised definition or model of safety culture is not clear-cut. Yule (2003) concurs with Pidgeon and Cooper when he asserts that there is no definitive definition of the concept of safety culture for two main reasons: (i) different researchers emphasise different elements of safety culture as most salient, and (ii) culture of any kind is an extremely difficult concept to succinctly define. Yule opines that as human behaviours (and thus at an individual level, safe or unsafe behaviours) are partly guided by personal beliefs, values, and attitudes, continued workplace safety may have its base in individually, and

organizationally constructed shared beliefs that safety is important. He however, adds that a proper definition of safety culture should encapsulate beliefs, values and attitudes that are shared by a group (Yule, 2003). Therefore, the Health and Safety Executive [HSE], (2005), notes that despite the existence of wealth of information in articles and reports relating to safety culture, yet there is still no universally recognised and respected definition or model for the concept of safety culture.

Whilst there are numerous definitions of safety climate found in the literature, for the purpose of this study the hybrid definition of safety culture by Weigmann, Zhang, Thaden, Sharma and Mitchell (2002) would be adopted. They define safety culture as "the enduring value and priority placed on worker and public safety by everyone in every group at every level of an organisation. It refers to the extent to which individuals and groups will commit to personal responsibility for safety, act to preserve, enhance and communicate safety concerns, strive to actively learn, adapt and modify (both individual and organisational) behaviour based on lessons learned from mistakes, and be rewarded in a manner consistent with these values" (p.8).

2.4 The Concept of Safety Climate

According to Wiegmann, Zhang, Thaden, Sharma and Mitchell (2002), although the debate over the definition of safety culture has not reached unanimous agreement, a similar term "safety climate" has been used frequently in the literature and has added to the confusion. Given the antecedent of safety climate, Bust (2010) stated that the term safety climate originated from organisational climate, which appeared to have been developed in social psychology literature since the 1930s. He asserts that the term culture was originally used in anthropology before its application to organisational analysis in the 1950s (Cox, as cited in Bust, 2010). Guldenmund (2000) claimed that the earliest

located paper on safety climate is "Psychological climate and accidents in an automotive plant" authored by Keenan, Kerr and Sherman (1951). He reveals that Kenaan et al.'s study was based on introspective ratings from primary individuals in an automotive plant. Therefore, the term safety climate is said to have been derived from the theoretical background of organisational climate (Bahari, 2011).

However, the pioneering study on the concept of safety culture was conducted by Zohar (1980) who apparently first used the term safety climate in his empirical investigation using a 40-item questionnaire administered to workers in 20 Israeli manufacturing companies to test the model of safety climate. He defined safety climate as a "summary of molar perceptions that employees share about their work environment" (p.96). He referred to safety climate as a particular type of organizational climate, which reflects employees' perceptions about the relative importance of safe conduct in their occupational behaviour. He further asserts that the concept of safety climate can change from highly positive to a neutral level, and its average level reflects the safety climate in a given organization (Zohar as cited in Weigmann et al., 2002). Thus, it is the perceived state of safety of a particular place at a particular time, which is subject to change depending on the features of the operating environment (Flin, Mearns, Gordon & Fleming, 1998).

Zohar's study, which developed a questionnaire to measure a set of constructs that reveal worker perceptions of an organization's safety climate set the pace for future assessment of safety climate. The original safety climate constructs considered by Zohar in his questionnaire were: importance of safety training, effects of required work pace on safety, status of safety committee, status of safety officer, effects of safe conduct on promotion, level of risk at work place, management attitudes toward safety, and effect of safe conduct on social status (Zohar 1980).

In reviewing the literature on safety climate, it was found that subsequent definitions of safety climate were either built on that of Zohar (1980) or bore some characteristics indicated in his work. For instance, Niskanen (1994) defines safety climate as 'a set of attributes that can be perceived about particular work organizations and may be induced by the policies and practices that organizations impose upon their workers' (p. 241). Cox and Flin (1998) define safety climate as a manifestation of safety culture in the behaviour and expressed attitude of employees. Cheyne, Cox, Oliver and Tomas (1998) state that safety climate can be viewed as "a temporal state measure of culture, which is reflected in the shared perceptions of the organisation at a discrete point in time" (p.256). In other words, it is be regarded as the surface manifestation of culture derived from a sample of employees' attitudes and perceptions at a particular point in time (Flin, Mearns, O'Conner & Bryden, 2000). Yule, Flin, and Murdy (2001) describe it as the product of employee perception and attitudes about the current state of safety initiatives at their place of work. Also, Bahari (2011) views safety climate as an individual attribute, which includes two factors: management's commitment to safety and workers' involvement in safety.

In conceptualizing safety climate, Griffin and Neal (2000) opine that it should be conceptualized as a higher order factor, which comprises of more specific first order factors. They claim that higher order factor of safety climate should reflect the extent to which employees believe that safety is valued within the organization whilst first order factors of safety climate reflect perceptions of safety-related policies, procedures and rewards. In synthesising the varied safety climate definitions based on commonalities that exist between these definitions in the safety climate literature, Wiegmann et al. (2002) define safety climate as "the temporal state measure of safety culture, subject to commonalities among individual perceptions of the organization. It is therefore

situationally based, refers to the perceived state of safety at a particular place at a particular time, is relatively unstable, and subject to change depending on the features of the current environment or prevailing conditions" (p.4). Bahari (2011) noted that the main aspects of Weigmann et al.'s (2002) safety climate definition with concern to time frame as a safety climate are subject to changes because of many factors (i.e., working practices, safety policy, safety procedures and management attitudes towards safety). Bahari argues that the dynamic nature of safety climate denotes that there is a great need for reliable instruments that can measure the safety climate of an organisation as indicated by Cooper (1998). He concludes that consequently, these psychometric measures can be utilised in determining the effectiveness of safety programmes in the workplace, and how to improve future programmes.

Guldenmund (2000) upon thorough review of a number of definitions on safety climate and safety culture concluded that generally, the definitions of safety climate are apparently associated with safety culture as the shared aspects are emphasised in the definitions of the two concepts. However, Guldenmund assert that the perception aspect of the various definitions is more associated with safety climate as it implies employees' perceptions towards management and the work environment. Given the diverse definitions of safety climate found in the literature, for the purpose of this study, the researcher sides with the definition given by Bahari (2011). He refers to safety climate as individual perceptions of policies, procedures and practices relating to safety in the workplace that manifest in the underlying safety culture.

2.5 Determinants of Safety Climate on Construction Sites

In designing a framework for safety climate questionnaire, Fu, Zhang, Xie, and Zhang, (2006) after reviewing several safety climate surveys they found that the major

safety climate factors include: belief and value; management commitment; risk level and hazards identify; management efficiency; workers involvement and commitment; safety institutes and specialists; safety education and training; site management; and standardization. In ranking the above stated factors in order of importance, management commitment and management efficiency occupy the first and second positions respectively. Despite the importance attached to these two factors, Fu et al. (2006) however, suggest that researches involving detailed safety climate questionnaire could be conducted using the entire nine safety climate dimensions aforementioned. This is because; there are common characteristics that cut across all the safety climate dimensions.

In reviewing the safety climate factors outlined by Fu et al. (2006), Okolie and Okoye (2012) categorized the nine factors into four (4) factors namely: management commitment; workers involvement; safety education and training; and beliefs and perceptions. They opine that these factors are critical and relevant in analyses and discussion of safety climate for construction workers in Nigeria.

2.6 Safety Culture versus Safety Climate

Safety climate and safety culture have received considerable attention in safety literature since the publication Zohar's (1980) empirical study and the Chernobyl disaster report. The historical background of the concepts of "safety culture" and "safety climate" indicates that they were developed separately. Whilst "safety climate" had its genesis in the subject organisational culture research literature and "safety culture" has been used arbitrarily by accident investigators with no reference to any scientific source of information (Choudhry, Fang & Mohamed, 2007). Nazaruk (2011) contends that it

seems that the meanings of these two concepts were not distinguished explicitly and as a result they have been used interchangeably in many research studies.

The Occupational Safety and Health Council (OSHC) (2001) observe that one of the indicators of a positive safety culture is a good safety climate. OSHC claims that safety climate is often mistaken for safety culture as they are both inextricably linked, though they are distinctly separate entities. Health and Safety Executive [HSE] (2005) points out that the term safety culture can be used to refer to the behavioural aspects (i.e. 'what people do'), and the situational aspects of the company (i.e. 'what the organisation has'). On the other hand, the term safety climate normally refers to the psychological characteristics of employees (i.e. 'how people feel'), corresponding to the values, attitudes, and perceptions of employees with regard to safety within an organisation.

Again, whilst some researchers describe safety climate as people's perceptions of, and attitudes towards safety, which is a manifestation of safety culture in the behaviour and expressed attitudes of employees (Cox &Flin, 1998; OSHC 2001), safety culture is a sub facet of organizational culture that affects workers' attitudes and behaviour in relation to an organization's on-going safety performance (Mohamed, 2002). Wiegmann et al. (2002) contend that safety culture is commonly viewed as an enduring characteristic of an organization that is reflected in its consistent way of dealing with critical safety issues. However, safety climate is viewed as a temporary state of an organization that is subject to change depending on the features of the specific operational or economic circumstances. Again, Mohd Saidin, Abdul Hakim, Wan Yusoff, and Syamsus (2008) posit that safety culture is as a sub facet of organizational culture and exists at a higher level of abstraction than safety climate. From the foregoing, Cooper (2000) opines that it seems plausible that safety culture and safety climate are not reflective of a unitary concept, rather, they are complementary independent concepts.

Zohar (1980) asserts that in over three decades now safety culture or safety climate has been accepted as an essential and crucial solution for improving safety in the workplace across industries and countries. He postulates that theoretically, safety culture or safety climate provides a basis to guide the safety behaviour of employees so that they develop perceptions and expectations regarding safety behaviour outcomes. Guldenmund (2000) argues that the main differences in the definitions of the concepts of safety culture and safety climate are that whereas safety culture is characterised by shared underlying beliefs, values, and attitudes towards work and the organization in general; safety climate appears to be closer to operations, and is characterised by day-to-day perceptions towards the working environment, working practices, organizational policies, and management.

Despite the fact that the terms safety climate and safety culture are commonly used interchangeably in literature and in many research publications in over three decades now, however, to date, there is no conformity about a precise definition for both of them (Bahari, 2011; Nazaruk, 2011). Okoye (2010) observed that though safety climate is not synonymous with safety culture, both have formed the nucleus of organizational climate and culture respectively.

Since some of the definitions of safety climate are almost identical to and bore similar characteristics with the definitions of safety culture as seen in literature, in the context of this study, suffice it to say that an attempt to use the two concepts interchangeably will not be out of place or a novelty. Therefore, in this study the terms safety culture and safety climate would be used substitutable in this study though many other definitions do have commonalities and do differ from each other in important ways.

2.7 Safety Culture and Employee Behaviours

Nazaruk (2011) reviewed 17 papers on supervisory behaviours and 11 papers on managerial behaviours at the workplace. He coded the behaviours listed in these papers in order better to understand what classes of behaviour shape safety culture. Nazaruk found that there are some areas of safety-related behaviours that are common to both functional groups, such as discussing safety, praising safe behaviour and welcoming the reporting of safety issues. These areas which were referred to as elements of communication are supposed to be demonstrated by supervisors and managers. Again, he found other behaviours such as not turning a blind eye and building trust as shared features of leaders in both functional positions aforementioned. In addition, Nazaruk (2011), states that with regard to other components of communication, the role of the manager is to provide strategic safety information like statistics and informing personnel of new policies etc. In addition, the role of the supervisor is to provide a more contextualised understanding of safety by educating or explaining, emphasising the importance of safety, providing feedback on performance and reprimanding if necessary. He conclude by suggesting that, in order to enhance safety culture, supervisors should monitor the behaviour of their team mates while maintaining interest in their personal matters and trying to create a positive atmosphere of cooperation. However, a careful analysis of Nazaruk's review show that it did not consider the behaviours of low level workers such as operative or labourers as in the case of construction sites. Also, though he built his review on supervisory and managerial behaviours, the analysis of managerial behaviours was not straightforward.

2.8 Measuring Safety Culture and Safety Climate

Yule (2003) asserts that it is important to note that conceptual differentiation between safety culture and safety climate dictates that measuring safety culture and safety climate requires different methods. According to him, a number of qualitative methods have been used to measure safety culture, including interviews, focus groups, audits, and expert ratings. Studies that have measured safety culture have generally used a case study format to report findings. Thus, there are case studies of high reliability organizations, comparisons of high and low accident plants, and narratives of organizational crises. Yule posits that studies that have measured safety culture have generally rejected quantitative methods such as questionnaires as an inappropriate means of data collection. However, a number of studies have used qualitative methods to investigate safety culture, and then developed quantitative methods on the basis of those results (Lee, as cited in Yule, 2003).

Bahari (2011) observes that the conceptual differences between safety culture and safety climate indicate that the two concepts require different techniques of measurement. According to him, safety culture can mainly be assessed using qualitative methods, whereas safety climate can mainly been assessed using quantitative methods. However, according to Yule (2003), a number of qualitative methods have been used to develop quantitative measures of safety culture and climate.

2.8.1 Safety Culture Measurement - Qualitative Method

From the review of literature, it was found that more often than not qualitative methods such as interviews, focus groups, case studies, audits, and expert ratings have been used in safety culture measurement (Clarke, 1999; Lee, 1998; Mearns et al 1998). For instance, in his study on safety culture surveys, Carroll (1998) adopted the

qualitative approach of data collection using focus group discussions to develop a questionnaire survey for an interview to assess employees' safety value and behaviour in the US nuclear industry. He used the questionnaire survey method because it allowed the participants to be receptive to the questions during the discussion session. His study revealed that the most outstanding issues with regard to safety culture measurement were management involvement, accountability, and the role of supervisors. In their book "Human safety and risk management", Glendon, Clarke and McKenna (2006) assert that interviews may range from highly structured procedures to purely open-ended questioning with the aim of understanding research respondents' perspectives on target issues through generating and analysing primary qualitative data.

