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KUMASI, GHANA

Influence of Safety Climate on Safety Behaviour in the Construction Industry

By

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A Thesis submitted to the Department of Building Technology,

College of Art and Built Environment

in partial fulfilment of the requirement for the degree of

MASTER OF PHILOSOPHY

JUNE, 2018

DECLARATION

I hereby declare that, this thesis is entirely my own work towards the degree of MPhil. Construction Management and that, any additional sources of information have been duly cited.

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ABSTRACT

Occupational safety problems continue to remain prevalent in the construction industry despite considerable efforts to ensure safer operations. Massive economic and personnel costs are currently being incurred by the construction industry especially those in developing countries as a result of work-related injuries. Research posits that these accidents are worsen by human factors and climatic factors around work. The human factors which are seen in unsafe practices have been noted to account for quite a greater percentage of occupational safety incidents. Thus, if construction workers can be influenced to engage in safe rather than at-risk work behaviours, then a possible decrease in the rate of work-related injuries shall be achieved. As a result of the problem at stake, this study sought to find out how safety climate factors influenced safe behaviour on construction projects. The study employed the quantitative research design and used purposive sampling in choosing construction companies for data collection. Descriptive analysis, mean score ranking and partial least square (structural equation modeling) were used to report on the data. Two hundred and ten (210) questionnaires were received out of 250 distributed for analysis. The results from the data revealed that, four (4) out of five (5) safety climate factors which are; management communication and commitment, safety training, safety supervision and safety promotion significantly supported the hypothesis developed. However, awareness and competence did not support the research hypothesis having a negative relationship with safety behaviour, therefore, rejecting the earlier set hypothesis of the study. The study had limitations such as data solely collected from one region of Ghana, the use of only quantitative method making the study constrictive. It was therefore recommended that, Management must provide continuing safety program development for its workers to improve worker safety behaviour. Finally, future research should be done to include other geographical areas in Ghana to obtain a more solid conclusion.

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ACKNOWLEDGEMENT

My most sincere gratitude goes to the Almighty God for granting me knowledge, grace and strength to conduct this research. I also want to express my heartfelt gratitude to my supervisor Dr. Emmanuel Adinyira for the patience, guidance, and constructive critisms throughout the research process. Finally, members and friends for their support, understanding and prayers during the entire period of my study. To you all, I say God bless you abundantly.

DEDICATION

This project work is dedicated to my parents Mr. Augustus Achina Agyemang and Mrs. Rosemary Agyemang and my brothers: Gideon, Daniel and Joel.

CHAPTER ONE

GENERAL INTRODUCTION

1.1 INTRODUCTION

The construction industry is identified as a major contributor of a nation's GDP and also one of the most hazardous industries because its activities are risk related (see Choudhry et al., 2008; Sawacha et al. 1999; Hinze, 1997; Suao and Jaselskis, 1993). Workers in the construction industry face safety issues like serious injuries which sometimes lead to hospitalization, loss of work time, disability and even death. For this reason it has become very important to improve safety in the construction site (Kines et al. 2010). Accidents not only results in considerable pain and discomfort but affects productivity, quality, time, the environment and this in the long run increase cost of the project. It is important to note that accident on construction site is mostly caused by careless or unsafe behaviour as noted by (Zohar, 2003).

Work safety climate of an organisation is explained by some writers as the views people have regarding how important safety is as compared to other work ethics like work speed (Kath et al, 2010; Zohar, 2003; Griffin and Neals, 2000). Wills et al., (2004) added that work climate state the various rules and the best safety practices that is needed to follow to achieve safety in the construction site. This involves how workers on site presume safety in their minds when dealing with work on daily basis.

According to Cohen et al. (1998), one best way of turning systems and procedures into reality is by encouraging and emphasising on how important managing health and safety in the work place is. Safety behaviour is the various rules and precautions workers in an organisation put in place at the work place to ensure their own safety and that of their colleagues. Recently, various organisations have put in series of

measures with the aim of ensuring good safety behaviour in the workplace and this is captured as the efficient way of improving safety at the construction site (Schuttle, 2010). Nonetheless, Kath et al. (2010), attests that, little attention has been given to the important of climate safety in ensuring best safety practices by workers on the construction site. For this reason this research seek to build an in-depth knowledge on the influence safety climate has on safety behaviour in the construction industry.

1.2 PROBLEM STATEMENT

Despite the numerous effort organisations take to ensure safety on the construction site, the problem of occupational safety still continue to be a major problem workers in the construction industry battle with (Neal and Griffin, 2006). Research revealed that the construction industries in the developing world incurred huge cost with regard to safety issues on site (see Camm and Girard-Dwyer, 2005; Seo et al., 2004). It must be noted that, most safety related problems occur on site due to workers behaviour. This is because research indicates that most accident on site can be avoided if workers adopt positive safety behaviour by adhering to various safety rules and regulations (Zohar, 2003). The writers further indicated that most accident are caused by human factor as well as the existing safety climate factors on site but the human factor has been identified to be the highest as compared to the climate factor (Shimmin, 1980; Atherly, 1978).

According to Zohar and Luria (2003) about 40% of accident that happens on site is due to the failure of workers to use safety equipment. For this reason workers in the construction industry must be encouraged to adhere to safety practices which will influence safety behaviour and hence reduce accident on site. Although the issue of construction accident is on the rise in Ghanaian construction industries, it must be

noted that the intensity differ from firm to firm and from site to site. For this reason the study seeks to access the influence of safety climate on safety behaviour in the construction industry.

1.3 THE AIM AND OBJECTIVES OF THE RESEARCH

The main aim of the research and the research objective have been stated below

1.3.1 Aim of the Research

The study primarily aims to determine the impact safety climate has on safety behaviour on construction projects in Ghana.

1.3.2 Objectives of the Research

The purpose of the research is to address the following;

- To identify the significant safety climate factors in the Ghanaian construction industry.
- To identify the commonly occurring unsafe behaviours observed on construction projects in Ghana.
- To determine the impact safety climate factors has on unsafe behaviour on construction projects in Ghana

1.4 RESEARCH QUESTIONS

This study aims at addressing the following research questions:

- What are the important safety climate factors in the Ghanaian construction industry?
- What are the unsafe behaviours observed on construction projects?
- To what extend does safety climate factors impact on safe behaviour on construction projects?

1.5 SCOPE OF THE RESEARCH

The research work was narrowed to some building construction contractors in Kumasi. The study was interested in comparing findings from building contractors of class D1K1 because of easy acquisition of information regarding safety on construction projects. According to Eyiah and Cook (2003) construction industry has been classified into D1KI (large firms), D2K2 (medium firms) and D3K3 (small firms) based on certain criteria like profit level of the firm, financial status, level of experience, how management within the firm is structured, asset structure and equipment holding. Based on the classifications indicated, firms within each category can tender for building contracts which falls within their threshold (Badu et al., 2012). The Kumasi metropolis was chosen in terms of closeness and geographical scope of this study.

1.6 SIGNIFICANCE OF STUDY

In recent times, various organisations have put in series of measures with the aim of ensuring good safety behaviour in the work place and this is captured as the efficient way of improving safety at the construction site (Choudhry et. al., 2008). Nonetheless not much attention has been paid to how important the climate of safety is in ensuring best safety practices by workers on the construction site. For this reason this research seek to build an in-depth knowledge on the influence safety climate has on safety behaviour in the construction industry. The findings of the research would contribute significantly to the growth of the construction industry in Ghana which is considered as the backbone for development of the economy, since the occurrence of accident would be reduced.

Finally, this research would be of much importance to academia, serving as a major and critical contribution to knowledge and also serve as the basis for other research works to be carried out in similar fields.

1.7 RESEARCH METHODOLOGY

The research method adopted was quantitative approach of enquiry leaning towards positivist traditions. An in-depth literature was reviewed on relevant issues related to the subject under study. This was to identify academics paradigms that supported the issue on board in other to establish relationship that exist between safety behaviour and safety climate. For the purpose of this research, literature was gathered from books, journals, publications as well as literature from corporate bodies'. After identifying the gap in data based on the secondary source, the missing data was collected from the field using workers and managements in the building construction industry as the main targets. The data was collected from the field using structured questionnaires. The data collected was analysed using descriptive analysis, mean ranking and partial least square (structural equation modelling)

1.8 STRUCTURE OF STUDY

The research was categorized under five broad headings. The first was chapter one which embodied the general introduction of the study. This chapter further revealed the problem at hand, the research question and objectives to achieve, what the research aim at, the scope of the research, how significant the research is and the method used in carrying out the research as well as how the research has been structured. The second chapter which is chapter two reviewed relevant literature related to the subject and the study objectives. Chapter three captured the research methodology. Chapter four covered the analysis of data collected and the discussion

of findings. Lastly, chapter five gave the summary and conclusion from the study as well as some recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter, the influence of safety climate on safety behaviour in the construction industry was reviewed. Content examination of prevailing theories would be visited to determine their validity and practicability in the context of the construction industry. These theories are expected to aid the assessment of influence of safety climate on safety behaviour in the construction industry would be reviewed.

2.2 SAFETY CLIMATE (SC)

Safety climate is define as the summary of workers moral perception of their working environment; thus, is a framework that is use as reference that guide workers on how to adapt proper safety behaviour at the work place (Zohar 1980). Safety climate is also defined by Neal and Griffin (2006) as how individuals see procedures, practices and policies that guide safety at the work place. According to Flin et al. (2000), there is a difference between safety climate and safety culture. This is because safety climate is seen as the knowledge and the understanding workers have in Organisational Health and Safety (OHS) within a specific time frame. On the other hand safety culture is the core believes of an organisation. Guldenmund (2000) is of the view that safety culture manifest itself through safety climate. The writer argues that in order to ensure an effective OHS then more attention must be paid to various mechanisms that will help improve a positive safety culture. The safety climate will be the tool that will be used to measure whether there has been an improvement in the safety culture or not. This is to say that, the safety climate is used to assess the state of safety culture in an organisation. Several researches have been conducted on safety

climate in various organisations especially in the construction industry, manufacturing industries, in road administration, airport ground handling and in the wood processing industries (Larsson et al., 2008; Melia et al., 2008, Clarke 2006; Gillen et al., 2002; Griffin and Neal, 2000; Dedobbeleer and Be´land, 1991; Brown and Holmes, 1986; Zohar, 1980). All these researches point out to the fact that organizational safety climate has efficacy in a varied range of industrial environment.