Clarke (1999) conducted a study among British Rail employees to examine the perceptions of a number of safety issues using a series of interviews. Developing a 75-item questionnaire to assess the shared perceptions of culture between train drivers, supervisors and managers, she was of the view that the method of data collection allowed the research participants to respond to questions about safety culture from the viewpoint of different organisational levels as a means of assessing shared perceptions of culture.

In assessing safety culture at a nuclear reprocessing plant at the British Nuclear Fuels in Cumbria, Lee (1998) firstly conducted a focus group discussion and the result were subsequently used to develop a 172-item questionnaire covering safety procedure, risk permit-to-work, job satisfaction, safety rules training, participation, control of safety and plant design. In another of using focus group discussions to develop questionnaire for the assessment of an organization's safety culture, Mearns, Flin, Gordon and Fleming (1998) measuring safety climate on offshore installations in the UK developed an Offshore Safety Questionnaire (OSQ) consisting of 52-item based on the focus group discussions and literature review. It could be observed that a number of studies on the

assessment of safety culture (Carroll 1998; Lee, 1998) made use of focus group discussions in one way or the other. Rousseau (1990) posits that in focus group discussions, participants interact directly or indirectly with researcher and have opportunity to use their own terms and concepts to express their point of view. Therefore, Bahari (2011) states that through qualitative measurement, intensive and in-depth information can be obtained using the focal group's own language. Again, Carroll (1998) claims that he used qualitative methods in his study because he felt that quantitative methods such as questionnaires presented results which were open to misinterpretation and researcher-bias unless some form of follow up was conducted with respondents.

Despite the frequent use of qualitative data collection methods such as interviews, focus groups, case studies, audits and expert ratings in assessing organizational safety culture due to the fact that they provide in-depth information on specific issues, these methods are not immune from limitations. For instance, Glendon et al. (2006) claim that in using qualitative methods such as interviews and focus group discussions, the interviewer's capability to form association with the respondents is very important, as they need to extract relevant information within a limited time and make sure that the discussion is on the right track.

2.8.2 Safety Climate Measurement - Quantitative Method

Though many researchers prefer the use of qualitative methods in assessing safety culture, Bahari (2011) contend that safety climate can mainly been assessed using quantitative methods. Also, Bergh (2011) opines that evaluating safety climate is much simpler than evaluating safety culture and therefore the use of questionnaires is very common when evaluating safety climate. The main reason for this is that it can be done

by using only quantitative methods. Arguably, Zohar (1980) developed the first safety climate measurement model in his work on safety climate in industrial organizations. A review of safety climate literature reveals that there has emerged a variety of safety climate measurement techniques modeled around that of Zohar (Brown & Holmes, 1986; Cooper & Phillips, 2004).

In addition, subsequent researchers after Zohar (such as Cheyne et al. 1998, Flin et al. 2000; Arboleda, Morow, Crum & Shelley, 2003; Lin, Tang, Miao, Wang & Wang, 2008) have developed their own safety climate measurement methods. Also, Bahari (2011) noted that, there specific safety climate measurement approaches in various industries (for example manufacturing, construction, offshore, nuclear, service, aviation and healthcare) and across countries especially UK, US, Australia, Sweden, Norway, Denmark, Taiwan, Hong Kong, Korea and Malaysia.

Yule (2003) asserts that the multiple definitions of safety climate in the literature has determined to a large extent what variables research teams have incorporated when developing measures of safety climate. Therefore, he claims that the central debate among theorists appears to be whether safety climate should be restricted to workforce perceptions about management and the manner in which management reconcile safety with productivity, or whether the role of management is incorporated with other safety issues such as risk perception, worker involvement, personal accountability, perceptions of the physical environment, and job communication. He concludes that this debate has not been resolved, and as a result, the research field of safety climate has favoured empirical research over theoretical development. In the light of this argument, Bergh (2011) posits that when evaluating safety climate it is important to evaluate it at a group level and not at an individual level since safety climate is by definition the *shared* perceptions of a group.

Coyle, Sleeman and Adams (as cited in Bahari, 2011) administered a safety climate questionnaire to two similar organisations to investigate the uniformity of their safety climate factors in similar organisations using the same questionnaires. According to Bahari, they factor-analysed each organisation's questionnaire separately, but failed to find a consistent safety climate factor structure. As a result, although they concluded that obtaining a universal stability of safety climate factors is highly uncertain, they argued that failing to produce a specific factor solution did not mean that the comparison of safety climate factors was meaningless. Instead, they proposed that the identification of different factor sets for a given organisation were an effective means of determining where attention might be most usefully focused.

Ostrom, Wilhelmsen and Kaplan (1993) developed a 88-item questionnaire, from interviews, analysis of manager's safety statements, and literature review to investigate safety awareness, teamwork, pride and commitment, excellence, honesty, communications, leadership and supervision, innovation, training, customer relations, compliance, safety effectiveness, facilities used in a US nuclear power plant. Philips et al. (1993) used a 50 item questionnaire developed based on Zohar's (1980) scale to assess management attitudes, safety training, promotion, risk, work pace, safety officer status, social status, safety committee in a UK package production plant. Though their study attempted to identify Zohar's (1980) safety climate dimensions in a UK sample however, those findings were not replicated. In their study, management and supervisory factors were deemed to be two factors rather than one and a reduced number of dimensions were suggested.

Again, Griffin and Neal (2000) used 81-item questionnaire survey to assess management values, safety inspections, personnel training, safety communication, safety knowledge, safety compliance, safety participation of workers of Australian

manufacturing and mining firms. In their study, safety climate was found to reflect management values, safety communication, safety practices, safety training, and safety equipment. Also, safety climate was found to influence workforce compliance and participation indirectly through a strong relationship with safety knowledge, and through weaker (but significant) relationships with compliance motivation and participant motivation. Brown, Willis and Prussia (2000) developed a questionnaire using in-depth tours, interviews, focus group discussions to investigate safety climate, pressure, cavalier attitude, safety efficacy, safe work behaviour of employees in the US steel industry. They found that safety climate was negatively related to supervisory pressure, indicating that positive safety climate is characterised by a low-pressure working environment. Also, it was found that pressure positively influenced safe behaviour directly, was positively related to cavalier attitude, and negatively related to safety efficacy whilst safety hazards were found to have a negative impact on perceptions of safety climate.

It must be emphasized that, despite the existence of some common characteristics among the different safety climate studies, the debate among researchers has not been unravelled and therefore the research on safety climate has advanced in empirical development rather than theoretical development. For instance, Glendon and Litherland (2001) argue that the inconsistencies of safety climate dimensions, is due to the fact that a variety of questionnaires, samples and methodologies are used by different researchers in their attempt to assess safety climate factors. They further aver that there is increasing evidence that consistent safety climate dimensions may not transfer from one organisation to another, particularly as every organisation differs in their management style and safety rules and regulations (Glendon & Litherland, 2001).

2.9 Safety Climate and Safety Outcomes

Mearns et al. (2003) posit that that there is an increasing attention to the role of safety climate to predict individual accidents and injuries in the workplace. This development is the light of the transition from traditional safety measures that are solely based on retrospective data or "lagging indicators" towards "leading indicators" such as safety climate (Flin et al. 2000). Hofmann and Stetzer, (1996) reported that workers are less likely to engage with unsafe acts or unsafe behaviour when they favour the safety perception of their workplace. Corroborating the position of Hofmann and Stetzer, Bahari (2011) claims that safety climate has been found to be negatively correlated with workplace accidents or injuries indicating that when employees perceive safety climate positively they are less likely to be involved in workplace accidents.

Several studies (Zohar, 2000; Mearns et al., 2003; Clarke, 2006; Nielsen et al, 2008; Seo et al., 2004; Tharaldsen et al., 2008) have examined the relationship between safety climate and safety outcome across various industries such as mining, petroleum and gas, manufacturing, nuclear, construction, etc. Most of these studies were conducted mainly to compare safety climate scores between accidents and non-accident group. Using a factor-analytic procedure to assess the validity of an employee safety climate model, Brown and Holmes (1986) found significant differences between accident and non-accident groups in terms of the safety climate scores for all three dimensions identified. Again, in his assessment of safety culture at a nuclear reprocessing plant, Lee (1998) found major differences between the self-reported accidents and non-accidents groups in all the 15 safety climate dimensions used in the questionnaire. In addition, Williamson, Feyer, Cairns and Biancotti (1997) studied the role of safety perceptions and attitudes on an organization's safety climate. Similarly, they found significant differences between the self-reported accident and non-accident groups.

Despite the fact that many researchers have studied the relationship between safety climate and safety outcomes in terms of self-reported accident and non-accident groups, only a few studies of such studies (Nielsen et al., 2008; Mearns et al., 2003) have attempted to test the validity of safety climate measures with actual company accident records as well as self-report accidents and injuries. Again, Clarke (2006) noted that even though there has been a growing interest in safety climate and its role in the prevention of accidents in the workplace, very few studies have attempted to measure the relationship between safety climate and workplace accidents over long period of time. In their two cross-sectional analyses, Nielsen et al. (2008) found that there is a relationship between safety climate and self-reported injuries and companies reported accidents. In addition, in their benchmarking of offshore safety, Mearns et al. (2003) found partial support for the hypothesis that safety climate predicts accidents, both with self-reported accidents and the official company accidents record.

2.10 Factors influencing Unsafe Worker Behaviours on Constructions Sites

It has been established that unsafe behaviour are intrinsically linked to workplace accidents. It has also been confirmed that a positive correlation exists between workers safe behaviour and safety climate within construction site environment and that workers attitudes towards safety are influenced by their risk perceptions, risk management, safety rules, procedures and cultural background (Okolie & Okoye, 2013). Oswald, Sherratt and Smith (2013) explored factors affecting unsafe behaviours involving construction workers from many different backgrounds and nationalities in the UK through a process of literature exploration, a safety climate survey and focus group discussions. After a careful review of previous health and safety literature, they identified various factors as potentially contributing to behavioural safety issues on construction sites. Oswald et al.

concluded that a combination of all the behavioural factors found in safety literature would potentially create a very complex safety equation on site, with behaviours influenced by some factors more than others, at different times and in different situations. Therefore, they highlighted all the factors identified and explored their relevance within a large multinational workforce in order to establish their perceived influences in practice. They found that time pressure, training, experience, risk perception, safety culture, culture and management are the factors most likely to influence behavioural responses of individuals. Time pressure was perhaps the most important factor as it was often regarded as having the greatest influence by the focus group. Also, the study revealed that 31% of 475 participants indicated that alcohol and drugs were 'always' a factor in accidents.

Burke and Litwin (1992) developed a model of organisational performance and change that made use of an open system framework to operationalise the major factors that may affect worker behaviour across various industries. They focused their study on the extent to which their proposed factors influence worker behaviour. Among the factors they considered were:

- External environment;
- Mission and strategy;
- Leadership;
- Organisational culture;
- Structure;
- Management practices;
- Systems (policies and procedures);
- Work unit climate;
- Task and individual skills;

- Motivation;
- Individual needs and values;
- Individual and organisational performance (behaviour)

They found that each of the above stated factors influences one or more other factors to some extent. Therefore, they recommend that in exploring worker behaviour using their model with these factors under consideration, it is very necessary to examine all the factors as a whole instead of selecting a number of them. This is because to better understand worker behaviour, the influence of all these factors should be considered and analysed not just culture

2.11 Relationship between Safety Culture and Accidents

Ridley (1986) claims that about 99 per cent of accidents that happen on construction sites are caused by either unsafe acts or unsafe conditions exhibited by construction workers. Dester and Blockley (1995) concur with Ridley when he avers that most of the accidents that occur on construction sites are because of poor safety culture leading to unsafe worker behaviours. In his book titled "Safety Management in Industry", Krishnan (1999) states that the major causes of accident on construction sites are as a result of human errors and unsafe actions caused by illiteracy, lack of training, poor supervision, technical flaws relating to design, layout, machine guarding and arrangement of work. Similarly, Sawacha, Naoum and Fong (1999) assert that majority of the accident that occuron constructions sites are due to lack of knowledge or training, lack of effective supervision, error of judgement, worker apathy or recklessness.

Studying the causes of accidents on construction sites, Abdul Hamid (2003) found that the main causes of accidents are negligence on the part of construction workers, non-compliance with safety rules and regulations, working at high elevations,

poor site management, low knowledge and skill of workers, failure to use personal protective equipment and poor worker attitude towards safety. In examining the causes of accidents in Thailand construction sites, Pipitsupaphol and Watanabe (2000) categorized the major causes of accidents as follows: the unique nature of the construction industry, job site conditions, unsafe equipment, unsafe methods of work, human elements and management factors. They added that factors such as failure to use personal protective equipment, improper loading or placement of equipment or supplies, and improper use of equipment were some of the causes of accidents on construction sites.

Gibb and Bust (2006) conducted a study on health and safety on construction sites in developing countries. They found that the following factors having a negative impact on health and safety management in developing countries:

- poor infrastructure;
- problems of communication due to low literacy level;
- unregulated practices on construction sites;
- adherence to traditional methods of working;
- non availability of equipment;
- extreme weather conditions;
- improper use of equipment; and,
- corruption

Also, Oswald et al. (2013) found that the factors that are perceived to be contributors of on-site accidents on construction sites are poor safety culture, risk taking alcohol and drugs poor risk perception, tiredness, lack of training/experience, poor management style, thrill seeking, and national/cultural clashes.

In a study conducted by Brace, Gibb, Pendlebury and Bust (2009) on "Health and safety in the construction industry", they found that the underlying causes of construction accidents could be categorised under societal and industry wide influences (macro); project and process factors (mezzo) and worker/supervisor/workplace causes (micro). The causes of construction accidents at the macro level were identified to include immature corporate systems, inappropriate enforcement, lack of proper accident data, lack of leadership from 'Government' as a key client and a lack of influence of trades unions in practice on most sites, especially for smaller projects. Mezzo factors were identified as immature project systems and processes, inappropriate procurement and supply chain arrangements, lack of understanding and engagement by some of the design community, lack of proper accident investigation/data and consequently, a lack of organisational learning. Micro factors included a shortage of competent supervisors; a lack of individual competency and understanding of workers and supervisors; the ineffectiveness or lack of training and certification of competence; a lack of ownership, engagement and empowerment of, communication with and responsibility for workers and supervisors. These factors were also aggravated by poor behaviour, cost pressures; poor equipment or misuse of equipment, including personal protective equipment; site hazards; poor employment practices; an itinerant workforce and inadequate management of and provision for vulnerable workers such as younger, older or migrant workers.