According to Zohar (1980), the factors to consider in SC include; level of risk at the work place, management commitment to safety, safety training, safety officers status, effect of working pace on safety and the effects of safe behaviour on promotion and social status. A study conducted by Holmes and Brown in 1986 on some ten (10) industries in America with a total sample size of 425 confirm to these factors as most relevant in safety climate. Nevertheless, only three factors were derived: management attitudes, management actions and level of risk. This was also reviewed by Flin et al. (2000) who came out with the 'big five' factors of SC to be management, risk, safety systems, competence and work pressure. Ten (10) factors in construction site setting was outlined by Mohamed (2002) and they include; safety rules and procedures, commitment, worker involvement, communication, appreciation of personal risk, supervisory environment, appraisal of work hazards, supportive environment, competence and work pressure. Another study was conducted in Hong Kong and the following 10 dimensions were identified; attitudes and management commitment, safety training, supervisor and workmate roles, risk-taking behaviour, safety resources, safety procedures, worker involvement, workmate influence and competence (Fang et al., 2006).

A study conducted by Choudhry et al. (2009), in Hong Kong, collecting 1120 valid questionnaires from 22 construction sites, produced four main factors: employee involvement and management commitment, along with inappropriate work practices and safety procedures. The studies reviewed revealed that SC factors have no universal set that is to be strictly followed although some of the factors by different scholars appear to be similar. Summarising the above, factors of SC vary from industry to industry and from region to region. Therefore, the factors that have an effect on SC within one industry may not be valid in another, which suggests that no common set of SC factors exist (Fang et al., 2006). The SC which was considered for the study was adopted from what was revealed by these authors Flin et al. (2000), Mohamed (2002), Fang et al. (2006) and Choudhry et al. (2009). The factors include the following; the perceptions workers have on management communication and commitment, workers perception on safety, work pressure, how workers appreciate risk and workers competent level. These factors are summarised in the Table 2.1 adopted from Mohammed (2002).

Table 2.1: Details of the operational safety climate

Construct/Factor	Description	Example of measurement variable	Reference
Management communication and Commitment (SC1)	The quality of communication and its frequency in the organisation and how relevant it is for management to improve performance on safety.	1. Management acts quickly to correct safety problems. 2. Management and supervisors listen and discuss issues on safety. 3. Managements make sure to collect feedback from workers on safety issues on site.	Ferraro (2002); Mohamed (2002); Griffin and Neal (2006); Fang et al., (2006) Bhasi and Vinodkumar (2010)
Competence (SC2)	The relevance of qualification as well as ensuring effective skills and safety training in issues of safety.	1. People here have adequate safety training to perform. 2. People here have the skills to avoid the dangers of workplace hazards.	Mohamed (2002); Fang et al., (2006) Bhasi and Vinodkumar (2010)
Appreciation of personal risk (SC3)	Individual's intuitive assessment on the appropriate risk on site or workplace.	1. I think site conditions help individuals to work safely. 2. People here usually pay attention to health and safety. 3. I think the health and safety instructions are followed in our workplace.	Mohamed (2002); Ferraro (2002) Fang et al., (2006)
Work pressure (SC4)	The time available for workers to safely plan and complete their work to determine whether workers perform their task under pressure or not.	1. Workers are given the needed time to safely get the work done. 2. Usually I work under pressure.	Flin et al., (2000) Mohamed (2002); Fang et al., (2006)
Safety rules and procedures (SC5)	How effective are the safety inspections and emergency procedures and are safety equipment and facilities available to ensure safety at the work place	1. At our workplace, current safety rules and procedures are available to protect employees from accidents. 2. At our workplace, measures have been put in place to ensure that workers observe the existing safety rules such as the use of protective equipment whenever it deems fit.	Fang et al., (2006), Mohamed, (2002), Flin et al, (2000).

Source: Adopted from Mohamed (2002)

2.2.1 Safety climate in construction

Dedobbeleer and Beland (1991) observed that to achieve overall safety in the workplace involves the commitment of both workers and management in Organisation's Health and Safety (OHS). Some research has revealed that there is a positive relationship between safety climate and the performance of OHS (Gillen et al., 2002). A test was conducted through survey on how workers see their attitude, that of their colleagues and managements in terms of safety practices and the result revealed that accumulative negative attitude of workers have direct links to the rate of reported accidents. On the contrary negative attitude of workers had indirect relationship to accidents that occurs as a result of psychological distress of workers (Siu et al., 2004). Similarly managements and workers commitment had a significant positive influence on safety than workers personal experience and skills on safety (Zhou et al., 2008). Moreover, Pousette et al. (2008) also conducted a study using Swedish construction workers in a 'two-wave study' and the findings was that the score of safety climate within a specific time frame (time 1) significantly predicted self-reported safety behaviours seven months later (after controlling for safety behaviour at time 1).

2.3 SAFETY BEHAVIOUR (SB)

In recent times, safety behaviour has been conceptualised to include the specific behaviour performance of workers on site. The performance has been categorised into contextual performance and task performance which serve as the bases for differentiating safety behaviour at the workplace (Borman and Motowidlo 1993). With regards to task performance the writers postulated that how workers comply with safety rules should be used to expound the core activities that individuals need to do to ensure safety at the workplace, some of such safety activities include wearing

protective equipment. On the other hand, how individuals participate in activities that will ensure safety at the work place is what constitute contextual performance, this include attending safety meetings or volunteering to take part in safety activities. Although participating in safety activities may not directly ensure safety at the work place, they aid in developing a more safety friendly environment (Schuttle, 2010). The Borman and Motowidlo's (1993) concept was adopted in many studies, such as those of Griffin and Neal (2000) and Christian et al. (2009), to examine the relationship between SC and SB. The two dimensions of safety behaviour together with their references and descriptions has been summarised in Table 2.2 as adopted from Neal and Griffin (2000).

Table 2.2: Details of the operational safety Behaviour

Construct/Factor	Description	Example of measurement variable	Reference
Compliance to safety (SB1)	Self-measurement of compliance to safety rules and procedures.	1. I do my possible best to use the needed safety equipment provided on site. 2. I always make sure that my work is carried out in a safe manner. 3. It is practical for me to follow most safety rules and procedures while doing my job.	Griffin and Neal (2006); Bhasi and Vinodkumar (2010)
Participating in safety (SB2)	Individuals self-assessment of how they support and get involve in safety.	1. I do my maximum best to enhance safety on site. 2. I always attend regular safety meetings or workshops arranged by workplace management. 3. I take action against people who break safety instructions.	Griffin and Neal (2006);Bhasi and Vinodkumar (2010)

Source: Adopted from Neal and Griffin (2000)

2.4 RELATIONSHIP BETWEEN SAFETY BEHAVIOUR AND SAFETY OUTCOME

Safety behaviour is explained as the best practices that workers are supposed to embrace to ensure occupational safety to avoid accident at the workplace. It is the behaviour that support safety practices. Interest in safety behaviour in the workplace emerged in the 1930s after research indicated that the incident of occupational hazard has risen up as far as 95% due to workers negative attitude towards safety precautions at the workplace (Cooper, 2004). According to Simard and Marchand (1997), many safety practitioners hold the firm belief that worker behaviour is one of the main contributors to accidents. This belief is influenced by H.W. Heinrich's'dominos theory', which proposes that 80% of all accidents at work stem from unsafe actions performed by workers (Simard and Marchand, 1997). Rundmo (1996) studied the relationship between risk-taking behaviour and safety outcomes (accidents and near misses) among employees on twelve offshore oil installations and found a significant positive correlation between risky behaviour and safety outcomes. Similarly, significant and positive relationship between negative behaviour and the probability of an accident which involves personal injury was found in a study of nuclear reprocessing plant employees (Lee, 1998). Christian et al. (2009) developed a meta-analytic path model for workplace safety focusing on the roles of personal and situational factors, which established a causal link in terms of safe behaviour (measured by safety compliance and participation) and safety outcomes (measured by accidents and injuries). Further, in a study by Clarke (2010), safety behaviour was found to have a direct effect on occupational accidents and at the same time partly mediated the relationship between safety climate and occupational accidents. Although it may be argued that poor safety behaviour does not necessarily result in

accidents, the foregoing research findings tend to support the notion that good safety behaviours are more likely to reduce accidents and injuries.

2.5 SAFETY COMPLIANCE

It could be said that compliance is one major concern in most firms due to the increase number of safety regulations which business managements are to ensure that workers understands these regulations and comply with them. It could therefore be said that safety compliance is the degree to which workers abide by safety requirement as well as rules and regulations on safety at the workplace. It can also be seen as an accident free working environment (Adams et al., 2007; Stanton et al., 2007; Neal et al., 2000). Safety compliance refers to the act of conforming to established safety standards and regulations, or the process of becoming so (Morrish, 2016). Thus, safety compliance means undertakings that employees does to enhance their own safety and the safety of their workplace. Examples include following safety procedures while working and using the right protective equipment if applicable. Unsafe behaviour triggers between 80% and 95% of all workplace accidents and human error often gets the blame (Paul and Maiti, 2005; Ashworth and Peake, 1994).

Most firms see compliance as an ethical issue, to them compliance is an issue of balancing the firm needs with that of workers safety needs (Lundgren and McMackin, 2009). MacDonald and Hrymak (2002) argue that compliance can only be evident and exhibit a positive relationship if there are safety representatives on site charged with the sole responsibility of ensuring safety compliance at the workplace. This is because safety representatives have specific ways of ensuring safety on site aside their influence on the response to audits and hazards. For instance safety representatives ensure that all hazards on site are reported, they follow up to make sure that a positive

result is achieved for better safety compliance. Their present on site reduce hazard and ensure that workers work in hazard free environment.

2.6 SAFETY PARTICIPATION

Participation simply means ‘taking (Vroom and Jago 1988). Participation can either be formal or informal, direct or indirect, participation can be shared or performed alone. DeArmond et al., (2011) define safety participation as a voluntary conduct of taking part in activities that best ensure safety practices at workplace. Examples of such activities include taking part in safety meetings and workshops, helping other colleagues to take part in safety practices and voluntary engaging in safety activities (Griffin and Neal, 2006), it is important to note that individuals who engage in safety participation do so willingly, that is, they volunteer to take part in safety activities. Their participation is not based on role or responsibility. According to Griffin and Neal, (2006) workers willingness in taking part of safety activities serve as a motivation to increase the level of safety performance. This is because workers participation in safety is very relevant in managing safety and health at the workplace. To emphasis this, the benefits of safety participation adopted from (EU-OSHA) includes the following; (1) Safety participation has the tendency of lowering illness accidents at the work place. (2) It reduces cost of the project because fewer accidents cases are recorded reduce the threat of legal action, decrease absenteeism and lower turnover rates. (3) It explains the need to take a particular action and how the action taking will help ensure safety on site which increases the complying rate to safety. (4) It helps shape workers attitude of safety practices by giving advice, suggesting improved methods of ensuring safety at the work place.

(5) Productivity increases when workers participate in safety since work is done in a healthy environment free of accidents, they are motivated to put in their maximum best.

2.7 CONCEPTUAL FRAMEWORK

Figure 2.1 shows the conceptual framework and hypothesis developed for the study through relevant literature from safety climate factors and safety behaviour.

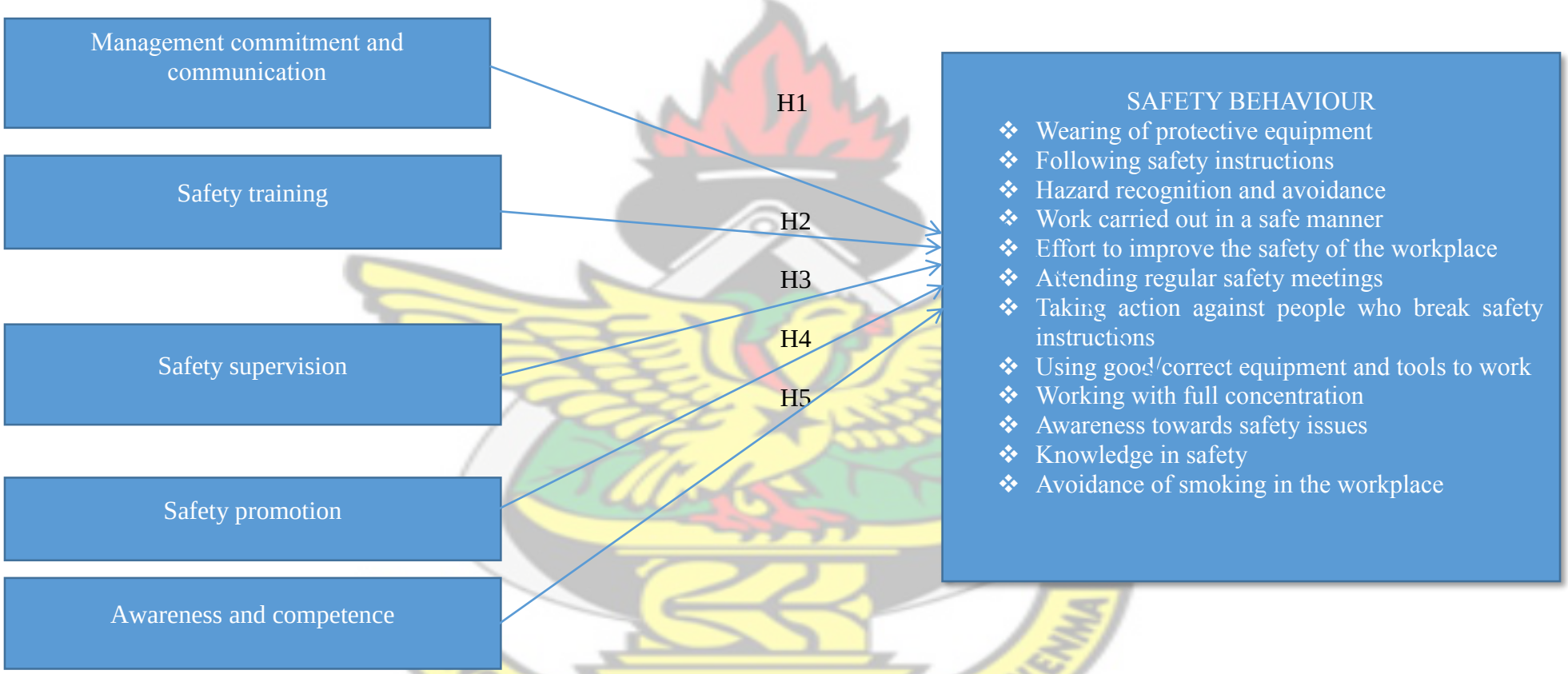


Figure 2.1: Conceptual framework of safety climate factors on safety behaviour

Hypothesis 1

H1: "Management commitment and communication" positively influences safety behaviour.

Hypothesis 2

H2: "Safety training" positively influences safety behaviour.

Hypothesis 3

H3: "Safety supervision" positively influences safety behaviour

Hypothesis 4

H4: "Safety promotion" positively influences safety behaviour.

Hypothesis 5

H5: "Awareness and competence'' positively influences safety behaviour.

To this end, five safety climate factors were identified after reviewing several models. The factors have various indicators that come together to form each construct of the safety climate factor. The safety behaviour also identified is geared towards the best safety practices that need to be employed by workers to ensure safety on site. Various indicators also inform the safety behaviour construct. Table 2.3 details the definition of the various indicators under the constructs of the latent variables.

Table 2.3: Definition of safety climate factors and safety behaviour

SAFETY CLIMATE FACTORS (Exogenous Variables)	SAFETY BEHAVIOUR (Endogenous Variables)
Management commitment and communication ❖ Management acts quickly to correct safety problems ❖ Management and supervisors listen and discuss safety issues ❖ Management encourages feedback and safety participation from site workers on safety issues ❖ Management offers enough safety information ❖ Management believes safety is of the same importance as production	❖ Wearing of protective equipment ❖ Following safety instructions ❖ Hazard recognition and avoidance ❖ Work carried out in a safe manner ❖ Effort to improve the safety of the workplace ❖ Attending regular safety meetings ❖ Taking action against people who break ❖ safety instructions ❖ Using good/correct equipment and tools to work ❖ Working with full concentration ❖ Awareness towards safety issues ❖ Knowledge in safety ❖ Avoidance of smoking in the workplace
Safety Training (ST) ❖ Training in PPE usage ❖ Regular and useful safety training	
Safety Supervision (SS) ❖ Production level should be frequently checked by supervisors ❖ Workers attention should be drawn to the production level ❖ No- smoking rules in the workplace should be strictly enforced by supervisors ❖ Supervisors should make emphasis on safety in each day of work ❖ Supervisors should make show that workers wear PPE	
Safety Promotion (SP) ❖ Safety bulletin boards ❖ Safety signs and posters ❖ Recognition and reward for good safety performance by individuals	
Awareness and Competence (AC) ❖ Workers are clear about responsibilities for workplace safety ❖ Workers understand the safety rules in my job ❖ Workers deal with safety problems in my workplace ❖ Workers comply with the safety rules all the time	

Source: Authors Construct (2018)

2.8 CHAPTER SUMMARY

This chapter has reviewed literature to discuss the theoretical backing of the research in the area of safety climate and safety behaviour.The chapter also elaborates on the development of a conceptual framework and hypotheses for safety climate factors on safety behaviour. The chapter ends with the discussion of the hypotheses.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

The chapter gives an in-depth knowledge on the methodology used to conduct the research. The method includes the research strategy that was adopted, how the study was designed and procedures used in the collection of data for the purpose of achieving the research aim and objectives. It also elaborated on the sampling size and the sampling technique used as well as the development and administering of questionnaires. Lastly, the mode of data presentation in addition to the statistical tools used for the critical analysis of the data gathered is discussed.

3.2 RESEARCH PHILOSOPHY

Research philosophy can be defined as the method of developing the research knowledge and the research background based on which research is conducted (Saunders and Thornhill, 2007). Research paradigms aid in explaining research philosophy. Research paradigm is explained as a broad framework which house beliefs, perceptions and understanding of research theories (Cohen et al., 2000). It can also be explained as a baseline from which research questions and research objectives are developed.

Gliner and Morgan (2000) view paradigms as a way of thinking about how to conduct a research. It does not only involve methodology but it also state how the research should be carried out. Research paradigms and research philosophy combine various factors in carrying out the research, this include individuals way of seeing things, his mental mode, beliefs, perception etc. This concept influences the beliefs and value of the researchers, so that he can provide valid arguments and terminology to give

reliable results. Easter-by-Smith et al. (2006) have discussed three different components of research philosophy which are; epistemology, ontology and axiology.

3.2.1 Epistemology

Epistemology spells out the nature, validity and limits of inquiry (Chia 2002) which Hughes et al., (2006) buttresses with his statement "How probable it is without difficulty to have access to the knowledge of this world?" epistemology is describe as a philosophical branch of research that controls the process of knowledge acquisition combined with its validation. Epistemology spells out the mechanism of acquiring knowledge and its validation (Gall et al., 2003). Epistemology is a philosophical branch which concerns itself with what is right for an individual; classified as positivism and interpretivism. Approach to knowledge was largely dependent on the positivist approach. Scientifically, facts can be accumulated for the positivists (Eriksson and Kovalainen, 2008; Easter-by-Smith et al., 2008; Saunders et al., 2007; Hatch and Cunliffe, 2006; Blaikie, 1993).

A researcher with an interpretivist view looks at making sense out of his or her immediate environment. It stresses the realism of context, where the understanding, interpretation are from the perspective of the researcher as well as his point of reference (Hatch and Cunliffe, 2006). An uncommitted impartial point is difficult when following from the interpretivist position in research, in that, the researcher is absorbed in the research and the principles and theories of the researcher become the chief motive in the explanation of results (Saunders et al., 2007). This study epistemologically adopted positivist tradition because it tends to determine the relationship between variables (safety climate factors and safety behaviour). This study is also not based on the researcher's ideas but by acquiring actual facts on the

ground using research instruments. Systematic and simplified approach was used in the exploration of this research.

3.2.2 Ontology

Ontology defining nature's reality; how nature is real (Blaikie, 2010). It can also be described as "the product of one's mind". Saunders and Thornhill (2012) emphasized that ontology contributes significantly to decision making which establishes the realities and certainty clearly defined by subjecting the human actors to examination. The view of reality based on the researcher's assumption plays a vital role in all other assumptions and serves as a basis for various assumptions, what is assumed here predicts the researcher's other assumption (Bryman, 2012). Two basic distinctions can be made here: firstly, the world's aren't real but rather socially and discursively made and hence rely on a particular time or culture-hence the expression anti foundationalism. Secondly, there is an independent real world upon which foundations life is built-hence the name foundationalism, which is in tandem with this research (Bryman, 2012). This research adopted a realist position because the variables that explain the safety climate factors exist in literature. The aim of the study (determining the impact of safety climate on safety behaviour) is viewed as more practical than it being abstract.

3.2.3 Axiology

Sanders and Thornhill (2012) define Axiology as an aspect of philosophy charged with the sole responsibility of making judgements about values. Also Li, (2016) postulated that axiology assesses the role researcher play and the values they have concerning the process to be adopted for the research. Usually the aim of the research is also considered as the 'Axiology primarily'. Axiology gives clarification on any

attempt made to understand or make prediction on the World (Lings and Lee, 2008). It simply explains what the value of every research is. This is very relevant in every research because what the researcher value has influence on how the research is conducted and the result to be obtained. The study is value free since the choice for what to study or how to study is explored by objective criteria.