2.12 Safety Management in the Construction Industry

Mohamed, Ali and Tam (2009), defines safety management system as an organized approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures. Thus, it relates to the actual practices, roles and functions associated with remaining safe. Mohd Saidin et al. (2008)

emphasized that effective safety management is both functional (involving management control, monitoring, executive and communication subsystems) and human (involving leadership, political and safety culture sub-systems paramount to safety culture).In the modern business environment, occupational health and safety has become a very sensitive management responsibility and therefore influences the very survival of organizations in some extreme cases (Bhutto; Griffith & Stephenson 2004). In this regard, the Health and Safety Executive (HSE) (2005), advocates that organizations shift from traditional safety management approach, which is reactive, to a modern approach that is more proactive. In line with these developments, there have been the emergences of new regulations, laws, standards and codes which have made it necessary for construction firms to improve their safety performance.

2.13 Summary

Safety culture and safety climate are interrelated concepts that evolved in the 1980s from the broader concepts of organizational culture and organizational climate. Though these two concepts are quite distinct from each other, neither empirical nor theoretical studies found in the safety literature nor the practical application of these concepts has offered any clear-cut distinctions. The confusion is more compounded when it comes to the definition of the two concepts with some researcher's mixing up the characteristics of the concepts in an attempt to define one of them resulting in considerable definitional confusion. Therefore, the literature indicates that there is little agreement regarding the definition of the safety culture and safety climate concepts. Moreover, some researchers' suggest that the two concepts are just different aspects of the same phenomenon, and therefore use them interchangeably. However, despite the vague heritage of the term "safety culture" and its confusion with "safety climate", many

authors attempted to distinguish these two concepts. Safety climate is usually regarded as a safety culture manifestation in behaviour expressed in the attitude of employees In an attempt to differentiate the two concepts, the main differences in the definitions are that whereas safety culture is characterized by shared underlying beliefs, values, and attitudes towards work and the organization in general, safety climate appears to be closer to operations, and is characterized by day-to-day perceptions towards the working environment, working practices, organizational policies and management. It was revealed that there is no one generic structure of safety climate; rather, its dimensional composition depends on the specifics of the industry sector and contextual variables of the particular organization. It was observed in prior literature that time pressure, training, experience, risk perception, safety culture, culture and management are the factors perceived to be most likely to influence the worker behaviour on construction sites with time pressure was often regarded as most influential. Also, the major causes of accident on construction sites as found in previous studies were the unique nature of the construction industry, job site conditions, unsafe equipment, unsafe methods of work, human elements and management factors.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents methodology adopted for the study. To be specific, it presents and justifies approaches used in the data collection based on the research questions. The chapter covers aspects such as research design, populations, sampling technique and sample size, sources of data, data collection instruments and procedure, pre-testing of questionnaire and data analysis techniques adopted for the study

3.2 Research Paradigm

According to Boateng (2014), before starting any research, the researcher needs to determine the research paradigm. A paradigm is "a set of beliefs, values and techniques which is shared by members of a scientific community, and which acts as a guide or map, dictating the kinds of problems scientists should address and the types of explanations that are acceptable to them" (Kuhn, 1970, p.175). In the world of research, there are a number of paradigms and even new paradigms have continued to evolve over time. However, Kuhn asserts that the dominant paradigms widely accepted in research are the positivist, interpretive/constructivist, and critical paradigms.Considering the various type of research paradigms, Boateng (2014) contends that the choice of a particular research paradigm can arguably be based on: a researcher's philosophical beliefs/views of the world, the research topic of interest, the level of existing knowledge pertaining to the topic, and the range of skills researcher may have in methodological approaches. He explains that firstly, a researcher's philosophical beliefs about reality/world and how knowledge is constructed and can be known may influence the choice of any of the paradigms discussed earlier. Secondly, different approaches of

research allow researchers to understand different phenomena and for different reasons. Thus, the choice of a research paradigm and its related methodologies may depend on the questions being asked rather than a commitment to a particular paradigm. Also, where the level of knowledge or literature pertaining to the topic is yet to gain maturity, a field of research may begin with a particular approach (e.g. qualitative interpretive approaches), and later move towards a different approach (e.g quantitative positivist approach) as it matures. Furthermore, Boateng indicates that the abilities and limitations of the researchers in terms of data analysis techniques sometimes influence the choice of research paradigms instead of their view of the world.

According to Kheni (2008), the choice of research methods in management and social sciences embodies the researcher's assumptions about the nature of the social world, the nature of the knowledge to be obtained and methods of gaining knowledge. He asserts that these assumptions or paradigms are important, since a researcher's chosen research methods should be most appropriate for a context matching its underlying assumptions. Hence, Hesse-Biber and Leavy (2006) aver that research paradigms provide a conceptual framework through which to view the world. Hesse-Biber and Leavy posit that in most cases, researchers who adopt quantitative and/or qualitative research methods are usually associated with two main paradigms; thus positivism and interpretivist paradigms. Kheni (2008) postulates that positivism considers the social world as if it were a concrete, objective reality, in a way that laws can be found that explain this reality. Thus, in the view of the positivists, this real world can be studied only through the utilization of methods that prevent human contamination of its apprehension or comprehension. On the other hand, interpretivist paradigm views the social world as one that individuals create, modify and interpret the environment within which they function.

From the foregoing, it can be deduced that different paradigms provide different perspectives of the real-world, sometimes too complex, or incommensurable. For instance, Kheni (2008) states that the richness of real-world situations means one paradigm is unlikely to present a complete picture of it or, to put it another way, different paradigms give different aspects of the real world. However, the researcher tends to support the positivist view of social reality and therefore adopts the positivist paradigm. The positivism paradigm is to instrumentally learn about reality so that the general laws that govern reality can be discovered and explained in order to describe, predict and control reality (Boateng, 2014). The positivists believe in empiricism, the idea that observation and measurement are at the core of the scientific endeavour. Thus the positivists assume an objective reality which is single and concrete. Positivist researchers are independent from what is being researched. This is because of distance or objective separateness between the researcher and object of study and therefore knowledge is discovered and verified through direct observations or measurements of reality. The positivists believe that the only way to conduct research is through a quantitative means and this is equated with truth. This is because quantitative research is based on the principles of the natural sciences and relies on the assumptions of an objectivist view of the social world (Kheni, 2008). Therefore, objective methods of measurements are used in the measurement of constructs in quantitative research.

3.3 Research Strategy

Denzin and Lincoln (2000, p.371) explain that a "research strategy connects the researcher to specific approaches and methods for collecting and analyzing data". Hence the research strategy outlines the particular research approach to be adopted by the researcher. Yin (2003) refers to research approach as a systematic and logical procedure

for solving a problem with the support of facts. Fellows and Liu, (2003) provide that there are two principal approaches to research namely; qualitative and quantitative approaches. However, Denzin and Lincoln (2000), assert that research approaches may be categorized as qualitative, quantitative or multi-methodology. Also, Creswell (2003) concurs with Denzin and Lincoln (2000), on their assertion of three major approaches. He identified a third approach which he calls the mixed method approach earlier referred to as multi-methodology by Denzin and Lincoln.

The quantitative research method adopts a deductive and objective view, which is characterized by tangible data such as counts, weight, mass, and other physical measures (Fellows & Liu, 2003). Boateng (2014) emphasizes that the quantitative method is used to determine the extent of a problem or the existence of a relationship between aspects of a phenomenon by quantifying the variation. It usually includes the investigation of frequencies and different measurable variables with the aim of explaining a certain phenomenon (Phoya, 2012). Phoya asserts that the advantage of the quantitative approach is that it measures the reactions of a great many people to a limited set of questions, thus facilitating comparisons and statistical aggregation of the data, and so the results can be generalized. Also, quantitative method has the advantage of allowing the researcher to reach conclusions with a known degree of confidence about the extent and making of precise statements (Weiss, 1998). The quantitative method deals with numerical measurements which mainly consist of several kinds of data collection tools including questionnaires and checklists. Examples of quantitative designs include experimental research, correlational research, and survey research.

Qualitative research on the other hand, adopts the inductive and subjective view of knowledge of the real world. It views individuals or organizations in a holistic manner rather than isolated variables and hypotheses (Phoya, 2012). The qualitative method

seeks to explore the meanings, attitudes, values, beliefs people associate with a phenomenon in order to establish a better understanding, rather than to test to support or disprove a relationship (Boateng, 2014). Cresswell, (2003) observed that qualitative data provide depth and details through direct quotations and a careful description of programmes, situations, events, people, interactions and observed behaviours. This is possible because the qualitative method gives the respondent the opportunity to speak freely, which can provide important data that would not be obtained by the quantitative method (Yin, 2003). In addition, the qualitative method incorporates evidence gathered from multiple perspectives and do not rely on only the researchers' pre-set categories, thus they provide a comprehensive and a full range information and richness in details (Dehlor, 2006). Some major example of qualitative research includes case study, ethnography, and grounded theory.

The third approach as indicated by Denzin and Lincoln (2000); Creswell (2003) is the multi-methodology or mixed methods approach. As the name implies, it is the combination of both quantitative and qualitative approaches (methods) to collect and analyze data in a particular study (Denzin and Lincoln 2000; Creswell & Clark 2007; Morgan 2006). Collins, Onwuegbuzie and Jiao (2007) contend that since the 1960s, an increasing number of researchers in various fields of social and behavioural sciences have been advocating the combination of quantitative and qualitative approaches commonly known as mixed methods research to the study of various social phenomena. The mixed method approach involves collecting both numeric and text information, either simultaneously or sequentially, so as to best understand research problems, with the final database representing both quantitative and qualitative information (Creswell & Clark, 2007). Johnson and Onwuegbuzie (2004, pp 17-18) describes the mixed methods approach as a "logic of inquiry which includes the use of induction (or discovery of

patterns), deduction (testing of theories and hypotheses), and abduction (uncovering and relying on the best of a set of explanations for understanding one's results)". According to Morgan (2006), the assumptions underlying the mixed methods approach represent bipolar extremes, whereas it tends to emphasize both the inductive-subjective-contextual approach and deductive-objective-generalizing approach. Therefore, this approach presents the situation whereby research problems can be understood better by employing both methods rather than by using only one method (Creswell, 2003).

With respect to the research issue under consideration as well as the specific objectives of the study, the researcher was of the opinion that a quantitative view of the study will present the researcher with a better understanding of the influence of construction workers' behaviour on safety outcomes of construction sites in Ghana. Therefore, in line with the research questions posed, the researcher deemed it appropriate to quantitative approach for the purpose of data collection and analysis.

3.4 Research Design

Denzin and Lincoln (2000, p.22) defines a research design as "a sets out guidelines that linkup the elements of methodology adopted for a study namely; relating the paradigm to the research strategy and then the strategy to methods for collecting empirical data". It is a plan that guides the researcher in the process of collecting, analyzing and interpreting observations (Nachmias & Nachmias, 1993).It involves the practical procedures adopted for accessing the subjects of the research. In order words, a research design is referred to as the advance planning of the methods to be adopted for collecting relevant data and the techniques to be used in their analysis, keeping in view the objective of the research and the availability of staff, time and money (Agyedu, Donkor & Obeng, 2013). Agyedu et al. assert that the researcher needs to state the type

of research design employed to test the hypotheses or to answer the research questions that guide the study.

The research design adopted for the study was survey. Survey research design is a type of descriptive research where the research administers a questionnaire to a sample or to the entire population to describe the attitudes, opinions, behaviours, or characteristics of the population (Creswell, 2012). Creswell asserts that in this procedure, survey researchers collect quantitative, numbered data using questionnaires (e.g., mailed questionnaires) and statistically analyze the data to describe trends about responses to questions and to test research questions or hypotheses. Considering the nature of the study, the survey design was deemed appropriate in terms of collecting data from a large group of respondents within a relatively short period of time. Also since the study focused on construction workers, the survey design was used for the purpose of generalization of the results of the study to construction workers within the Ashanti Region. Kothari (2004), posits that the survey research design is where a sample of the population is studied (questioned or observed) to determine its characteristics or relationship, and it is then inferred that the population has the same characteristics or relationship.

3.5 Population

Population is "a collection of all possible individuals, objects or measurement that have one or more characteristics in common that are of interest to the researcher" (Arthur, 2012 p.109). Thus, population is a complete set of individuals (subjects or events) having common characteristics in which the researcher is interested (Fraenkel& Warren, 2002). The target population for the study comprised site level operatives i.e

skilled and unskilled labour and site foremen of the 150 registered building and civil engineering contractors in the Ashanti Region.

3.6 Sample and Sampling Techniques

Sampling is the process of selecting a portion of the population to represent the entire population in the study (Amedahe, 2004).Sample on the hand consist of a carefully selected unit of the population for a particular study (Sarantakos, 2005) or is a sub-group of the population that is an ideal representative of the entire population (Kumar, 1999). It is "the representative of the population to the extent that it exhibits the same distribution of characteristics as the population" (Arthur, 2012, p. 111). Best and Kahn (1998) posit that, to study a large population to arrive at generalization would be impracticable, if not impossible. Gay (1992) asserts that in general, the minimum number of subjects believed to be acceptable for a study depends upon the type of research involved. It is worthy to note that, the most important task of sample selection is to come up with a sample that is representative of the population under consideration. The study focused on site level operatives in active operation during the period of the study. Though the target population comprised all registered construction firms in the Ashanti Region, due to time and financial constraints the sample size was limited to only firms undertaking active construction projects with the Kumasi Metropolis at the time of data collection. Hence the sample comprised site level operatives and site foremen of 12 construction firms who were working on projects within the Kumasi Metropolis. The study focused on registered construction firms undertaking active projects in the Kumasi Metropolis because the on-going construction projects (public and private) which were not registered with the Metropolis could not be easily located.

For the purpose of data collection, the researcher adopted the convenience sampling technique in selecting a total of 438 site level operatives of the 12 construction firms to whom the questionnaire was administered. This technique was employed because due to the nature of their work, only workers who were readily available and willing to participate in the study were considered. On the other hand the purposive sampling technique was used to select 24 site foremen. This technique was adopted based on the researcher's judgment in respect of the respondents' competency to provide detail and appropriate responses to the research instruments. Therefore, at least two foremen on the selected construction site are purposively selected to participate in the study.

3.7 Data Collection Instruments

The choice of data collection instrument(s) for a particular study depends on the research approach adopted, thus whether quantitative, qualitative or mixed methods approach as well as the pertinent research questions posed (Boateng, 2014). In this study, the quantitative approach was adopted. Therefore, for the purpose of data collection and analysis, the researcher employed questionnaire to collect data from the respondents. Questionnaires are used to collect data that is not directly observable from the participants in a sample about their characteristics, experiences and opinions. It co nsists of series of questions to address psychological, social and/or professional topics with the objective of obtaining data on the problem(s) under investigation. The questionnaire is regarded as an effective instrument for securing factual information about practices and conditions of which the respondents are presumed to have knowledge and opinions on (Cohen, Manion & Morrison, 2005).

One sets of questionnaire was designed and self-administered to the construction workers at the operational level. The researcher developed a questionnaire bank from all relevant empirical studies related from which the appropriate questionnaire items were finally selected based on the specific research objectives. The questionnaire was in five sections, thus Section A, B, C, D and Section E. The Section A part of the questionnaire was made up of dichotomous response items which captured the demographic data of the respondents such as gender, age, work experience, educational qualification, and job title. The rest of the sections consisted of forced-choice closed-ended items developed based on the pertinent research questions which were presented under four subsection according the to the four research questions. Section B comprised 25 response items with regards to the determinants of safety climate on construction sites. Section C comprised 17 response items with regards to unsafe behaviours of workers on construction sites. Section D comprised 16 response items with regards to causes of unsafe behaviour on construction sites. Finally, Section E comprised 15 response items with regards to safety outcomes construction sites. A copy of the questionnaire is attached as an Appendix A. Closed-ended questions were used for the reason that they are easy to ask and quick to answer, they require no writing by either respondent or interviewer, and their analysis is straightforward (Naoum, 1998). The closed-ended items were rated using a five-point Likert scale with a response categories of: 1 – Strongly disagree, 2 – Disagree, 3 – Neutral, 4 - Agree and 5 – Strongly agree for Sections B, C, D and E

3.8 Validity and Reliability of Instruments Used

Mugenda and Mugenda (2003) define validity as the degree to which results obtained from the analysis of the data actually represent the phenomena under study while reliability is a measure of the degree to which a research instrument yields

consistent results or data after repeated trials. Carmines and Zeller (1979) contend that the reliability of a research instrument is characterized by its ability to reproduce data in a consistent way on repeated trials though there will always be a presence of chance error no matter how reliable the method is. Thus, reliability exists when the operations of a study such as the data collection procedures can be repeated with the same results (Phoya, 2012).

The researcher ensured the validation and reliability of the questionnaire in various ways by utilizing different approaches. In an attempt to ensure that the questionnaire measured what they were supposed to measure, the researcher designed the questionnaire himself with reference to the purpose of the study and the pertinent research questions. Secondly, the researcher gave a draft to five construction experts to examine the appropriateness of the response items. The comments and suggestions from these experts assisted the researcher in improving upon the face and content validity of the instruments. Furthermore, the questionnaire was submitted to the researcher's supervisor for vetting and his expert advice for necessary corrections and modifications to be made. Based on these exercises, the researcher assumed a reasonable face and content validity of the instruments.

To ensure a reliable and accurate questionnaire free from ambiguities, a pretest was carried out on a construction site at Kumasi Police Training School, Patasi where understanding of participants on issues of safety climate, behaviour and culture became a priority. Identified ambiguities with some of the questions were corrected and reframed. The relevance of the questions were taken into consideration and dealt with accordingly. Cronbach's alpha reliability test was conducted which yield a reliability coefficient of 0.91. This coefficient was deemed was high enough to justify the use of the instrument

for the study because according to De Vellis (1991), a reliability coefficient of 0.80 is considered very respectable for determining the appropriateness of the instrument.

3.9 Data Collection Procedure

One week before the commencement of data collection on the various construction sites, the researcher officially visited the selected construction sites. During the visits, the researcher explained the purpose and objectives of the study to the site managers and why he wanted to use their firms and workers as case studies. The researcher and the site managers agreed on an appropriate date and time for the administration of the questionnaire and the conduct of the interview. This helped the respondents to prepare well in advance in order to provide appropriate responses to the questions within the stipulated time. The questionnaire was self-administered to the site level operatives on the various construction sites within one month. Workers on each site where given one week starting from the day of administering the questionnaire on a particular site to answer the questionnaire. The researcher explained questionnaire items to illiterate respondents in the language they understood better and given some time to reflect on the responses before giving their options. However, most of the respondents completed and delivered their questionnaire on the spot with concern that it might be misplaced due to their busy schedules. At the end of the data collection process, the researcher was able to retrieve 347 completed questionnaire from the respondents out of the total of 438 questionnaire administered (i.e. 414 site level operatives and 24 site foremen). However, out of the 347 questionnaire retrieved, it was found that 41 of them were not answered correctly or were incomplete. Hence, the researcher relied on 306 fully and correctly answered questionnaire for the purpose of data analysis.

3.10 Data Analysis

The responses from the questionnaire were edited in order to identify omissions and to correct errors if any. All the questionnaire items were classified, categorized in order to ensure that items and responses measuring the same concept were grouped together. Subsequently, the results were coded and analyzed using the Statistical Package for Service Solutions (SPSS version 20). The data were analyzed using descriptive statistics (frequencies, percentages and weighed means) and inferential statistics. Mean Score Index and Standard Deviation were computed to find out the key determinants of safety climate, factors of unsafe behaviour and safety outcomes of construction sites. Factor analysis was employed to attain the principal factors of: determinants of safety climate, factors of unsafe behaviour, unsafe behaviour of workers of construction site and safety outcomes.

Exploratory factor analysis was employed because it is a statistical tool useful in bringing insights regarding the relationship among numerous correlated, but seemingly unrelated variables in terms of relatively few underlining factors (Overall and Klett, 1972). The tool is widely used by researchers of different disciplines to identify and interpret non-correlated clusters of variable (Ocal, Oral, Erdis & Vural, 2007; Lee and Lee, 2011). In order to ascertain the relationship between unsafe behaviour and safety outcomes of construction sites, Spearman correlation test was adopted at 5% (0.05) significance level. The results generated from the quantitative analysis were presented in tables.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF RESULTS

4.1 Introduction

The chapter focuses on the presentation and analysis of results of the study. The chapter is organised into seven main sections including; the response rate of the questionnaire, demographic characteristics of respondents, key determinants of safety climate of construction sites, factors influencing unsafe behaviour of workers on construction sites and relationship between unsafe worker behaviour and safety outcomes on construction sites.

4.2 Response Rate

A total of 438 questionnaires were administered to the survey respondents and 347 were completed and returned. Forty one questionnaires were not properly completed and as such did not form part of the analysis. Three hundred and six completed questionnaires were therefore analysed constituting a response rate of 70%. This is an acceptable response rate for analysis (Punch, 2003).

4.3 Demographic Characteristics of Respondents

Issues covered under the background of respondents include the gender, age, job title, working experience and educational qualification of respondents. The background of respondents were very necessary to enable the researcher describe the peculiar characteristics of the respondents.

4.3.1 Gender of Respondents

The gender distribution of the respondents was presented in Table 4.1 as follows:

Table 4.1: Gender of Respondents

Gender	Frequency	Percent
Male	271	88.6
Female	35	11.4
Total	306	100.0

Source: Researchers Field Work, 2016

From the data collected, majority (271) of the respondents representing 88.6% were males with the remaining 35, representing 11.4% being females. The gender distribution as depicted in Table 4.1 implies that the study was dominated by male respondents. This confirms the male-dominant characteristic of the construction industry.

4.3.2 Age of Respondents

The age distribution of the respondents who successfully completed the questionnaire was presented in Table 4.2 as follows:

Table 4.2: Age of Respondents

Age	Frequency(N)	Percentage (%)
Under 20years	3	1.0
21-30years	147	48.0
31-40years	129	42.2
41-50years	27	8.8
Total	306	100.0

Source: Researchers Field Work, 2016

It was observed from Table 4.2 that over 90% of the respondents were above 20 years. Thus, whilst almost half (48.0%) of the respondents were within the ages of 21 to 30 years, 42.2 % of them were within the 30-40years age bracket with a slightly below one-tenth (8.8%) of them aging between 41-50 years. A careful analysis of the age

distribution of the respondents clearly showed that due to the nature of the construction work, it requires workers who are in their youthful stage and can stand the strength and physique needed.

4.3.3 Job Title of Respondents

The section contains information with respect to the job title of the respondents as presented in Table 4.3 as follows:

Table 4.3: Job title of Respondents

Job title	Frequency (N)	Percentage (%)
Foreman	20	6.5
Steel bender	23	7.5
Mason	93	30.4
Carpenter	28	9.2
Plumber	11	3.6
Labourer	114	37.3
Painter	17	5.6
Total	306	100.0

Source: Researchers Field Work, 2016

Table 4.3 showed the job portfolio of construction workers at operational and management levels on construction sites in the Kumasi Metropolis. The job specifications comprised foreman, steel bender, mason, carpenter, plumber, labourer and painter. Among the construction workers who participated in the study, 20 of the representing 6.5% were foreman, 23 of them representing 7.5% of were steel benders, whilst 93 representing 30.4% were masons. In addition, 28 of the respondents constituting 9.2% were carpenters, 11(3.6%) respondents were plumbers, and 17(5.6%) of them were painters. Labourers constituted the single majority of the respondents with the highest number of 114 persons representing 37.3%. The distribution of the workers with regards to their trades revealed the different categories of workers employed or engaged to work on projects on construction sites.

4.3.4 Working Experience of Respondents

The section contains information with respect to the work experience of the respondents as presented in Table 4.4 as follows:

Table 4.4: Working Experience

Working experience	Frequency(N)	Percentage (%)
Under 1year	120	39.2
1-5years	159	52.0
Above 5 but less than 10years	12	3.9
10-15years	15	4.9
Total	306	100.0

Source: Researchers Field Work, 2016

It could be observed from Table 4.4 that slightly over half (52.0%) of the respondents had worked in the construction industry for five years whilst 39.2% had just entered the industry with the last one year. In addition, 15 of the workers had gained over 0-15 years working experience in the construction industry. The years of experience in the construction industry by the respondents as depicted in Table 4.4 was very encouraging and justified the ability of the respondents to provide the appropriate responses to the questions been asked. This is because based on their experience, appreciation and understanding of the safety issues on construction sites, they were in good position to present the issues as there were on the ground.

4.3.5 Educational Qualification of Respondents

A section of the questionnaire was designed to capture the education qualification of the respondents. This data was necessary to inform readers about the competency of the respondents in terms of their ability to read and understand the questionnaire items they were asked to respond to. The educational qualification of the respondents was presented in Table 4.5.

Table 4.5: Qualification of Respondents

Qualification	Frequency (N)	Percentage (%)
No formal education	75	24.5
BECE	115	37.6
SSCE/WASSCE	45	14.7
City and Guilds Intermediate	33	10.8
NVTI certificate	23	7.5
Technician Certificate	15	4.9
Total	**306**	**100.0**

Source: Researchers Field Work, 2016

From Table 4.5, it was observed that majority of the respondents representing 37.6% of the total respondents used in the analysis had only acquired basic level education with BECE as their highest educational qualification. Slightly below one-quarter (24.5%) of them had no formal education and therefore could neither read nor write. With those in this category of non-formal education, the researcher translated the questionnaire items to them in the major local language of the people (Twi) so that they could understand the questions and tick the appropriate responses per their judgement. Also, some of the respondents indicated that they have acquired form level of secondary education and had obtained educational qualifications such as SSCE/WASSCE (14.7%), City and Guilds Intermediate certificate (10.8%), NVTI certificate (7.5%), and Construction Technician Certificate (4.9%). The data with regards to the educational qualifications of the respondents as shown in Table 4.5 implies that majority of the respondents had attained some level of formal education were in a better position to read and understand the questionnaire administered to them.

4.4 Determinants of Safety Climate of Construction Sites

In order to answer the first research question, the questionnaire captured the views of construction workers on what they deemed as the key determinants of safety climate on construction sites. The descriptive statistics for all the variables under investigation in relation to the issue of key determinants of safety climate on construction site is presented in Table 4.6. The data comprises of the mean, standard deviation and number of respondents (N) who participated in the survey.