3.3 RESEARCH APPROACH

3.3.1 Inductive approach

This is an approach to research that starts with observation and the end result of the research is theory. The inductive reasoning is a research approach that is mainly used to build theories. This includes observing aspects of social life from which patterns from developing theory are identified (Babbie, 2007). The inductive approach begins with specific examples or facets of societal life. From these observations, outlines are identified with generalisations made on what has been investigated (Godfrey and Hudson, 2010). The inductive approach also termed as theory building, includes the researcher gathering data in the bid of developing a theory (Bernand, 2011). Godfrey and Hudson (2010) affirmed that, it is concerned with the observation of tentative reality; laying emphasis that inferences are gathered based on specific conditions depicting the opposite nature of the deductive method, because it turns to move away from observing individuals to statement of general pattern or laws. Lodico et al. (2010) argues that the researcher uses the observations in order to construct an abstract or to describe the circumstances being studied. The main advantage of the inductive method is that there is no necessity for any pre-fabricated framework or model.

3.3.2 Deductive Theory

The deductive reasoning is whereby one derives a prospect and a testable assumption from a general abstract (Wilson, 2010). The deductive theory indicates the main issue at hand and aids to find patterns which can be tested through observation. It is a valid model in which precise prospects of hypothesis (i.e. an idea which has been suggested but not proven to be true) are established on the basis of universal principles. This moves from the universal principles to particular ones. In addition, it then changes from a pattern which is theoretically expected to observations which examine whether the predictable pattern truly occurs (Sneider and Larner, 2009). Deductive reasoning has specific characteristics that needs be understood. If the premises of deductive reasoning are accepted, then, the conclusion must necessarily be accepted. In a deductive reasoning, the contents of the result are implicitly stated in the premises, making such argument a non-ampliative one.

3.3.3 Research Approach chosen

The study adopted the deductive approach in the use of a quantitative approach to collect data from respondents and in the analysis because conclusions needed to be made base on facts (Burney, 2008). The deductive approach was adopted also because certain observed variables were identified from literature to measure safety climate factors through quantitative empirical testing.

3.4 RESEARCH DESIGN

Research design is the researcher's overall view for answering the research question or testing the research hypothesis (Polit et al., 2001). Again, research design is seen as a master plan that specifies how a research is conducted (Welman et al., 2009). It is a method of collecting data and analysing it in order to answer the research questions

which have been discovered in a research, giving a theoretical framework for conducting the research. A research design starts with an interest in an idea which gradually leads to forming a theory which supports the study. Research design comprises the processes with which one can discover and examine the relationship surrounded by variables involved in a problem and discuss the choice of a specific process to other variables (Babbie and Mouton 2008). The research adopts an explanatory research design because it deals with the clarification of the existence of a relationship that exists between two or more aspects of a phenomenon or situation. This goes with the research aim of finding the influence of safety climate on safety behaviour in the construction industry.

3.5 RESEARCH STRATEGY

Naoum (1998) is of the view that research strategy is the method use to achieve the objective of a research. Research strategies can take numerous forms but Saunders et al. (2009) argues that, there are substantially huge overlaps between the strategies. The most important thing is to choose the best suited research strategy among survey, experimental and case study research strategies. The Survey approach was adopted for the study because it enables the researcher to collect data on existing practices and situations at a particular piont in time through the use of questionnaires (Zikmund and Babin, 2010). The existing relationship among data is established by using quantitative analytical tool. One major important of survey is that real world environment can be studied and a large variable can be studied at a particular point in time which might not be possible in field experiments.

3.6 RESEARCH METHODS

Research method is the general form in carrying out research work (Leedy and Ormrod 2001). There are three forms of carrying out research work; they include quantitative approach, qualitative approach and the mixed method approach. The type of approach used depends on how primary data for the research will be collected. That is whether the data will be in numeral form, text or both. Research with numeral data adopts the quantitative approach, research that collect it data in text form uses qualitative approach and mixed method is used to collect data that take both qualitative and quantitative approaches.

3.6.1 Quantitative research approach

Quantitative method is testing a hypothesis or theory which comprises of variables and measured with numbers by an enquiry into human problem (Creswell, 1994). This strategy uses statistics and mathematical tools to help establish linkages and relationships. It views social reality as external and objective reality. This research is by nature objective and also comprises of theories and variables. According to Creswell (2003) the techniques used to collect data in quantitative research are questionnaires. Quantitative is associated with hard data and the samples are normally large and are used representatively. Therefore, the results on small samples can be replicated on larger populations with the existence of error limits. The validity of the results obtained depends on the measure of instrument and its accuracy.

3.6.2 Qualitative research approach

Creswell (1994) described qualitative research as a model that occurs in a natural position gallowing the researcher to develop a level of detail from high participation in the actual experiences. Qualitative research approach focuses on words instead of

quantification. This type of research is by nature subjective. It is also attitudinal and exploratory. Qualitative researchers often depend on critical or social science. They follow a path that is non-linear. Contexts and cases are the language of qualitative. The types of data collected in qualitative are observations, open-ended questionnaires and written documents. These therefore go with quotations, excerpts and descriptions. These could either be semi-structured or unstructured (Ormrod, 2001). The data is also deep and determines the existence of things instead of their numbers. Creswell (2003) contributed that this type of research establishes purpose, impression, description, attributes, metaphors, representations and description of things. Inherently, this research is better responsive to the nature and needs of research happenings. Qualitative research is greatly dependent on the competence, integrity, skill and rigor of the researcher involved.

3.6.3 Mixed methods approach

The mixed method is when both qualitative and quantitative methods are used, it produces a rich understanding of the phenomena and the triangulation is explained whiles concentrating on the important research findings. The mixed method comprises of assumptions which are philosophical that directs and guides the gathering and analyzing of data as well as the combination of both quantitative and qualitative (Onwuegbuzie and Johnson, 2014). The use of mixed method approach is to harness all the merits that are inherent in both qualitative and quantitative research approach (Onwuegbuzie and Johnson, 2014).

3.6.4 Research Method adopted for the study

A quantitative approach consisting of both desktop and field study was adopted for this study in other to confirm and test the research hypotheses. The following are

justifications why quantitative research was adopted for this research; quantitative research gathers realistic data on the issue of concern. It establishes a clear relationship between facts and theories. It is deductive in nature and hence aid in the confirmation of the hypothesis test of theories. Quantitative is associated with hard data and the samples are normally large and are used representatively. Therefore, the results on small samples can be replicated on larger populations with the existence of error limits. The conclusive results are used to recommend a final course of action to achieve a particular positivism.

3.7 DATA SOURCES

Primary data and secondary information was the two main data sources for the research. Secondary data was gathered by reviewing relevant literature related to the topic. Secondary data is information that already exists. The research gathered information from published data such as journals, articles, reports, books, manuals and internet source, informal discussions with experts, colleagues, seminars and conferences as well as published guides. Primary data source can be categorized into two forms. Firstly, the data source could be original work or data based on a person's own thoughts. Secondly, primary data can be data collected at first hand which is organized and presented by the one who gathered such data. Primary data was collected with the use of questionnaires.

3.8 SAMPLING TECHNIQUE AND SAMPLE SIZE

Sampling procedures enlightens on how part of the population involved in the data was selected. According to Naoum (1998), sample is a finite part of a statistical population drawn to reflect the remaining population. 'Population' on the other hand as defined by (Mugo, 2002) is a group of individuals, objects or items from which

samples are chosen for measurement. According to (Kwofie, 2014; Hair et al., 2013; Curran et al., 2004) the use of variable ratios in determining suitable sample size has been noted to be very suitable. Tong (2007) indicated that the variable ratio should be at least 5:1. Taking into deliberation of the 50 observed variables with a 5:1 variable ratio for an ideal SEM model, a size of 250 samples was considered. For the purpose of this research, purposive sampling which is an illustration of the non-probability sampling technique was used in finding the key respondents who were building contractors of class D1K1 and their operatives.

The following criteria were also used in selecting the sample size;

- Construction sites visited should have certain safety policies within their firm.
- Construction sites should be within KNUST campus and carrying out projects belonging to the university.
- Operatives selected to answer the questionnaire should have executed several projects and gained enough experience.

3.9 SURVEY QUESTIONNAIRE

According to Monette et al. (2011) questionnaire is an assemblage tool that facilitate the collection of data from people. Administering of questionnaires can be in the form of telephone, by mail, hand-outs, using face-to face interviews or electronically. The questionnaire design must address the needs of the research which is a feature of a good research design. Questionnaires are data assemblage tools that are developed by the researcher to facilitate the collection of data, simply by asking questions.

3.9.1 Design and development of structured questionnaire

Questionnaire development is considered as the most integral part of every research (Oppenheim 1992). Questionnaires for research can be open-ended, closed-ended or

can take both forms based on the expected result the researcher wishes to achieve (Frazer and Lawley, 2000; Oppenheim, 1992). The research adopted closed-ended format in its questionnaire development which required respondents to choose between several options. This idea was used in other to achieve the research objectives since the questions were developed based on the objectives of the research. Simple and straight forward questions were asked in other for respondents to understand and give accurate answers to them. The questions were structure into four sections that start from section A, B, C and D.

Section A which was the first part of the questionnaire was designed to request for respondent's demographics. The responses were used to test if any of the variables in Section A had an essential impact on the rating of the experience and expertise. According to (Hallowell and Gambatese, 2009), years of professional experience in construction, professional's role, level of education and professional affiliations are known to be important indicators of experience and expertise in construction (Hallowell and Gambatese, 2009). Data was thus collected on these variables.

Section B which represented the second part of the questionnaire demanded that respondent's rank the most significant safety climate factors on construction sites on a likert scale of 1= Insignificant, 2= Less significant, 3= Moderately significant, 4= Significant and 5= Very significant

Section C which represented the third part of the questionnaire demanded that respondents rank the frequency of unsaved behaviour observed on construction sites on a likert scale of 1=Not frequent; 2=Less frequent; 3=Moderately frequent; 4=frequent; 5=Very frequent

Section D which represented the fourth part of the questionnaire demanded that respondents rate the impact of safety climate on safety behaviour on construction sites.

3.9.2 Pilot study

Bless et al. (2006) stated that pilot study is a small study conducted to test the sampling, methodology and the overall appropriateness of the research instrument being used to determine whether the method and the instrument adopted will be appropriate for the research. The errors that are identified in the pilot survey are corrected before the methods and instruments used in the actual survey, this is to ensure accuracy and clarification (Wilkinson and Birmingham, 2003). Moreover, pilot survey help in eliminating unclear and misleading questions in other to achieve flow in the interview and generate a useful feedback. The purpose of pilot survey has been summarised below as adopted from (De Vos et al., 2011; Welman et al., 2009:148).

- One main purpose of pilot survey is to eliminate possible flaws in the measuring instrument like ambiguous instructions which delay time
- To identify questions that will be unclear to respondents and restructure it this is identified when respondent are made to interpret the questions according to their way of understanding during the pilot survey.
- It gives the researcher an opportunity to identify questions that will cause discomfort to respondent by observing the non-verbal behaviour of respondents during the pilot survey

In this study, the pilot questionnaires were administered to persons from general construction industry and academia that have in-depth knowledge in the subject area. They were to check for any ambiguity, clarity and the time it will take to complete the

questionnaire. The feedback showed that responses to be taken from the questionnaire were going to be relevant.

3.9.3 Questionnaire administration

The questionnaires were having covering letters which sought the consent of respondent. Confidentiality regarding respondents was followed stringently. Respondents were assured that information they had offered for this research or their involvement will not be used against them in any way. The study hopes to have no interference of the private affairs of respondents regarding information offered. The principle of concealing the identity of respondents would be sustained all through the interactions with respondents. Questionnaires were administered by hand delivery by the researcher to building contractors and their operatives for a period of two weeks.

3.10 DATA COLLECTION

In all 250 questionnaires were administered. All 250 questionnaires were self-administered. Some of the questionnaires were retrieved on the spot whiles the rest were retrieved some days after their administration. All questionnaires had cover letters introducing briefly the research and its purpose. Regular reminders in the form of telephone calls and emails extended the survey duration to ensure accurate response. These reminders in the form of emails were sent every 4 days to the participants. As many as 20 questionnaires were gotten from construction sites of individual firms due to the firm having more than one construction sites. As a means of explaining the purpose of the research to the participants, the researcher made use of telephones and emails. In all 210 questionnaires were finally received from the various Health and Safety officers and Construction workers from the sites visited.

3.11 DATA ANALYSIS AND STATISTICAL TOOLS

Emory and Cooper (1991) are of the view that raw data from a study is useless unless it is transformed into information for the purpose of decision making. The data collected was sorted and coded and subjected to analysis using descriptive analysis, mean ranking and partial least square (structural equation modeling). The findings from the analysed data were used to obtain the mean score, descriptive statistics like mean, frequency, standard deviation, percentages and the like. This was represented using frequency tables. The results from these analyses provided relevant information in meeting the objectives of the study.

3.11.1 Partial Least Square Structural Equation Modelling (PLS-SEM)

Partial Least Square (PLS) is used to analyse data that have many factors which are collinear. It used to construct predictive models. It is important to note that the idea of using PLS is to predict responses and not to establish relationships between variables. Basically PLS is used to generate theories that explain research. It is key to note that PLS is not used for screening out factors that have negligible effect on respondent, however, PLS can only be used when prediction is the main goal and there is no limit on measured factors. PLS was initiated by Herman Wold in 1960 as an econometric technique, later Wold's son Synate also developed a keen interest and became one of its proponents in the field of chemometrician and engineering. Not only has PLS used in the field mention above but also in the industrial world. Some industries apply PLS in its monitoring and controlling process. According to (Hair et al., 2011; Wolfinbarger et al., 2011), Path models are diagrams used to visually show the hypotheses and variable relationships that are examined when SEM is applied. PLS path models are formally defined by two sets of linear equations: the measurement model (also called outer model) and the structural model (also called inner model).

The measurement model specifies the relations between a construct and their (indicators) whereas the structural model specifies the relationships between the constructs (latent variables).

3.12 CHAPTER SUMMARY

This chapter concentrated on the methods which were adopted for carrying out this research. Key considerations were given to the Philosophical orientation of the research, which influenced the choice of Deductive research approach, Survey research strategy and Quantitative research method. Purposive Sampling became the most appropriate choice of sampling technique since the study population was undefined. Descriptive analysis, mean score ranking, and Structural Equation Model were employed as analytical tools for the study.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 INTRODUCTION

The chapter throws more light on the survey and its scientific analyses and interpretations. The demographic data is analysed using descriptive statistics but the data on the main objectives is analysed using Mean Score Ranking (MSR) and Structural Equation Modelling (SEM). The Chapter also aims to show the various results from every section of the survey instrument. The results from the analysis were discussed thoroughly by the researcher. The Chapter was formed in four main sections namely;

1. Section A considered respondent's demographics.
2. Section B considered the significant safety climate factors on construction sites.
3. Section C dealt with unsaved behaviour observed on construction sites.
4. Section D dealt with the impact of safety climate on safety behaviour on construction sites.

4.2 RESPONSE RATE

According to Rea and Parker (1997) and Aday (1996), the quality of a survey data is of good importance because the greater the response rate, the better the accuracy of the result. A total of 250 questionnaires were administered and as a result of continuous follow up through telephone calls, emails and personal distribution of questionnaires, 210 were retrieved. Thus, a response rate of 87.5% was achieved from all the 12 construction sites employed for the study. This sample size was appropriate for the study since the least required number of responses for Structural Equation

Model (SEM) is 200 according to (Biemer and Lyberg, 2003; Atrostic et al., 2001; Rea and Parker, 1997; Aday, 1996).

4.3 ANALYSIS OF DEMOGRAPHIC DATA

This section of the demographics comprised of five individual questions which are gender, age, position, experience and profession of the respondents. Although this information does not form part of the main study, it is important to the research because it enhances confidence in the credibility of the data and eventually the findings of the study. This data was analysed using descriptive statistics. The analysis and results provided in table 4.1 from the descriptive statistics attest to the fact that the respondents are qualified enough and have the right requisite knowledge to provide credible responses due to their level of experience in the construction industry and the expertise in the field of this research. Again, the respondents were willing to provide and involve themselves in the provision of credible data for this research.

Table 4.1: Respondents Characteristics

Characteristics	Frequency	Percentage (%)
Gender		
Male	190	90.5
Female	20	9.5
Age (years)		
18-30	105	50.0
31-40	63	30.0
41-49	29	13.8
50 years and above	13	6.20
Role of respondents in their firms		
Construction manager	7	3.3
Construction supervisors	24	11.4
Operator	9	4.3
Safety officer	10	4.8
Carpenters	29	13.8
Electricians	20	9.5
Tiller	18	8.6
Steel fixers	12	5.7
Masons	33	15.7
Labourers	48	22.9
Working experience (years)		
1-4	20	9.5
5-10	108	51.4
11-15	52	24.8
16 and above	30	14.3
Educational background		
MPhil/MSc	20	9.5
BSc	42	20.0
High National Diploma	52	24.8
Technician (CTC1,2,3)/ SHS/JHS	96	45.7

Source: Field survey (2018)

Table 4.1 details the characteristics of the survey respondents with 90.5% males and 9.5% females. According to the field survey, 50% of the respondents have an age range of 18 to 30 years representing the youth in Ghana with 31 to 40 years making 30% of the respondents, accordingly, 13.8% of the respondents fall in the range of 41-49 years and lastly 6.2% of respondents having age range of above 50 years. The

professional background according to the table indicated that greater part of the respondents were Labourers, which represents 22.9% and Mason, representing 15.7% of the total number of respondents.

The information gathered also shows working experience of workers. Majority of the respondents representing 51.4% had 5-10 years working experience with their firms in the construction industry. It was necessary to find out the working experience of the respondents so as to obtain practical and convincing response. This informs the credibility of the data collected from these professionals. Lastly educational background which to some extent determines the roles of individuals in a firm was assessed. From the table, 9.5% are Postgraduate (MSc/MPhil) holders, 20% are First degree (BSc) holders, 24.8% are Higher National Diploma (HND) holders and 45.7% are Technician (CTC1,2,3)/SHS/JHS. The question was posed to find out the educational qualification of the respondents since the level of this qualification to a larger extent determines their roles in the firm.

4.4 SAFETY CLIMATE FACTORS IN THE CONSTRUCTION INDUSTRY

The Section B of the questionnaire was used to address Objective One which was ***to identify the significant safety climate factors in the Ghanaian construction industry.*** The various variables on the safety climate factors were identified from literature. These variables were then considered under the various themes (Management commitment and communication; Awareness and competence; Safety supervision; safety training; Safety promotion). Respondents were asked by the researcher to score on a Likert scale of 1-5 the rate at which the following safety climate factors occur in construction industry using the Likert scale, “Insignificant” ranked 1, “Less significant” ranked as 2, “Moderately significant” as 3, “Significant” as 4 and the

highest scale “Very significant” as 5. Any safety climate indicator that has its ranking having a mean of 3.0 or above is identified as a significant indicator whereas a mean score below 3.0 is marked as irrelevant. Mean Score ranking was used to examine the indicator variables ranking them according to the most significant. **Table 4.2** indicates the various variables with their respective mean score and ranking.

Table 4.2: Safety climate factors

Safety climate factors	Mean	Standard Deviation	Ranking	Overall Ranking
Management Commitment and Communication	**3.19**	**1.302**		
Management acts quickly to correct safety problems (MCC1)	3.60	1.090	2nd	**5th**
Management and supervisors listen and discuss safety issues (MCC2)	2.43	1.570	4th	**14th**
Management encourages feedback and safety participation from site workers on safety issues (MCC3)	2.40	1.461	5th	**13th**
Management offers enough safety information (MCC4)	3.06	1.278	3rd	**11th**
Management believes safety is of the same importance as production (MCC5)	4.44	1.111	1st	**1st**
Awareness and Competence	**2.52**	**1.274**		
Workers are clear about responsibilities for workplace safety (AC1)	2.04	1.332	4th	**18th**
Workers understand the safety rules in my job (AC2)	3.02	1.119	1st	**10th**
Workers deal with safety problems in my workplace (AC3)	2.26	1.346	3rd	**17th**
Workers comply with the safety rules all the time (AC4)	3.00	1.298	2nd	**12th**
Safety Supervision	**2.76**	**1.221**		
Production level should be frequently checked by supervisors (SS1)	2.31	1.468	4th	**15th**
No- smoking rules in the workplace should be strictly enforced by supervisors (SS2)	2.25	1.371	5th	**16th**
Supervisors should make show that workers wear PPE and workers attention should be drawn to the production level	3.27	1.071	2nd	**8th**
Supervisors frequently talk about safety (SS4)	2.66	1.083	3rd	
Supervisors remind employees to wear PPE (SS5)	3.29	1.114	1st	**7th**
Safety training	**3.86**	**1.255**		
Training in PPE usage (ST1)	3.67	1.254	2nd	**4th**
Regular and useful safety training (ST2)	4.05	1.256	1st	**2nd**
Safety Promotion	**3.45**	**1.126**		
Safety bulletin boards (SP1)	3.17	0.996	3rd	**9th**
Safety signs and posters (SP2)	3.72	1.352	1st	**3rd**
Recognition and reward for good safety performance by individuals (SP3)	3.46	1.031	2nd	**6th**

Source: Field survey, (2018)

From Table 4.2, the highest mean of each construct with their standard deviation are as follows: MCC5 had a highest mean as 4.44 and a standard deviation of 1.111 ranked 1st among its indicators and 1st among other indicators. AC2 had a highest mean as 3.02 and a standard deviation of 1.119 ranked 1st among its indicators and 10th among other indicators. SS5 had a highest mean as 3.29 and a standard deviation of 1.114 ranked 1st among its indicators and 7th among other indicators. ST2 had a highest mean as 4.05 and a standard deviation of 1.256 ranked 1st among its indicators and 2nd among other indicators. SP2 had a highest mean as 3.72 and a standard deviation of 1.352 ranked 1st among its indicators and 3rd among other indicators. It could be inferred from the table that not all the indicators were deemed fit for the PLS-SEM. This is due to the fact that these indicators are not practiced by the Ghanaian construction industry. Thus, indicators with mean value less than 3.0 were deemed insignificant and not included in further analysis.