Table 4.6: Responses to questions on the determinants of safety climate

Safety climate Determinants	Responses					Mean	Std. Dev.	RK
	1=SD	2=D	3=N	4=A	5=SA			
Management involvement in safety	---	1(0.3%)	22(7.2%)	99(32.4%)	184(60.1%)	4.52	.644	**1**
Investment in safety	--	32(10.5%)	124(40.5%)	124(40.5%)	148(48.4%)	4.37	.694	**2**
Positive organizational attributes	---	10(3.3%)	13(4.2%)	139(45.4%)	144(47.1%)	4.36	.717	**3**
Management commitment to safety	2(0.7%)	6(1.6%)	24(7.8%)	130(42.5%)	145(47.4%)	4.34	.749	**4**
Personal responsibility for safety	---	4(1.3%)	25(8.2%)	157(51.3%)	120(39.2%)	4.28	.668	**5**
Attitudes to safety	6(2.0%)	7(2.3%)	16(5.2%)	145(47.4%)	132(43.1%)	4.27	.824	**6**
Identification of risk levels and hazards	---	10(3.3%)	9(2.9%)	176(57.5%)	111(36.3%)	4.27	.673	**7**
Workers involvement and commitment	---	14(4.6%)	23(7.5%)	148(48.4%)	121(39.5%)	4.23	.777	**8**
Peer support for safety	---	8(2.6%)	38(12.4%)	141(46.1%)	119(38.9%)	4.21	.758	**9**
Profile of safety within a firm	---	2(0.7%)	27(8.8%)	182(59.5%)	95(31.0%)	4.21	.618	**10**
Perceptions of the physical environment	---	8(2.5%)	35(11.4%)	150(49.0%)	113(36.9%)	4.20	.741	**11**
Safety information	---	16(5.2%)	18(5.9%)	213(69.6%)	59(19.3%)	4.03	.679	**12**
Communication about safety	12(3.9%)	37(12.1%)	14(4.6%)	122(39.9%)	121(39.5%)	3.99	1.132	**13**
Site management	10(3.3%)	39(12.7%)	26(8.5%)	133(43.6%)	98(32.0%)	3.88	1.095	**14**
Perceptions of safety performance	27(8.8%)	35(11.4%)	22(7.2%)	126(41.2%)	96(31.4%)	3.75	1.257	**15**
Safety management systems	30(9.8%)	41(13.4%)	22(7.2%)	109(35.6%)	104(34.0%)	3.71	1.323	**16**
Belief and value systems	35(11.4%)	40(13.1%)	25(8.2%)	103(33.7%)	103(33.7%)	3.65	1.362	**17**
Safety priorities	27(8.8%)	55(18.0%)	27(8.8%)	98(32.0%)	99(32.4%)	3.61	1.334	**18**
Concern over minor incidents	43(14.1%)	26(8.5%)	29(9.5%)	120(39.2%)	88(28.8%)	3.60	1.354	**19**
Site standardization	31(10.1%)	57(18.6%)	20(6.5%)	125(40.8%)	73(23.9%)	3.50	1.309	**20**
Access to safety information	42(13.7%)	57(18.6%)	12(3.9%)	99(32.4%)	96(31.4%)	3.49	1.442	**21**
Learning from safety issues	43(14.1%)	57(18.6%)	21(6.9%)	104(34.0%)	81(26.5%)	3.40	1.411	**22**
Safety policies and procedures	86(21.6%)	62(20.3%)	26(8.5%)	93(30.4%)	59(19.3%)	3.06	1.464	**23**
Workplace ergonomics	85(27.8%)	57(18.6%)	14(4.6%)	84(27.5%)	66(21.6%)	2.96	1.562	**24**
Recognition and openness about safety issues	76(24.8%)	62(20.3%)	12(3.9%)	129(42.2%)	27(8.8%)	2.90	1.402	**25**

Source: Researchers Field Work, 2016 *x-bar ≥3.5=Agreed*

Key: SD=Strongly disagree, D=Disagree, N=Neutral, A=Agree, SA = Strongly agree; RK= Ranking

It can be observed from Table 4.6 that management involvement in safety is the most important variable that determines the effectiveness of safety climate on construction sites. This is because it has the highest mean of 4.52. Following in the order of rank was management commitment of resources towards ensuring safety on construction sites as shown by a mean score of 4.37. Also, factors such as positive organizational attributes, management commitment to safety, personal responsibility for safety, workers attitude to safety, identification of risk levels and hazards, workers involvement and commitment towards safety on construction sites, peer support for safety, profile of safety within a firm, perceptions of the physical environment, availability of timely safety information to workers were ranked as key factors that highly determined and influenced safety climate on construction sites with a mean scores ranging between 4.36 and 4.03. In addition, other factors such as communication about safety, site management, perceptions of safety performance, safety management systems, belief and value systems, safety priorities, concern over minor incidents, and site standardization were deemed to have a considerable influence on the safety climate of construction sites as revealed by the relatively high mean scores of between 3.99 and 3.50 attributed to these factors. Using 3.50 as the cut-off point (*x-bar* $\geq$*3.5*) for what were regarded as key determinants of safety climate, it was observed that factors such as access to safety information, learning from safety issues, safety policies and procedures, workplace ergonomics, recognition and openness about safety issues though had a mean score of 3.49 to 2.90 were excluded from the key determining factors of safety climate.

4.5 Factors of unsafe behaviour of workers on construction sites

The second research question was intended to answer the question on the factors of unsafe behaviour of workers on construction site. Again, respondents were asked to indicate their level of agreement to statements on the perceived unsafe behaviour of workers on construction sites and the causes of unsafe behaviour of workers on construction site. Presented in Table 4.7 and 4.8 were the responses gathered.

The response from the importance index ranking (Table 4.9) indicted that the highest 5 ranked unsafe behaviour of workers on construction sites are; poor awareness of safety hazards and risks, failure to warn others of danger, failure to use PPE even when provided, lack of rest causing fatigue, burnout or drowsiness and unsafe behaviour of fellow workers on health and safety issues with the mean scores of 4.22, 4.10, 4.03, 4.02, 4.00 respectively. On the other hand, the least 5 ranked unsafe behaviour of workers on construction sites are; taking unsafe shortcuts to get the work done ($\bar{x}$=2.99), gross negligence on site ($\bar{x}$=2.75), hurrying to complete a task quickly ($\bar{x}$=2.59) intake of harmful drugs (cocaine, marijuana) ($\bar{x}$=2.56), and annoyance and horseplay on site ($\bar{x}$=1.94). The highest rated mean score of unsafe behaviours displayed in Table 4.8 met the cut-off point of 3.5. This shows that, there are numerous unsafe behaviours on construction sites which exposed workers to various forms of health and safety hazards and risks at construction sites.

Table 4.7: Responses to questions on unsafe behaviour of workers on construction sites

Unsafe behavior	Responses					Mean	Std. Dev	RK
	1=SD	2=D	3=N	4=A	5=SA			
Poor awareness of safety hazards and risks	15(4.9%)	16(5.2%)	20(6.5%)	92(30.1%)	163(53.3%)	4.22	1.098	**1**
Failure to warn others of danger	11(3.6%)	12(3.9%)	19(6.2%)	158(51.6%)	106(34.6%)	4.10	.939	**2**
Failure to use PPE even when provided	8(2.6%)	27(8.8%)	13(4.2%)	159(52.0%)	99(32.4%)	4.03	.978	**3**
Lack of rest causing fatigue, burnout or drowsiness	13(4.2%)	26(8.5%)	30(9.8%)	109(35.6%)	128(41.8%)	4.02	1.114	**4**
Unsafe behaviour of fellow workers on health and safety issues	22(7.2%)	11(3.6%)	15(4.9%)	154(50.3%)	104(34.0%)	4.00	1.088	**5**
Using defective equipment	30(9.8%)	49(16.0%)	8(2.6%)	104(34.0%)	115(37.6%)	3.74	1.364	**6**
Poor handling of equipment and tools	41(13.4%)	42(13.7%)	5(1.6%)	70(22.9%)	148(48.4%)	3.79	1.489	**7**
Handling heavy load manually	23(7.5%)	18(5.9%)	19(6.2%)	199(65.0%)	47(15.4%)	3.75	1.033	**8**
Intake of alcohol	23(7.5%)	13(4.2%)	21(6.9%)	169(54.6%)	82(26.8%)	3.89	1.084	**9**
Non-compliance with safety rules and guidelines on site	29(9.5%)	55(18.0%)	8(2.6%)	101(33.0%)	113(36.9%)	3.70	1.372	**10**
Poor attitude toward work such as laziness, lackadaisical attitudes	58(19.0%)	46(15.0%)	9(2.9%)	75(24.5%)	118(38.6%)	3.49	1.571	**11**
Improper posture for tasks such as climbing or jumping	39(12.7%)	73(23.9%)	10(3.3%)	86(28.1%)	98(32.0%)	3.43	1.461	**12**
Taking unsafe shortcuts to get the work done	63(20.6%)	84(27.5%)	16(5.2%)	79(25.8%)	64(20.9%)	2.99	1.483	**13**
Gross negligence on site	99(32.4%)	70(22.9%	21(6.9%)	41(13.4%)	75(24.5%)	2.75	1.607	**14**
Hurrying to complete a task quickly	85(27.8%)	94(30.7%)	17(5.6%)	82(26.8%)	28(9.2%)	2.59	1.374	**15**
Intake of harmful drugs(cocaine, marijuana)	82(26.8%)	119(38.9%)	6(2.0%)	51(16.7%)	48(15.7%)	2.56	1.437	**16**
Annoyance and horseplay on site	146(47.7%)	102(33.3%)	4(1.3%)	38(12.4%)	16(5.2%)	1.94	1.208	**17**

Source: Researchers Field Work, 2016 *x-bar $\geq$3.5=Agreed*

Key: SD=Strongly disagree, D=Disagree, N=Neutral, A=Agree, SA = Strongly agree; RK=Ranking

Table 4.8: Responses to questions on the factors of unsafe behaviours on construction sites

Causes of Unsafe Behaviour	Responses					Mean	Std. Dev	RK
	1=SD	2=D	3=N	4=A	5=SA			
Poor communication on sites	11(3.6%)	9(2.9%)	24(7.8%)	113(36.9%)	149(48.7%)	4.24	.975	**1**
Time pressures	3(1.0%)	30(9.8%)	12(3.9%)	116(37.9%)	145(47.4%)	4.21	.976	**2**
Lack of safety rules and guidelines, e.g safety posters and signs	---	15(4.9%)	30(9.8%)	145(47.4%)	116(37.9%)	4.18	.801	**3**
Poor safety supervision by site managers or foremen	5(1.6%)	18(5.9%)	16(5.2%)	146(47.7%)	121(39.5%)	4.18	.895	**4**
Too much workload	2(0.7%)	25(8.2%)	13(4.2%)	148(48.4%)	118(38.6%)	4.16	.889	**5**
Lack of proper safety education and training	4(1.3%)	19(6.2%)	32(10.5%)	130(42.5%)	121(39.5%)	4.13	.923	**6**
Lack of personal protection equipment	14(4.6%)	7(2.3%)	26(8.5%)	157(51.3%)	102(33.3%)	4.07	.959	**7**
Lack of management commitment	15(4.9%)	10(3.3%)	15(4.9%)	168(54.9%)	98(32.0%)	4.06	.970	**8**
Stress due to family pressure and economic conditions	2(0.7%)	25(8.2%)	28(9.2%)	169(55.2%)	82(26.8%)	3.99	.865	**9**
Complicated safety rules and guidelines	10(3.3%)	21(6.9%)	35(11.4%)	158(5.16%)	82(26.8%)	3.92	.973	**10**
Non-enforcement of safety rules and regulations	21(6.9%)	15(4.9%)	32(10.5%)	161(52.6%)	77(25.2%)	3.84	1.072	**11**
Overconfidence in taking risk/not being risk averse	44(14.4%)	59(19.3%)	13(4.2%)	104(34.0%)	86(28.1%)	3.42	1.436	**12**
Absence of safety regulatory framework in the construction industry	41(13.4%)	61(19.9%)	23(7.5%)	109(35.6%)	72(23.5%)	3.36	1.382	**13**
Poor risk perception	40(13.1%)	78(25.5%)	22(7.2%)	95(31.0%)	71(23.2%)	3.26	1.399	**14**
Poor safety climate and culture	50(16.3%)	81(26.5%)	16(5.2%)	100(32.7%)	59(19.3%)	3.12	1.417	**15**
Resentful behaviour of co-workers	89(29.1%)	106(34.6%)	9(2.9%)	72(23.5%)	30(9.8%)	2.50	1.377	**16**

Source: Researchers Field Work, 2016 *x-bar $\geq$3.5=Agreed*
Key: SD=Strongly disagree, D=Disagree, N=Neutral, A=Agree, SA = Strongly agree; RK=Rankin

It has been established that unsafe behaviour are intrinsically linked to workplace accidents. Oswald, Sherratt and Smith (2013) explored causes of unsafe behaviours of construction workers from many different backgrounds. After a careful review of previous health and safety literature, they identified various potential causes of behavioural safety issues on construction sites. Table 4.8identified the causes of unsafe behaviour on construction sites. The response from the importance index ranking (Table 4.10) indicted that the highest 5 ranked causes of unsafe behaviour of workers on construction site are: poor communication on sites ($\bar{x}$=4.24), time pressures ($\bar{x}$=4.21),

lack of safety rules and guidelines, e.g. safety posters and signs ($\bar{x}$=4.18), poor safety supervision by site managers or foremen ($\bar{x}$=4.18), too much workload ($\bar{x}$=4.16). Though not all these effects are directly work based, such stress induced reactions end up affecting the construction professionals. Furthermore, overconfidence in taking risk/not being risk averse ($\bar{x}$=3.42), absence of safety regulatory frameworks in the construction industry ($\bar{x}$=3.36), poor risk perceptions ($\bar{x}$=3.26), poor safety climate and culture ($\bar{x}$=3.12), and resentful behaviour of co-workers ($\bar{x}$=2.50) were the least 5 ranked causes of unsafe behaviour on construction site. All the mean score of the highest rated causes of unsafe behaviour on construction site met the predetermined cut-off point of 3.5. This means affects the behaviour of workers on construction sites. Ridley (1986) claims that about 99 per cent of accidents that happen on construction sites are caused by either unsafe acts or unsafe conditions exhibited by construction workers. Dester and Blockley (1995) concur with Ridley when he avers that most of the accidents that occur on construction sites are because of poor safety culture like poor communication on sites, time pressures, and poor safety supervision by site managers or foremen etc. leading to unsafe worker behaviours.

4.6 Safety Outcomes on Construction sites

The third research question sought to identify the safety outcomes of workers on construction sites. Respondents were asked to state their level of agreement on statements relating to the safety outcomes on construction sites. Table 4.9 shows the responses to questions on safety outcomes on construction sites.