4.5 UNSAFE BEHAVIOUR OCCURING ON CONSTRUCTION SITES

The Section B of the questionnaire was used to address Objective Two which was ***to identify the commonly occurring unsafe behaviours observed on construction projects in Ghana***. Mean Score ranking was used to examine the indicator variables ranking them according to the frequency of occurrence. The five-point Likert scale rating was used in establishing the occurrence of these indicators with a success criterion set at a mean value at 3.0 or above (MacMillan et al., 1985). The Likert scale was designed with a scale of 1 – 5, where 1=Not frequent; 2=Less frequent; 3= Moderately frequent; 4=frequent; 5=Very frequent, giving the respondents a choice to choose.

Table 4.3 Level of occurrence of unsafe behaviours.

Unsafe Behaviours (variables)	Mean	Std. Deviation	Rank
Disregarding the wear of PPE (Personal Protective Equipment)	4.40	1.317	1st
Not paying much attention to the instruction on manuals before using new machines	4.35	1.161	2nd
Placing materials and objects in dangerous positions and locations	4.21	1.051	3rd
using faulty tools and equipment to work	3.87	1.107	4th
Not switching of power source and not reporting to supervisors when machines becomes abnormal during work	3.59	1.096	5th
Leaving the work benches dirty after work	3.45	0.988	6th
Removing safety guards from the workplace or equipment	3.43	1.066	7th
Working with lack of concentration	3.30	0.960	8th
Failing to caution members or failing to rescue workers out of danger	3.06	1.098	9th
Working above the expected speed limit	3.03	1.030	10th
Doing work under the influence of drug or alcohol	2.24	0.924	11th
Smoking at workplace	2.08	0.901	12th

Source: Field survey (2018)

From the analysis, the respondents indicated that, 'Disregarding the wear of PPE' occurs most on construction sites. It was ranked 1st with a mean of 4.40 and standard deviation of 1.317. 'Not paying much attention to the instruction on manuals before using new machines' and 'Placing materials and objects in dangerous positions and locations' ranked 2nd and 3rd with means of 4.35 and 4.21; with standard deviation of 1.161 and 1.051 respectively. 'Using faulty tools and equipment to work' and 'Not switching of power source and not reporting to supervisors when machines becomes abnormal during work' ranked 4th and 5th with means of 3.87 and 3.59; with standard deviation of 1.107 and 1.096 respectively. 'Leaving the work benches dirty after work' and 'Removing safety guards from the workplace or equipment' ranked 6th and

7th with means of 3.45 and 3.43; with standard deviation of 0.988 and 1.066 respectively. 'Working with lack of concentration' and 'Failing to caution members or failing to rescue workers out of danger' ranked 8th and 9th with means of 3.30 and 3.06; with standard deviation of 0.960 and 1.098 respectively. 'Working above the expected speed limit, exceeding the prescribed speed limits' was ranked 10th with a mean of 3.03 and standard deviation of 1.030. 'Working under the effects of alcohol' and 'Smoking at workplace' ranked 11th and 12th with means of 2.24 and 2.08; with standard deviation of 0.924 and 0.901 respectively. These two unsafe behaviours had mean values less than 3.0 depicting that they are not observed by the Ghanaian construction industry

4.6 STRUCTURAL EQUATION MODEL

Generally the structural equation model is widely use in behavioral sciences. The model combines path analysis and factor analysis in giving meanings to data. The model have the ability of testing theories, it can identify errors and model latent variables which makes it more suitable for plethora of research. When using SEM, measurement error can be completely dealt with and absolutely considered in the theoretical models enhancing the validity of the models as compared to conventional method such as regression (Byrne, 2006). The study employed the use of Partial Least Squares (PLS) which was developed with the software smart PLS 2.0 (M3) to ***identify the impact of safety climate on safety behaviour in the construction industry***. This supports the assertion made by Hair et al. (2014), that structural equation modelling has become an analytical tool used in testing the relationships or impact among latent variables in a model.

4.6.1 Composite Reliability and Convergent Validity (Average Variance Extracted)

Henseler and Fassott (2010) argue that composite reliability and Cronbach's alpha are the traditional basis when measuring internal consistency reliability. Composite reliability assesses indicators with the aim that they have different loadings whilst Cronbach's alpha considers the equal reliability of all indicators. Nunnally and Bernstein (1994) posited that an internal consistency reliability value below 0.6 is adjudged weak in its contribution to the construct, whereas, a coefficient above the value 0.7 and 0.8 in the early and advanced stages of any studies is adjudged satisfactory respectively. In measurement of convergent validity, the average variance extracted (AVE) is considered, which is the sum of standardised loading square to the sum of standardised loading square plus measurement error (Fornell and Larcker, 1981). Latent variable with AVE of at least 0.5 is deemed satisfactory because half of their indicators have been has explained.

Table 4.4 Composite reliability and convergent validity

Constructs	Cronbach's Alpha	Composite Reliability	AVE
Management commitment and communication	0.943	0.949	0.898
Safety Training	0.744	0.750	0.795
Safety supervision	0.773	0.775	0.815
Awareness and Competence	0.976	0.980	0.977
Safety promotion	0.778	0.785	0.698
Safety behaviour	0.973	0.974	0.776

Source: Field Survey (2018)

From table 4.4, Management commitment and communication had a Cronbach's alpha of 0.943 and composite reliability of 0.949, Safety training had a Cronbach's alpha of 0.744 and composite reliability of 0.750, Safety supervision had a Cronbach's alpha of 0.773 and composite reliability of 0.775, Awareness and competence had a Cronbach's alpha of 0.976 and composite reliability of 0.980, Safety promotion had a Cronbach's alpha of 0.778 and composite reliability of 0.785 and Safety behaviour had a Cronbach's alpha of 0.973 and composite reliability of 0.974. The results confirm the recommendation made by Fornell and Larker (1981) and Nunnally (1978) that the acceptable level of Cronbach's alpha and composite reliability is a value that exceeds 0.7.

The convergent validity was also assessed with Management commitment and communication having an AVE of 0.898, Safety training having an AVE of 0.795, Safety supervision an AVE of 0.815, Awareness and competence having an AVE of 0.977, Safety promotion having an AVE of 0.698 and Safety behaviour having an AVE of 0.776. This also fully confirms the submission made by Bagozi and Yi (1988) as the various AVE exceeds 0.5 (Fornell and Larcker, 1981).

4.6.2 Indicator Reliability

The amount of the indicators variance that explains its corresponding latent variable is assessed by indicator reliability. The loadings of the reflective indicators can be monitored to assess the indicator reliability. Chin (2010) proposed that variance of each indicator must be at least explained by 50% of the latent variable. The higher the loading the better, therefore, researchers have accepted that an indicator factor loading should exceed 0.5 or 0.7 in other studies identified by (Chin, 2010; Hair et al., 2006).

Table 4.5: Indicator loadings of construct

Construct		MCC	ST	SS	AC	SP	SB
Management commitment and communication	MCC1	0.947					
	MCC4	0.976					
	MCC5	0.919					
Safety Training	ST1		0.905				
	ST2		0.879				
Safety Supervision	SS3			0.896			
	SS5			0.909			
Awareness and competence	AC2				0.988		
	AC4				0.989		
Safety Promotion	SP1					0.727	
	SP2					0.908	
	SP3					0.862	
Safety Behaviour	SB1						0.912
	SB2						0.815
	SB3						0.851
	SB4						0.843
	SB5						0.930
	SB6						0.927
	SB7						0.874
	SB8						0.924
	SB9						0.886
	SB10						0.931
	SB11						0.840
	SB12						0.825

Source: Field survey, (2018)

4.6.3 Discriminant Validity

According to Hair et al. (2016) the extent to which a construct diverge from one another based on empirical standard is considered as discriminant validity. The discriminant validity is assessed by the criteria set by Fornell-Larcker. PLS-SEM uses two measures to determine discriminant validity. The first one measures the

correlation of latent variable scores against the indicators. The construct indicators are not replaceable if the loadings of the indicators are higher for the selected construct than the scores of the components of the other constructs (Chin, 2010). The second measure requires the latent variable to share its variance with the indicators that are assigned to it than with any other latent variable which uses the Fornell-Larcker criterion (1981). To establish discriminant validity further "the diagonal elements must be greater than the off-diagonal elements for the same row and column, not the AVE value itself" (Lowry and Gaskin2014).

Table 4.6: Fornell-lacker criterion

Construct		**AC**	**MCC**	**SB**	**SP**	**SS**	**ST**
Awareness and competence	AC	0.980					
Management commitment and communication	MCC	0.780	0.948				
Safety behaviour	SB	0.785	0.756	0.881			
Safety promotion	SP	0.901	0.622	0.880	0.836		
Safety supervision	SS	0.853	0.587	0.909	0.873	0.903	
Safety training	ST	0.614	0.758	0.849	0.689	0.779	0.892

Source: Field survey, (2018)

From Table 4.6, it can be realised that all the loadings on the indicators have loaded highly on their respective constructs. Having the elements at the diagonal sections, all loading greater than the corresponding column or row specifies satisfactory discriminant validity confirms the assertion made by Lowry and Gaskin, (2014).

4.6.4 Coefficient of determination (R^2 value)

The R^2 value is the most predominantly used criteria in analysing structural model. It assesses the accuracy of the predictions derived (Hair et al., 2016). The R^2 also represents the combined effect of the exogeneous latent variables on the endogeneous

latent variables. Its variables ranges from 0-1 with 0.25 deemed weak, 0.50 deemed moderate and 0.75 deemed substantial (Hair et al., 2016).