The result in Table 4.9 show that complying with safety policies and procedures on the construction site, extra effort putting to improve the safety of the workplace paying attention to safety training and apply the knowledge gained, senior management

considering safety to be important and workers putting much effort to maintain and improve personal safety were ranked as the dominate safety outcomes on construction sites in Kumasi Metropolis. Moreover, placing a strong emphasis on workplace health and safety by senior management, a good communication between workers and senior management, carrying out task or activities voluntarily that help improve workplace safety, maintaining safety at all times and high prioritizing safety by senior management were the least safety outcomes on construction sites. The mean score of the safety outcomes shown in Table 4.9 met the predetermined mean of 3.5 (*x-bar* $\geq$*3.5*). This means that workers are adheres to safety procedures and carrying out work in a safe manner. Safety participation involves helping co-workers, promoting the safety program within the workplace, demonstrating initiative and putting effort into improving safety in the workplace (Lingard & Yesilyurt, 2003; Mohamed, 2002).

Table 4.9: Responses to questions on safety outcomes on construction sites

Safety outcomes	**Responses**					**Mean**	**Std. Dev.**	**RK**
	1=SD	**2=D**	**3=N**	**4=A**	**5=SA**			
Comply with safety policies and procedures at the construction site	2(0.7%)	2(0.7%)	10(3.3%)	135(44.1%)	157(51.3%)	4.45	.657	**1**
Extra effort put to improve the safety of the workplace	--	1(0.3%)	24(7.8%)	136(44.4%)	145(47.4%)	4.39	.645	**2**
Pay attention to safety training and apply the knowledge gained	4(1.3%)	1(0.3%)	16(5.2%)	137(44.8%)	148(48.4%)	4.39	.721	**3**
Senior Management considers safety to be important	4(1.3%)	2(0.7%)	12(3.9%)	162(52.9%)	126(41.2%)	4.32	.703	**4**
Workers put much effort to maintain and improve personal safety	2(0.7%)	3(1.0%)	37(12.1%)	122(39.9%	142(46.4%)	4.30	.770	**5**
Risk of accidents and incidents in the workplace are reduced	4(1.3%)	14(4.6%)	24(7.8%)	136(44.4%)	128(41.8%)	4.21	.870	**6**
Safety within the organisation is promoted	10(3.3%)	19(6.2%)	14(4.6%)	118(38.6%)	145(47.4%)	4.21	1.011	**7**
Correct safety procedures for carrying out job is used	10(3.3%)	9(2.9%)	20(6.5%)	151(49.3%)	116(37.9%)	4.16	.913	**8**
Safety equipment is used to carry out job	---	20(6.5%)	44(14.4%)	140(45.8%)	102(33.3%)	4.06	.859	**9**
The highest levels of safety is ensured when carrying out job	30(9.8%)	18(5.9%)	10(3.3%)	151(49.3%)	97(31.7%)	3.87	1.207	**10**
Senior management places a strong emphasis on workplace health and safety	23(7.5%)	22(7.2%)	20(6.0%)	177(57.8%)	64(20.9%)	3.77	1.092	**11**

There is a good communication between workers and senior management	41(13.4%)	60(19.5%)	10(3.3%)	132(43.1%)	63(20.6%)	3.38	1.360	**12**
Carry out tasks or activities voluntarily that help improve workplace safety	55(18.0%)	50(16.35)	22(7.2%)	98(32.0%)	81(26.5%)	3.33	1.470	**13**
Safety is maintained at all times	48(15.7%)	71(23.2%)	21(6.9%)	98(32.0%)	68(22.2%)	3.22	1.424	**14**
Safety is given a high priority by senior management	65(21.2%)	77(25.2%)	29(9.9%)	89(29.1%)	46(15.0%)	2.92	1.412	**15**

Source: Researchers Field Work, 2016 *x-bar ≥3.5=Agreed*
Key: SD=Strongly disagree, D=Disagree, N=Neutral, A=Agree, SA = Strongly agree; RK=Ranking

4.7 Identification of Principal Factors

When dealing with a large number of variables, factor analysis is used to find latent factors among observed variables in order to reduce the number of variables. Factor analysis is recommended for a relatively large set of variables ranging from 20 to 50. By conducting a factor analysis, variables with similar characteristics together are loaded or grouped under one factor that will serve as the common factor to represent the other variables. Factor analysis linearly reduces/combines or condenses highly correlated variables that contain most of the information. It assumes that the observed correlations between variables result from their sharing of factors. Therefore, with factor analysis you can produce a small number of factors from a large number of variables which is capable of explaining the observed variance in the larger number of variables. Thus, the factor analysis produces a new set of variables known as factors which are linear composites or combinations of the original variables. After extracting the required number of factors, the reduced factors can now be used for subsequent analysis.

To conduct a factor analysis, it is necessary to consider issues such as sampling adequacy as well as the strength of the relationship among variables. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy measures the sampling adequacy (which determines if the responses given with the sample are adequate or not) which should be close than 0.5 for a satisfactory factor analysis to proceed. Also, Bartlett's Test of Sphericity is conducted to test the strength of the relationship among variables. Thus, it

tests whether the correlation matrix is an identity matrix, which would indicate that the factor model is inappropriate.

4.7.1 Factor Analysis of Key Determinants of Safety Climate

In the factorability, 20 items that met the predetermined cut-off point (*x-bar* ≥3.5) were examined. The Kaiser-Meyer-Olkin measure of sampling adequacy was .802, above the commonly recommended value of .6, and Bartlett's test of sphericity was significant ($\chi 2$ (190) = 1310.695, $p < 0.01$) (See Appendix B). The communalities were all above .4, as indicated in Table 4.10, further confirming that each item shared some common variance with other items. Given these overall indicators, factor analysis was deemed to be suitable with all 20 items. In all six factors were extracted, which includes, Factor 1 (Safety management systems), Factor 2 (Commitment to health and safety, Factor 3 (Availability of health and safety information), Factor 4(Health and safety awareness), Factor 5 (Effective communication) and Factor 6(Health and safety performance). On the variance-covariance matrix, all the 6 extracted factors with an eigenvalue greater than 1.0.

Table 4.10: Factor loadings of determinants of safety climate

Item	Factor	Variables included in the factor	Factor Loading	Eigenvalue	Variance explained %	Cumulative variance %
1	Safety management systems	Management involvement in safety	.680	4.544	**22.722**	**22.722**
		Investment in safety	.564			
		Positive organisational attributes	.689			
		Management commitment to safety	.574			
		Attitude to safety	.515			
		Identification of risk levels and hazards	.533			
		Workers involvement and commitment	.608			
		Peer support for safety	.590			
		Profile of safety within a firm	.598			
		Perceptions of the physical environment	.526			
		Communication about safety	.310			
		Safety management systems	.683			
		Safety priorities	.380			
2	Commitment to health and safety	Investment in safety	.426	1.709	8.545	31.267
		Positive organisational attributes	-.445			
		Management commitment to safety	-.397			
		Identification of risk levels and hazards	-.424			
		Workers involvement and commitment	.454			
		Perceptions of the physical environment	-.558			

		Site standardization	-.314			
3	Availability of health and safety information	Personal responsibility for safety Safety information Site management Safety priorities Concern over minor incidents Site standardization	.304 .439 -.530 .562 -.364 -.306	1.362	6.808	30.076
4	Health and Safety awareness	Personal responsibility for safety Attitudes to safety Perceptions of safety performance Safety priorities Site standardization	.605 -.332 .384 -.359 .537	1.267	6.337	44.412
5	Effective communication	Peer support for safety Communication about safety Site management Belief and value systems Concern over minor incidents	-.335 .464 .351 -.456 .502	1.188	5.941	50.353
6.	Health and Safety performance	Management commitment to safety Peer support for safety Perceptions of safety performance Belief and value systems	-.300 .417 .629 -.336	1.103	5.517	55.871

Extraction Method: Principal Component Analysis.
a. 6 components extracted.
Note. Factor loadings < .30 are suppressed

4.7.2 Factor Analysis of Unsafe Behaviours of workers on construction sites

Table 4.11 reveals the major unsafe behaviour variables. The factor loading was set at an absolute value of 0.30 which based on all loadings of 0.30 having practical significant and only factors of 0.30 and above was shown in the Table 4.11. It can be seen that five (5) variables (FI, FII, FIII, FIV and FV) were extracted. Factor I (Poor workers attitudes), Factor II (Workers non-compliance with safety procedures), Factor III (Bad practices of workers) Factor IV (wrong use/handling of equipments and tools) and Factor V (Lack of rest causing fatigue, burnout or drowsiness). The Kaiser-Meyer-Olkin (KMO) test used for basic components analysis for the unsafe behaviour variables showed that the size of the sample was sufficient (KMO value .927) for factor analysis. Bartlett test conducted to determine whether the data for unsafe behaviour conformed to normal distribution or produced a significant result (1427.160; $p<0.01$), (see Appendix B).

Table 4.11: Factor loadings of unsafe behavior of workers

Item	Factor	Variables included in the factor	Factor Loading	Eigenvalue	Variance explained %	Cumulative variance %
1	Poor workers attitudes	Poor awareness of safety hazards and risks	.818	5.136	**51.365**	**51.365**
		Failure to warn others of danger	.761			
		Failure to use PPE even when provided	.419			
		Lack of rest causing fatigue, burnout or drowsiness	.764			
		Unsafe behaviour of fellow workers on health and safety issues	.769			
		Using defective equipment	.786			
		Poor handling of equipment and tools	.586			
		Handling heavy load manually	.844			
		Intake of alcohol	.842			
2	Workers non-compliance with safety procedures	Failure to use PPE even when provided	.668	1.089	10.887	62.252.
		Poor handling of equipment and tools	.490			
		Non-compliance with safety rules and guidelines on site	-.582			
3	Bad practices of workers	Failure to use PPE even when provided	.490	.790	7.904	70.155
		Non-compliance with safety rules and guidelines on site	.673			
4	Wrong use/handling of equipments and tools	Poor handling of equipment and tools	.570	.639	6.389	76.544
5	Lack of rest causing fatigue, burnout or drowsiness	Lack of rest causing fatigue, burnout or drowsiness	.406	.504	5.041	81.585
		Unsafe behaviour of fellow workers on health and safety issues	-.404			

Extraction Method: Principal Component Analysis
a. 5 components extracted
Note. Factor loadings < .30 are suppressed

4.7.3 Factor Analysis of Factors Influencing Unsafe Behaviour of construction workers

Table 4.12 shows the key factors that influence unsafe behaviour variables. Kaiser-Meyer-Olkin (KMO) test used for basic components analysis for the factors that influence unsafe behaviour variables showed that the size of the sample was sufficient (KMO value .940) for factor analysis. Bartlett test conducted to determine whether the data for unsafe behaviour conformed to normal distribution or not produced a significant result (2473.962; $p<0.01$) (see Appendix B). The factor analysis of the 11 variables yielded five (5) factors. Which includes (Factor A) Lack of management commitment to

health and safety, (Factor B) absence of rules and regulations, (Factor C) Poor health and safety education,(Factor D) Economic conditions, and(Factor E)Inadequate PPE. Factor loadings of these eleven items are shown in Table 4.12.

Table 4.12: Factor loadings of factors influencing unsafe behaviours

Item	Factor	Variables included in the factor	Factor Loading	Eigenvalue	Variance explained %	Cumulative variance %
1	Lack of Management Commitment to health and safety	Poor communication on sites	.856	7.026	63.871	63.871
		Time pressures	.865			
		Lack of safety rules and guidelines, e.g. safety posters and signs	.716			
		Poor safety supervision by site managers or foremen	.839			
		Too much workload	.812			
		Lack of proper safety education and training	.757			
		Lack of personal protection equipment	.798			
		Lack of management commitment	.826			
		Stress due to family pressure and economic conditions	.768			
		Complicated safety rules and guidelines	.740			
		Non-enforcement of safety rules and regulations	.800			
2	Absence of rules and regulations	Lack of safety rules and guidelines, e.g. safety posters and signs	.406	.741	6.735	70.606
		Lack of proper safety education and training	.353			
		Complicated safety rules and guidelines	.478			
3	Poor health and safety education	Too much workload	.329	.571	5.195	75.801
		Lack of proper safety education and training	.309			
		Lack of personal protective equipment	-.331			
		Lack of management commitment	-.447			
4	Economic conditions	Lack of safety rules and guidelines, e.g. safety posters and signs	.432	.514	4.674	80.475
		Lack of proper safety education and training	-.335			
		Stress due to family pressure and economic conditions	.307			
5.	Inadequate PPE	Lack of personal protective equipment	.343	.490	4.455	84.930
		Stress due to family pressure and economic conditions	-.345			
		Complicated safety rules and guidelines	-.341			

Note. Factor loadings < .30 are suppressed

4.7.4 Factor Analysis of safety outcomes on construction sites

Exploratory factor analysis with Varimax rotation was performed on the safety outcomes of workers on construction sites. On the 11 items were examined, Kaiser-Meyer-Olkin measure of sampling adequacy was .705 and Bartlett's test of sphericity

was significant ($\chi 2$ (55) = 524.912, $p < 0.01$), (see Appendix B). The factor analysis of the 11 variables yielded four (4) factors. With all these indicators, factor analysis of safety outcomes was deemed to be suitable with all 11 items. Based on the items loading on each factor, the factors were labeled" *safety policies, procedures and training"* (Factor 1), *"safety policies at workplace"* (Factor 2), *"best work practice"* (Factor 3), *"Top management involvement"* (Factor 4). Factor loadings of these eleven items are shown in Table 4.13.