Table 4.7: R Square

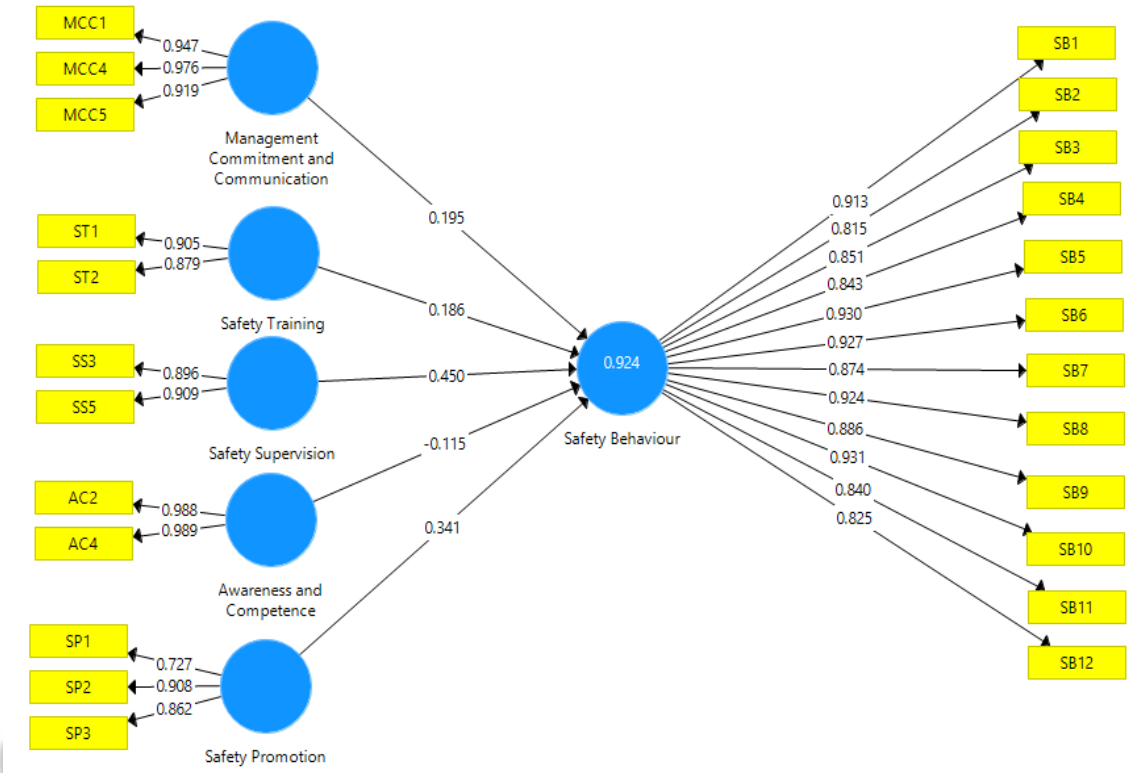
	R square	**R square adjusted**
Safety behaviour	0.924	0.917

From Table 4.7, the R^2 value of the endogeneous latent variable (Safety behaviour) is 0.924 which exceeds the set threshold 0.75.

4.6.5 Size and Significance of Path Coefficient

Causal relationship is represented by SEM statistical model as 'Paths'. Path is explain as a hypothesised link between casual component variables and the consequent construct of a theoretical position. Any of the path can be used to test theoretical position. For instance if a theory have the tendency of ease of use or the intension to be used, then SEM can be used to measure the relationship that exist between the ease of use and the in intension to use (Davis, 1993). Usually paths are represented by arrows as shown in the diagram. The arrows points to the direction of causation and the model can have a path for every theoretical position which allows a complete testing of all theoretical relationships. (Gefen et al., 2000). SEM maps paths to many dependent (theoretical or observed) variables in the same research model and analyse all the paths simultaneously rather than one at a time. Path coefficient values are standardized on a range from + 1 to - 1, with coefficients closer to - 1 constituting strong positive relationships and coefficients closer to + 1 constituting strong negative relationships. Although values close to - 1 or = 1 are almost always statistically significant.

Figure 4.1: Path algorithm of construct



Source: Field survey, (2018)

The figure 4.1 shows the path coefficient of the various exogenous variables to the endogenous variable. According to the analysis, four of the constructs showed positive measures with the endogenous variable leaving one exogenous variable as a negative measure. Management commitment and communication, Safety training, Safety supervision, and Safety promotion achieved a positive coefficient with safety behaviour, therefore supporting the hypotheses set from the beginning of the study with Awareness and competence having a negative relationship with safety behaviour therefore rejecting the earlier set hypothesis of the study.

4.6.6 Bootstrapping

Bootstrapping is used to calculate t-value of PLS which have independent samples and normal distributed data. It is a way of computing and generating t-values over a

normal distribution data. One key thing about bootstrapping is that it assumes independent residuals (the residuals are the divergence of the actual values from the estimated values). Lohmoler (1989) postulated that the residuals can be swapped without undermining the estimate. According to Hair et al. (2011) the bootstrapping analysis allows for the statistical testing of the hypothesis that a coefficient equals zero (null hypothesis) as opposed to the alternative hypothesis that the coefficient does not equal zero (two-tailed test). A bootstrap sample of 5000 was used for the analysis.

Table 4.8: T statistics and P values

Relation	Original sample	Sample mean	Standard deviation	T statistics	P values
Management commitment and communication > Safety behaviour	0.195	0191	0.099	1.974	0.049
Safety training > Safety behaviour	0.186	0.170	0.148	1.964	0.021
Safety supervision > Safety behaviour	0.450	0.484	0.178	2.534	0.012
Awareness and competence > behaviour	-0.115	-0.128	0.113	1.024	0.306
Safety promotion > Safety behaviour	0.341	0.331	0.141	2.426	0.016

Source: Field Survey (2018)

Table 4.8 demonstrates the relationship of the path model which is linked with the t-values. A two tail distribution was used with which their alpha values was based and connecting the hypothesis of no difference for the study. The statistical significance was tested interpreting the results based on the value of alpha: $p < .05^* = 1.96$ and df = 98.

In the interpretation of the results, attention was given to the computed t-score whether it exceeded the priori alpha value. With this, only four constructs made the cut (significant relationship) and these are Management commitment and communication > Safety behaviour, Safety training > Safety behaviour, Safety supervision > Safety behaviour and Safety promotion > Safety behaviour, whiles Awareness and competence was deemed not significant, thus, not supporting the hypothesis.

4.6.7 Blindfolding (Predictive Relevance, Q^2)

In measuring any structural model, it is vital that we know the models ability to predict. According to (Stone, 1974), the Stone-Geisser's Q^2 statistic is used for checking the predictive importance of the structural model, PLS uses blindfolding procedures to achieve this measurement (Tenenhaus et al., 2005).

Table 4.9 Predictive Relevance of Structural Model

CONSTRUCT	SSO	SSE	Q^2 (=1-SSE/SSO)
Management commitment and communication	26.892	26.892	
Safety training	18.315	18.315	
Safety supervision	15.990	15.990	
Awareness and competence	18.333	18.333	
Safety Promotion	22.529	22.529	
Safety behaviour	98.604	31.595	**(0.680)**

Source: Field Survey (2018)

Hair et al. (2014) argue that the larger the value of Q2 from zero of the endogenous constructs, the higher the predictive relevance of the particular path model. The Q2 value produced by this model is 0.680, which is quite larger from zero predicting a high predictive capability of the path model.

4.7 DISCUSSION OF STRUCTURAL MODELS

4.7.1 Safety climate factors

It could be inferred from Table 4.2 that not all the indicators were deemed fit for the PLS-SEM and also showed that some of these safety climate indicators were not practiced in the Ghanaian construction industry. These safety climate factors are discussed below;

4.7.1.1 Management commitment and communication (MCC): this demonstrates the extent to which managements assist workers to comply with safety on site. It also assesses how people perceive the whole idea of safety on site. When top management is committed to safety, they act quickly to correct safety problems; they set goals and policies on safety on site as well as giving positive feedback on safety issues raised by workers and provide the needed support that will ensure proper compliance to safety practices on site. The research revealed that the MCC indicators that are mostly used include; managements give a prompt response to safety issues on site, managements encourages workers to report safety issues and gives the needed feedback, managements understand that safety on site is as important as production itself. The results of the path analysis supported the hypothesized model. It could be seen from figure 4.1that; the data collected fit the model with a significant coefficient path. The result agree to what other scholars have revealed on MCC indicating that MCC is a major factor to be considered in ensuring safety climate on site which will improve the overall performance of workers. (Christian et al., 2009).

4.7.1.2 Safety supervision (SS): This is noted to be the integral part in ensuring safety at the work place together with positive safety behaviour like using personal protective Equipment (PPE) on site. A research was conducted by Zohar and Luria (2003) and in their research an intervention was made by educating supervisors to partake in safety communication with employees and colleagues'. The result of the intervention reviewed that minor accidents were reduced and the use of PPE was increased. Similarly, a research conducted by Zohar (2002) on the maintenance of heavy duty machines indicated that the education of supervisors to partake in safety communication with employees and colleagues' reduced micro accidents and the use of PPE was increased. It has been revealed that supervisors' communication with workers yields a positive result in ensuring safety compliance at the work place (Sampson et al., 2014). Graen and Uhl-Bien, (1995) on the other hand revealed in their Leader-Member-Exchange (LMX) theory that supervisors can motivate workers in complying with safety on site by monitoring them to make sure that they wear PPE on site. The SS of this study had five (5) indicators out of which supervisors remind workers to wear PPE and supervisors frequently check PPE and draw employees attention to safety guides or warnings labels were found to be the most significant indicators. The findings revealed that SS supported the hypothesized model.

4.7.1.3 Safety training (ST): Safety training is an important risk prevention and control strategies to guarantee every employee is safe in a good workplace conditions (Cohen et al., 1998). Safety training is one of the effective methods to improve worker unsafe behaviour on construction sites. Tackett et al. (2006) argues that informal training which is training received outside the classroom and usually not documented include; training on the job, supervision by leader-worker and monitoring other colleagues have been identified as some of the most significant training that

help improve workers safety on site. This is due to the fact that the leader of the informal training is mostly a colleague with experience in best safety practices; this therefore encourages other colleagues to improve their safety practices by learning from him. The results from the analysis showed that there is a significant relationship between safety training and safety behaviour based on the following indicators; training in PPE usage and regular and useful safety training as the supported the hypothesis.

4.7.1.4 Safety Promotion (SP): Safety promotion of a company includes; listing all the safety precautions on bill boards and positioning them at vantage points. The language should be simple for workers to read and understand (Choudhry et al., 2008). Collated statistics on accident should be displayed to motivate workers to abide by safety rules and regulations. According to Choudhry et al. (2008), some best ways of improving workers safety is by organising annual competitions to award the best safe site, best safe worker or best safe foreman and by acknowledging and publishing workers view on safety practices. The findings of the study revealed that all the indicators of SP which are safety bulletin boards, safety signs and posters, and recognition and reward for good safety performance by individuals were found to be the most significant indicators which supported the hypothesized model.