Table 4.13: Factor loadings of safety outcomes

Item	Factor	Variables included in the factor	Factor Loading	Eigenvalue	Variance explained %	Cumulative variance %
1	Safety policies, procedures and training	Workers put much effort to maintain and improve personal safety	.695	2.816	25.603	25.603
		Pay attention to safety training and apply the knowledge gained	.676			
		Senior Management considers safety to be important	.622			
		Risk of accidents and incidents in the workplace are reduced	.621			
		Extra effort put to improve the safety of the workplace	.598			
		Comply with safety policies and procedures at the construction site	.485			
		Correct safety procedures for carrying out job is used	.397			
		The highest levels of safety is ensured when carrying out job	.323			
		Safety within the organisation is promoted	.370			
		Safety equipment is used to carry out job	.313			
2	Safety practices at workplace	Comply with safety policies and procedures at the construction site	-.329	1.537	13.973	39.576
		Correct safety procedures for carrying out job is used	.675			
		The highest levels of safety is ensured when carrying out job	.658			
		Safety equipment is used to carry out job	.452			
		Senior management places a strong emphasis on workplace health and safety	-.368			
3	Best work practice	Risk of accidents and incidents in the workplace are reduced	.431	1.232	11.200	50.776
		Safety within the organisation is promoted	-.601			
		Safety equipment is used to carry out job	.541			
		Senior management places a strong emphasis on workplace health and safety	.320			
4.	Top	Comply with safety policies and	-.408	1.006	9.142	59.918

management involvement	procedures at the construction site	
	Senior management places a strong emphasis on workplace health and safety	.734

Extraction Method: Principal Component Analysis.
a. 4 components extracted.
Note. Factor loadings < .30 are suppressed

4.8 Correlation Test

Spearman's correlation coefficient matrix was run to measure the relationship between key determinants of safety climate and safety outcomes, and unsafe behaviour of construction worker and safety outcomes, shown on Table 4.14 and Table 4.15

Table 4.14: Correlation matrix of determinants of safety climate and safety outcomes

	1	2	3	4	5	6	7	8	9	10
Safety management systems	1.000	-.116	.018	.222	.247	.074	.376	.191	.476	-.262
Commitment to safety		1.000	-.107	.636*	.353	-.311	-.259	-.807**	.099	-.551
Availability of health and safety information			1.000	-.572*	-.054	-.489	.174	.245	-.095	.057
Health and safety awareness				1.000	.529	.038	.183	-.657*	.451	-.657*
Effective communication					1.000	-.551	.447	-.350	.857**	-.717**
Safety performance						1.000	.007	.467	-.352	.640*
Safety policies, procedures and training							1.000	.189	.364	-.053
Safety practices at workplace								1.000	-.038	.657*
Best work practice									1.000	-.704**
Top management involvement										1.000

Correlation is significant at the 0.05 level (2-tailed).,Correlation is significant at the 0.01 level (2-tailed).*
Source: Field Work using SPSS 20.0 (2016)

The results revealed that there was a strong positive significant relationship between effective communication and best work practice. Thus, effective communication encouraged best work practices on construction site (r=.857, P <0.01). The study further shows a positive weak relationship between safety performance and top management involvement (r=.640, P<0.05). However, there was a strong negative relationship between communication to safety and safety practices at workplace (r= -.807, P<0.01), safety awareness and safety practices at workplace (r= -.717, P <0.01). In addition a weak negative association was attained between Health and safety awareness and top

management involvement (r= -.657, P <0.05), Health and safety awareness and safety practices at workplace (r= -.657, P<0.05).

Table 4.15: Correlation matrix between unsafe behaviour and safety outcomes

	1	2	3	4	5	6	7	8	9
Poor workers attitudes	1.000	.279	.213	.313	.213	.504	-.226	.102	-.213
Workers non-compliance with safety procedures		1.000	.839**	.626*	.071	.333	-.229	-.304	-.071
Bad practices of workers			1.000	.613*	-.083	-.624*	.120	-.128	.083
Wrong use/ handling of equipments and tools				1.000	.736**	.465	-.440	.471	-.736**
Lack of rest causing fatigue, burnout or drowsiness					1.000	.053	-.657*	-.704**	-1.000**
Safety policies, procedures and training						1.000	.189	.364	-.053
Safety practices at workplace							1.000	-.038	.657*
Best work practice								1.000	-.704**
Top management involvement									1.000

**Correlation is significant at the 0.05 level (2-tailed)., **Correlation is significant at the 0.01 level (2-tailed).*
Source: Field Work using SPSS 20.0 (2016)

Table 4.15 presents the correlation matrix between unsafe behaviour and safety outcomes. It can be seen that a significant, strong negative correlation existed between lack of rest causing fatigue, burnout or drowsiness and best work practice on construction sites (r=-.704, p<0.01). The results of Spearman's correlation coefficient further shows a strong negative relationship between lack of rest causing fatigue, burnout or drowsiness and safety practices at workplace (r=-1.000, p<0.01). Additionally, a negative weak relationship between wrong use/ handling of equipments and tools and top management involvement (r=-.736, p<0.05). The study further revealed that bad practices of workers on site affects safety policies, procedures and training on construction sites (r= -.624, p<0.05).

CHAPTER FIVE

DISCUSSION OF RESULTS

5.1 Introduction

This chapter discusses the major findings that emerged from the study. The discussions were carried out with the objective and research questions set out in chapter one as the basis. For in-depth understanding, the discussions on the findings from the current study were linked to the related literature. The discussions are structured into the determinants of safety climate, unsafe workers behaviour, factors influencing unsafe behaviour of workers on construction sites and safety outcomes on construction sites.

5.2 Determinants of safety climate on construction site

The first objective of the study was to identify the determinants of safety climate on construction site. The study revealed that, safety managements systems, commitment to health and safety, availability of health and safety information, health and safety awareness, effective communication and health and safety performance are the key determinants of safety climate on construction sites in Kumasi Metropolis. These findings are in consonance with the works of Niskanen (1994); Fu, Zhang, Xie, and Zhang, (2006). In both studies, it emerged that a range of factors has been identified as being important components of safety climate. These factors include: management values (e.g. management concern for safety), management and organizational practices (e.g. adequacy of training, provision of safety equipment, quality of safety management systems), personal responsibility, and investment in workplace health and safety. According to Niskanen (1994), safety climate is a specific form of organizational climate, which describes individual perceptions of the value of safety in the work environment. A range of studies have demonstrated that these factors predict safety-

related outcomes, such as accidents and incidents (Dedobbeleer and Beland, 1991; DeJoy, 1994).

This suggests that management of construction sites should partake and invest in safety issues. Moreover, attitudes and responsibility of construction workers should be monitored. Construction workers must understand how to perform work safely and have the skill to be able to do it in order to comply with safety procedures. However, safety knowledge and skill should be an important factor for participatory activities, since these activities require more generic forms of knowledge and skill.

5.3 Factors of unsafe behaviour of workers on construction sites

The second research objective was to identify the perceived factors of unsafe behaviour of workers on construction sites. On this, the study revealed that, lack of management commitment, absence of rules and regulations, poor health and safety education, are the main factors that influence unsafe behavior of workers on construction sites in Kumasi Metropolis. These finding on the perceived factors of unsafe behaviour on construction site agrees with studies in the literature. According to Oswald, Sherratt and Smith (2013) time pressure, training, experience, risk perception, poor safety supervision, safety culture, culture and management are causes unsafe behavioural responses of individuals. In their study, time pressure was perhaps the most important cause as it was often regarded as having the greatest influence by the focus group.

The study of Burke and Litwin (1992) assess the factors that influence worker behaviour. Among the factors they considered management practices, systems (policies and procedures); task and individual skills, individual needs and values, individual and organisational performance (behaviour). They found that each of the stated factors influences one or more other factors to some extent. This is implies that to better

understand worker behaviour, the influence of all factors should be considered and analysed by the authorities.

Concerning unsafe workers behaviour at construction site the response from the importance index ranking indicted that poor awareness of safety hazards and risks, failure to warn others of danger, failure to use PPE even when provided, lack of rest causing fatigue, burnout or drowsiness and unsafe behaviour of fellow workers on health and safety issues are the main unsafe behavior of workers on construction sites. In the light of these perceived unsafe behaviour on construction site, managements should do their utmost best to reduce unsafe behaviour as a whole instead of selecting a number of them. This is because to better understand worker behaviour, the influence of all factors of unsafe behaviour should be considered and analysed. By doing so, accidents on construction sites will be reduced. Ridley (1986) claimed that accidents on construction sites are caused by unsafe behaviour exhibited by construction workers. Dester and Blockley (1995) concur with Ridley when he avers that most of the accidents that occur on construction sites are because of poor safety culture leading to unsafe worker behaviours. Krishnan (1999) states that the major causes of accident on construction sites are as a result of human errors and unsafe behaviour caused by lack of training, poor supervision, technical flaws relating to design, layout, machine guarding and arrangement of work. Similarly, Sawacha, Naoum and Fong (1999) asserted that accidents on constructions sites are due to lack of knowledge or training, lack of effective supervision, error of judgement, worker apathy or recklessness.

In order to enhance safety culture, supervisors should monitor the behaviour of the workers while maintaining interest in their personal matters and trying to create a positive atmosphere of cooperation.

5.4 Safety Outcomes on Construction sites

Aside ascertaining the determinants of safety climate, factors and the perceived unsafe behaviour on construction sites, the study further sought to identify the safety outcomes on construction sites. Fifteen (15) items were identified as safety outcomes on construction sites. From the data collected, the findings shows that complying with safety policies and procedures on the construction site, extra effort putting to improve the safety of the workplace, paying attention to safety training and apply the knowledge gained, senior management considering safety to be important and workers putting much effort to maintain and improve personal safety were ranked as the most safety outcomes on construction sites in Kumasi Metropolis. The findings of the study is in line with Lingard and Yesilyurt (2003) whose work indicated that safety outcome involves adhering to safety procedures and carrying out work in a safe manner. According to Lingard and Yesilyurt (2003) outcome on construction sites comprised of compliance and participation. Mohamed (2002) on the other hand viewed that safety participation involves helping co-workers, promoting the safety program within the workplace, demonstrating initiative and putting effort into improving safety in the workplace.

This implies that safety outcomes in the construction industry are of great importance to many organisations. For this reason, organisations should attempt to influence the safety culture and practices of the organization to achieve improved safety outcomes. This is confirmed by Lingard and Yesilyurt (2003) who in their studies asserted that safety outcomes are particular relevant in the construction industry, due to the labour-intensive nature of construction works.

5.5 Correlation between variables

5.5.1 Relationship between safety climate and safety outcomes on construction site

The results of correlation test (Spearman's) between safety climate determinants and safety outcomes were computed. There was a strong positive significant relationship between effective communication and best work practice(r=.857, $P<0.01$). This indicates that effective communication encouraged best work practices on construction site. The study further shows that safety performance of workers affects top management involvement on construction sites (r=.640, P<0.05). However, there was a strong negative relationship between communication to safety and safety practices at workplace (r= -.807, $P<0.01$), safety awareness and safety practices at workplace (r= -.717, $p<0.01$). In addition a weak negative association was attained between safety awareness and top management involvement (r= -.657, $p<0.05$), safety awareness and safety practices at workplace (r= -.657, P<0.05).Several studies (Zohar, 2000; Mearns *et al.,* 2003; Clarke, 2006; Nielsen et al., 2008; Seoet al., 2004; Tharaldsen et al., 2008) have examined the relationship between safety climate and safety outcome across various industries such as mining, petroleum and gas, manufacturing, nuclear, construction etc. The findings contradicts with Hofmann and Stetzer, Bahari (2011) who claims that safety climate has been found to be negatively correlated with workplace accidents or injuries indicating that when employees perceive safety climate positively they are less likely to be involved in workplace accidents. The results of the study buttress with Okolie & Okoye (2013) who confirmed that there is a positive correlation between workers safe behaviour and safety climate within construction site environment. They further indicated that workers safety outcomes are influenced by proper communication on construction sites (risk perceptions, risk management, safety rules, procedures and cultural background).

5.5.2 Relationship between unsafe behaviour and safety outcome

Spearman's correlation was tested to find out the relationship between unsafe behaviour and safety outcome on construction site. A negative relationship was found between lack of rest and best work practice on construction sites ($r=-.704$, $p<0.01$), bad practices of workers and safety policies, procedures and training on construction sites ($r=-.624$, $p<0.05$). The study further shows a negative relationship between lack of rest causing fatigue, burnout or drowsiness and safety practices at workplace ($r= -1.000$, $p<0.01$), wrong use/handling of equipments and tools and top management involvement ($r=-.736$, $p<0.05$). This implies that lack of rest affects the proper practices of safety on construction sites. Moreover, bad practices affect the safety policies, procedures and training of workers on construction sites. The study agrees with Hofmann and Stetzer, (1996) who avers that workers are less likely to engage with unsafe acts or unsafe behaviour when they favour the safety perception of their workplace. This implies that safer working environment support safer decision making and behaviors of workers on construction sites. According to Choudhry and Fang (2008), an unsafe behaviour can lead to inadequate operation at work. Additionally, inadequate PPE use can lead to higher 70 exposure to a struck-by accident involving surrounding objects

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The chapter presents the summary of the major findings of the study, and the relevant conclusions drawn from the findings indicating how the study has contributed to knowledge. In addition, it presents the recommendations made based on the findings of the study and the suggestions for future studies.

6.2 Summary of Key Findings

This section presents the summary of the major findings of the study under suitable themes developed from the respective research questions as follows:

6.2.1 Determinants of safety climate on construction site

It was observed that safety managements systems, commitment to health and safety, availability of health and safety information, health and safety awareness, effective communication and health and safety performance were the key determinants of safety climate on construction site.

6.2.2 Factors that influence unsafe behaviour of workers on construction sites

The study revealed that lack of management commitment to health and safety, absence of rules and regulations, poor health and safety education, economic conditions and inadequate personal protective equipments were the main factors that influence unsafe behavior of workers on construction site. Additionally, the findings of the study revealed that the dominant unsafe behaviours on construction sites included; poor

workers attitudes, workers non-compliance with safety procedures, bad practices of workers, wrong use/ handling of equipments and tools and lack of rest causing fatigue, burnout or drowsiness.

6.2.3 Safety Outcomes on Construction sites

The study revealed that safety policies, procedures and training, safety practices at workplace, best work practices and top management involvement of health and safety were the dominant safety outcomes on construction sites.

6.2.4 Spearman's Correlation tests between variables

The relationship between safety climate determinants and safety outcomes found a strong positive significant relationship between effective communication and best work practices on construction site, and a weak positive relationship between health and safety performance and top management involvement. However, there was a strong negative relationship between effective communication and safety practices at workplace, health and safety awareness and safety practices at workplace. In addition a weak negative association was attained between health and safety awareness and top management involvement.

On the relationship between unsafe behaviour and safety outcome on construction site, a strong negative relationship existed between lack of rest causing fatigue, burnout or drowsiness and best work practice on construction sites. In addition, a strong negative relationship between lack of rest causing fatigue, burnout or drowsiness and safety practices at workplace were attained. Additionally, a negative weak relationship between wrong use/handling of equipments and tools and top management

involvement were found. A weak negative correlation also existed between bad practices of workers on site and safety policies, procedures and training on construction sites.

6.3 Conclusions

Safety climate reflects employees' perceptions about the relative importance of safe conduct on construction site. The concept of safety climate can change from highly positive to a neutral level, and its average level reflects the safety climate in a given organization. It appeared that safety management systems, commitment to health and safety, safety awareness of health and safety and effective communication safety issues reflects safety climate on construction firms in Ashanti Region.

It has been established that unsafe behaviour are intrinsically linked to safety outcome. It has also been confirmed that a negative correlation exists between unsafe workers behaviour and safety outcome within construction site and that workers attitudes towards safety are influenced by lack of management commitment, absent of rules and regulations, poor safety education, economic conditions and inadequate personal protective equipment (PPE). Safety outcome of construction site can be realized by top management involvement, safety policies, procedures and training set by the company.

6.4 Recommendations

Based on the findings of this work, the researcher suggested a few recommendations.

- Managements should develop stronger criteria for active and effective safety management systems. These should include design and planning, day-to-day management and monitoring and auditing practices.

- Proper communications and interpersonal skills, which are necessary at every level should be ensured that the correct influences on behaviour are consistently reinforced.
- Site induction and refresher training should be enforced and skills to the working environment need to be carefully fostered and monitored by the supervisors.

6.5 Suggestion for Further Research

In a study such as this, recommendations for future research would address the issues generated from this study. Based on these findings, future research may start from a relatively higher level of knowledge.

- A replication of this study would be helpful in reexamining the validity of its findings for which the researcher was not able to investigate. Further empirical studies using larger sample sizes from different and greater geographical diversity would be helpful in validating the influence of construction worker behaivour on safety outcomes.
- Subsequent research needs to be engaged in the development of more valid and reliable operational definitions on the tested variables and overcoming the limitations posed by the data source used in this study. Also, more structured interviews should be conducted in different construction firms in Ghana, in order to continuously improve construction workers behavior on construction sites.
- An in-depth case study should be conducted in a Ghanaian construction firms to gain more insight into the effects of safety climate on safety outcomes on construction sites.
- It is important to identify and empirically evaluate motivational factors that potentially influence worker's transfer of training

- Finally, the influence of external environment should be studied in order to explore how external environment affects construction workers behavior on construction sites.

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APPENDICES

APPENDIX A

UNIVERSITY OF EDUCATION, WINNEBA

COLLEGE OF TECHNOLOGY EDUCATION, KUMASI

QUESTIONNAIRE FOR CONSTRUCTION WORKERS

The questionnaire is designed to solicit your views on construction worker's perception of safety outcomes of construction sites in Ghana. The researcher is a Master of Philosophy (Construction Technology) student at the University of Education, Winneba and the questionnaire is used to collect field data for his thesis. You are informed that the responses you provide will be used only for academic purposes. I therefore solicit your consent and cooperation to participate in the study. **Please in answering the questions, tick (√) where appropriate and state where necessary.**

SECTION A: DEMOGRAPHICS DATA OF RESPONDENTS

1.0 Please indicate your gender.

Male	□
Female	□

2.0 Please indicate your age group

Under 20years	□	21 – 30 years	□
31 – 40 years	□	41 – 50 years	□
51 – 60 years	□	Above 60 years	□

3.0 What is the title of your job?

Foreman	□	Steel bender	□
Mason	□	Carpenter	□
Plumber	□	Labourer	□
Painter	□	Others (please state)	□

4.0 How long have you been working in your current firm?

Under 1year	□	1– 5years	□
Above 5but less than 10years	□	10– 15years	□
Above 15but less than 20years	□	Above 20 years	□

5.0 What is your highest academic qualification?

No formal education	□	BECE	□
SSCE or O'Level Certificate	□	City and Guilds Intermediate	□
NVTI Certificate	□	Technician Certificate	□
Others			

SECTION B: DETERMINANTS OF SAFETY CLIMATE OF CONSTRUCTION SITES

To what extent do you agree or disagree with the following factors as determinants of safety climate on construction sites? Please rate your responses using a scale of 1 to 5: Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), and Strongly agree (5).

Please tick the box which best reflect your view and state briefly where necessary

Determinants of Safety Climate	**Score**				
	1	**2**	**3**	**4**	**5**
Safety information					
Learning from safety issues					
Perceptions of safety performance					
Investment in safety					
Communications about safety					

Profile of safety within the firm					
Access to safety information					
Management involvement in safety					
Recognition and openness about safety issues					
Attitudes to safety					
Management commitment to safety					
Belief and value systems					
Workers involvement and commitment					
Site management					
Identification of risk level and hazards					
Safety policies and procedures					
Perceptions of the physical environment					
Site standardization					
Personal Responsibility for Safety					
Peer Support for Safety					
Safety Management Systems					
Concern over minor incidents					
Safety priorities					
Workplace ergonomics					
Positive organizational attributes					

SECTION C: UNSAFE BEHAVIOURS OF WORKERS ON CONSTRUCTION SITES

To what extent do you agree or disagree with the following unsafe behaviours exhibited by workers on your construction sites? Please rate your responses using a scale of 1 to 5: Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), and Strongly agree (5).

Please tick the box which best reflect your view and state briefly where necessary

Unsafe Behaviours of Workers on Construction Sites	Score				
	1	2	3	4	5
Intake of alcohol					
Intake of harmful drugs (cocaine, marijuana)					
Failure to use PPE even when provided					
Gross negligence on site					
Non-compliance with safety rules and guidelines on site					
Poor attitudes toward work such as laziness, lackadaisical attitudes					
Poor handling of equipment and tools					
Handling heavy load manually					
Unsafe behaviour of fellow workers on health and safety issues					
Poor awareness of safety hazards and risks					
Lack of rest causing fatigue, burnout or drowsiness					
Annoyance and horseplay on site					
Hurrying to complete a task quickly					
Using defective equipment					
Taking unsafe shortcuts to get the work done					
Failure to warn others of danger					
Improper posture for tasks such climbing or jumping					

SECTION D: FACTORS INFLUENCING UNSAFE BEHAVIOUR OF WORKERS ON CONSTRUCTION SITES

To what extent do you agree or disagree with the following as causes of unsafe behaviour of workers on construction sites? Please rate your responses using a scale of 1 to 5: Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), and Strongly agree (5).

Please tick the box which best reflect your view and state briefly where necessary

Factors influencing Unsafe Behaviours on Construction Sites	Score				
	1	2	3	4	5
Non-enforcement of safety rules and regulations					
Overconfidence in taking risk/ not being risk averse					
Poor risk perception					
Lack of safety rules and guidelines e.g. safety posters and signs					
Complicated safety rules and guidelines					
Lack of proper safety education and training					
Absence of safety regulatory framework in the construction industry					
Lack of personal protection equipment					
Lack of management commitment					
Poor safety supervision by site managers or foremen					
Stress due to family pressure and economic conditions					
Too much workload					
Poor safety climate and culture					
Resentful behaviours of co-workers					
Time pressures					
Poor communication on sites					

SECTION E: SAFETY OUTCOMES ON CONSTRUCTION SITES

To what extent do you agree or disagree with the following safety outcomes on construction sites? Please rate your responses using a scale of 1 to 5: Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), and strongly agree (5). **Please tick the box which best reflect your view and state briefly where necessary.**

Safety Outcomes	Score				
	1	2	3	4	5
Senior management places a strong emphasis on workplace health and safety					
Safety is given a high priority by senior management					
Senior Management considers safety to be important					
Workers put much effort to maintain and improve personal safety					
Safety is maintained at all times					
Risk of accidents and incidents in the workplace are reduced					
Safety equipment is used to carry out job					
Correct safety procedures for carrying out job is used					
The highest levels of safety is ensured when carrying out job					
Safety within the organisation is promoted					
Extra effort put to improve the safety of the workplace					
Carry out tasks or activities voluntarily that help improve workplace safety					
There is a good communication between workers and senior management					
Pay attention to safety training and apply the knowledge gained					
Comply with safety policies and procedures at the construction site					

Please use this page for any further comments and suggestions you deem necessary.

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APPENDIX B

FACTOR ANALYSIS

KMO and Barlett's Tests for Variables

1. Key Determinants of Safety Climate

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.802
Bartlett's Test of Sphericity	Approx. Chi-Square	1310.695
	df	190
	Sig.	.000

2. Unsafe behaviour of construction workers

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.927
Bartlett's Test of Sphericity	Approx. Chi-Square	1427.160
	df	45
	Sig.	.000

3. Factors influencing unsafe behaviour of construction workers

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.940
Bartlett's Test of Sphericity	Approx. Chi-Square	2473.962
	df	55
	Sig.	.000

4. Safety outcomes of construction sites

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.705
Bartlett's Test of Sphericity	Approx. Chi-Square	524.912
	df	55
	Sig.	.000

APPENDIX C

COLLEGE OF TECHNOLOGY EDUCATION, KUMASI

UNIVERSITY OF EDUCATION, WINNEBA

P. O. Box 1277, Kumasi – Ghana Tel: 03220 53607, 50331, 53616, Fax 03220 50039

Department of Construction & Wood Technology Education

UEW/KC/CW/

June 6, 2016

TO WHOM IT MAY CONCERN

LETTER OF INTRODUCTION

I write to introduce **Mr. Stanley O. Bonney** as M.Phil student with Index No. 8161760001 pursuing M.Phil(Construction Technology) Programme at the College of Technology Education, Kumasi(UEW).

Mr. Bonney is a final year student who is undertaking a research project titled `` the influence of construction workers' behavior on safety outcomes at construction sites in Ghana.''

He wishes to collect data from your organisation.

Please kindly offer him the needed assistance.

Thank you.

Yours sincerely,

Michael K. Tsorgali
Ag. Head of Department

LIST OF CONTRACTORS AND PROJECTS UNDERTAKEN

AT KUMASI METROPOLITAN ASSEMBLY

NO.	NAME OF CONTRACTOR	PROJECT UNDERTAKEN
1.	MESSRS ISSAHAKU.L.COMPANY LTD. P.O.BOX 240, WA	CONSTRUCTION AND COMPLETION OF 1No. 6- UNIT CLASSROOM BLOCK AND REHABILITATION OF 2-STOREY 6-UNIT CLASSROOM WITH ANCILLARY FACILITIES AT AL-ZAIAH ISMALIC SCHOOL AT TAFO KUMASI.
2.	MESSRS RICH HOUSE CONSTRUCTION WORKS LTD. P.O.BOX 246 KUMASI	CONSTRUCTION AND COMPLETION OF 1No. 6 UNIT CLASSROOM BLOCK AND RHABILITATION OF 3No. 3-UNIT SCHOOL BLOCK AT OHIM IN KUMASI
3.	MESSRS EMBEGOSAN ENTERPRISE, P.O.BOX 4085 KUAMSI	CONSTRUCTION OF 2No. 6-UNIT CLASSROOM BLOCK AT DOMPOASE M/A AT DOMPOASE IN KUMASI
4.	MESSRS JACOB ABORAH CONSTRUCTION WORKS LTD. P.O.BOX S 1085 SUAME-KUMASI	CONSTRUCTION OF 6-UNIT CLASSROOM BLOCK(GROUND FLOOR) WITH ANCILLARY FACILITIES- ST CYPRIAN ANGLICAN PRIMARY A&B IN KUMASI
5.	MESSRS ABOAGYEWAA VENTURES P.O.BOX 1534 KUMASI	REHABILITATION OF 3No. 3-UNIT CLASSROOM BLOCK WITH ANCILLARY FACILITIES AT OLD TAFO, KUMASI
6.	MESSRS OWUATI CONSTRUCTION LTD. P.O.BOX AH 8716 KUMASI	CONSTRUCTION OF 1No. 6-UNIT AND COMPLETION OF 1No. 6-UNIT CLASSROOM BLOCK WITH ANCILLARY FACILITIES AT ST. HUBERT SEMINARY AT SANTASE, KUMASI
7.	MESSRS GOLD PRINT AND CONSTRUCTION LTD. P.O.BOX AH 8716 KUMASI	CONSTRUCTION OF 1No. 6-UNIT CLASSROOM BLOCK WITH ANCILLARY FACILITIES AT MMBROM-KUMASI

8.	MESSRS OWUATI CONSTRUCTION LTD. P.O.BOX AH 8716 KUMASI	REHABILITATION OF 2-STOREY 12-UNIT CLASSROOM BLOCKS, 1No. 6-UNIT CLASSROOM BLOCK AND 1No. 6-UNIT CLASSROOM BLOCK WITH ANCILLARY FACILITIES AT YAA ACHIAA AKOSA AND OHWIM, KUMASI
9.	MESSRS GOLD PRINT AND CONSTRUCTION LTD. P.O.BOX AH 8716 KUMASI	CONSTRUCTION OF 1No. 6-UNIT CLASSROOM BLOCK AND REHABILITATION OF 2No. 3-UNIT CLASSROOM BLOCK WITH ANCILLARY FACILITIES AT ABOABO, KUMASI
10.	MESSRS OSSIMILLER COMPLEX. P.O.BOX 4701 KUMASI	CONSTRUCTION OF 1No. 6-UNIT CLASSROOM BLOCK (FIRST FLOOR ONLY) WITH ANCILLARY FACILITES AT WEWESO M/A, KUMASI
11.	MESSRS JARTHUR COMPLEX LTD. P.O.BOX 8716 KUMASI	REHABILITATION OF 4No. 3-UNIT CLASSROOM BLOCK AND LIBRARY WITH ANCILLARY FACILITIES AT ANYAANO AND OLD TAFO, KUMASI
12.	MESSRS RICH HOUSE CONSTRUCTION WORKS LTD. P.O.BOX 246, KUMASI	CONSTRUCTION OF 1No. 6-UNIT CLASSROOM BLOCK WITH ANCILLARY FACILITIES AT AYIGYA, KUMASI

D C U
Deputy Dev. Control Engineer
K M A
Date 05/07/16