4.7.1.5 Awareness and competence (AC): This has to do with employees understanding of environmental issues and the relevance of those issues to the company's activities. Wolfgang et al. (2009) define workplace awareness as knowledge about the workplace design and job characteristics of co-workers Competence on the other hand refers to the fulfilling of duties in a manner which is consistent with the aims of the environmental policy and management system. It was

noted from the findings that, awareness and competence was not a significant indicator and there did not support the hypothesis. This is due to the fact that workers are not able to deal with safety problems, do not have proper understanding of the safety rules and also do not comply with the safety rules all the time.

4.8 CHAPTER SUMMARY

This chapter of the study concentrated on the impact of safety climate on safety behaviour in the construction industry. It begins with an introduction followed by analysis and discussion of demographics of respondents. Mean score ranking was also conducted on the data leading to the use of PLS-SEM for the modeling of the causal relationship between safety climate factors and safety behaviour. The chapter ends with a discussion of the analysis from the mean score ranking and PLS-SEM.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

The chapter summaries the entire research works. It starts with the summary of how the research objectives were achieved and how the research will add to knowledge. Lastly, the chapter makes conclusion for the entire research with some recommendations and also state areas for further research.

5.2 ACHIEVING THE RESEARCH OBJECTIVES

The purpose to which the research was carried out was to investigate the impact safety climate has on safety behaviour on construction projects. In an attempt to accomplish the stated aim, three research objectives were established. How the research objectives were achieved has been discussed below;

5.2.1 Objective 1: To identify significant safety climate factors in the Ghanaian construction industry

Based on review of literature, five (5) safety climate factors were identified to be practiced on construction sites. These five safety climate factors are; Management commitment and communication, Safety training, Awareness and competence, Safety supervision and Safety promotion. However, every safety climate factor had indicators which formed a construct. The main aim behind this objective was to identify the most significant safety climate factors in the construction industry. The result revealed that managements give a prompt response to safety issues on site, managements encourages workers to report safety issues and gives the needed feedback, managements understand that safety on site is as important as production itself, supervisors frequently check PPE and make workers aware of the need to pay

attention safety guides and warning labels, supervisors caution workers to wear PPE, educating employees on how to use PPE, regular and useful safety training, safety bulletin boards, safety signs and posters and recognition and reward for good safety performance by individuals are the most significant indicators of safety climate factors.

5.2.2 Objective 2: To identify the commonly occurring unsafe behaviours observed on construction projects in Ghana.

Several unsafe behaviours observed on construction sites were noted from review of literature. In all, twelve (12) unsafe behaviours were adapted from literature. Means Score Ranking was used to determine their frequency of occurrence on a Likert scale (1- Not frequent, 2-Less frequent, 3-Moderately frequent, 4-frequently, 5- Very frequent). From the results, ignoring to wear PPE was ranked first with smoking at work place ranked last. Also, the findings revealed that ten (10) of the variables were within the set mean which is 3.0 and above whilst two (2) of the variables were below the mean. These two variables were smoking at workplace and working under the effects of alcohol and other drugs.

5.2.3 Objective 3: To determine the impact safety climate factors has on unsafe behaviour on construction projects in Ghana

The conceptual framework and the literature review were used as the basis in developing a hypothesis for the study. Moreover the relationship between safety behaviour and climate also informed the development of the hypothesis. Questionnaire was developed to help in modelling the impact climate factors have on safety behaviour in the construction industry using PLS-SEM for the analysis.

The findings revealed that; management communication and commitment, safety supervision, safety training and safety promotion positively influence safety behaviour. This is because, their path coefficient showed positive measures with the endogenous variable (safety behaviour). On the other hand, awareness and competence did not support the set hypothesis because of its negative relationship.

5.3 LIMITATIONS TO THE STUDY

Limitations to the research study identified were;

1. Data was solely collected from one region of Ghana. Thus, the need to make a replica of the study in the other nine regions of Ghana to either affirm or conflict the findings obtained from the study.
2. During the administering of the questionnaire, challenges such as respondent's failure to response to questions led to the difficulty in acquiring all 250 questionnaires administered which led to the collection of 210 responses.
3. Quantitative research method was the only method employed for this study making it constrictive. More qualitative methods should be employed on the areas of study in order to provide a wider perspective to the present study

5.4 CONTRIBUTION TO KNOWLEDGE

In the context of the Ghanaian Construction Industry, there has been no or little study in this subject area. This study goes ahead to develop an equation model in an attempt to bridge that gap. The model developed proves the impact of safety climate factors on safety behaviour in construction industry. This research study thus adds significant contribution to the already existing body of knowledge in the field of impact of safety climate with exceptional cognizance given to the impact of safety climate factors on safety behaviour.

5.5 RECOMMENDATIONS

The following are recommendations proposed by the researcher:

1. The results from this study should be adopted by researchers and safety practitioners as they provide valuable guidance for identifying safety climate factors by which they can impact safety behaviour of workers.
2. Management must provide Continuing Safety Program Development for its workers to improve worker safety behaviour.
3. To achieve optimum safety behaviour at the work place, managements must put in place measures that will improve and maintain the safety climate if not daily at least on quarterly basis. Measures that can be adopted by managements include; improving the overall safety climate of the organisation, ensuring that effective safety management systems are put in place and managements are to participate in safety by giving a prompt response to workers complains on safety issues.

5.6 FUTURE RESEARCH

This research study concludes in this section by suggesting areas where some future works will be required.

1. Future research can be done to include other geographical areas in Ghana, to be able to come out with a more solid conclusion since this study was limited to only one region in Ghana.
2. Future works need to consider the effects these safety climate factors have on construction project performance.

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APPENDIX

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,

KUMASI

DEPARTMENT OF BUILDING TECHNOLOGY

QUESTIONNAIRE

Masters of Philosophy in Construction Management

Thesis Topic: INFLUENCE OF SAFETY CLIMATE ON SAFETY BEHAVIOUR IN THE CONSTRUCTION INDUSTRY

Preface

This research is designed to access the influence of safety climate on safety behaviour. It is also going to identify the relationships that exist between safety climate factors and safety behaviour in the construction industry.

Kindly respond to the questions by ticking (√) the appropriate space for each item. Please note that all information given will be strictly treated as confidential as this work is for academic purposes. In case of any clarification concerning the questionnaire, kindly contact

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SECTION A: GENERAL INFORMATION

1. Gender [ ] Male [ ] Female
2. What is your age

   [ ] 18-30 years

   [ ] 31-40 years

   [ ] 41-49 years

   [ ] 50 years and above
3. Job title or position

   [ ] Construction manager [ ] Electrician

   [ ] Construction supervisor [ ] Tiller

   [ ] Operator (bulldozer, excavator, etc.) [ ] Mason

   [ ] Safety Officer [ ] Steel fixer

   [ ] Labourers

   Others……..
4. Years of experience in the construction industry?

   [ ] 1-4years

   [ ] 5-10years

   [ ] 11-15years

   [ ] 16 and above

5. Highest Level of education

   [ ] MPHIL/MSc

   [ ] Bsc

   [ ] High national diploma

   [ ] Technician (CTC 1,2 3)/ SHS/JHS

SECTION B: SAFETY CLIMATE FACTORS

6. The following are important safety climate factors on construction sites? Kindly rank their significance in the construction industry using the following Likert scale: **1=Insignificant;**

   2=Less significant; 3=Moderately significant; 4= Significant; 5=Very Significant. Please tick (√) in the space provided.

	1	2	3	4	5
I. Management Commitment and Communication					
1. Management acts quickly to correct safety problems					
2. Management and supervisors listen and discuss safety issues					
3. Management encourages feedback from site workers on safety issues					
4. Management offers enough safety information					
5.Management believes safety is of the same importance as production					
II. Awareness and Competence					
1. Workers are clear about responsibilities for workplace safety					
2. Workers understand the safety rules in my job					
3. Workers deal with safety problems in my workplace					
4. Workers comply with the safety rules all the time					
III. Safety Supervision					
1. Supervisors frequently check the production situation					
2. Supervisors warn employees of no-smoking rules in the workplace					
3. Supervisors frequently check the PPE and draw Supervisors draw employees attention to production safety guides or warning labels					
4. Supervisors frequently talk about safety					

	1	2	3	4	5
III. Safety Supervision Cont'd					
5. Supervisors remind employees to wear PPE					
IV. Safety training					
1. Training in PPE usage					
2. Regular and useful safety training					
V. Safety Promotion					
1. Safety bulletin boards					
2. Safety signs and posters					
3 Recognition and reward for good safety performance by individuals					

SECTION B: UNSAFE BEHAVIOUR

6. The following are unsafe behaviours observed on construction sites. Kindly rank them using the following Likert scale: **1=Not frequent; 2=Less frequent; 3=Moderately frequent; 4= Frequently; 5=Very frequently**. Please tick (√) in the space provided.

Unsafe Behaviour	**1**	**2**	**3**	**4**	**5**
1. Not Turning off the power and inform the supervisory when a machine is working abnormally					
2. Working under the effects of alcohol and other drugs					
3. Smoking at workplace					
4. Improper placing and stacking of objects and materials in dangerous locations					
5. Removing safety guards from the workplace or equipment					
6. Not Reading instruction manual carefully before the use a new machine					
7. Ignoring to wear personal protective equipment (PPE)					
8. Using defective equipment and tools to work					
9. Not cleaning work bench before going off-duty					
10. Working at improper speed, exceeding the prescribed speed limits					
11. Working with lack of concentration					
12. Failure to warn or to secure members out of danger					

SECTION C: IMPACT OF SAFETY CLIMATE ON SAFETY BEHAVIOUR

8. Please indicate the extent to which these safety behaviours are being influenced by each of the five (5) safety climate factors (A, B, C, D, and E) on the construction site, using the Likert scale from 1-5 where, 1=Very low 2=Low 3=Medium 4=High and 5=Very high

A. Management Commitment and Communication
B. Awareness and Competence
C. Safety Supervision
D. Safety training
E. Safety Promotion

Examples:

i. How is wearing of protective equipment influenced by management commitment and communication (A)? Writing (5) in the box of "A" indicates that it affects is very high.

ii. How is wearing of protective equipment influenced by awareness and competence (B)? Writing (2) in the box of "B" indicates that it affects it low, etc.

	A	B	C	D	E
1. Wearing of protective equipment					
2. Following safety instructions					
3. Hazard recognition and avoidance					
4. Work carried out in a safe manner					
5. Effort to improve the safety of the workplace					
6. Attending regular safety meetings					
7. Taking action against people who break safety instructions					
8. Using good/correct equipment and tools to work					
9. Working with full concentration					
10. Awareness towards safety issues					
11. Knowledge in safety					
12. Avoidance of smoking in the workplace					