Development of Evidence Based Factors to Enhance Safety Behaviour in Oil and Gas Industry in the Niger Delta Region of Nigeria

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Development of Evidence Based Factors to Enhance Safety Behaviour in Oil and Gas Industry in the Niger Delta Region of Nigeria

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List of Abbreviations

OSHA	Occupational Safety and Health Administration
HSE	Health Safety and Environment
PPE	Personal Protective Equipment
ILO	International Labour Organisation
INSAG	International Nuclear Advisory Group
USA	United states of America
UK	United Kingdom
BARS	Behaviourally Anchored Rating Scales
SMS	Safety Management System
MBE-A	Active management by exception
MBE-P	Passive management by exception
AERs	After Event Reviews
SEMS	Safety and Environmental Management System
BOS	Bristol Online Survey
PTDF	Petroleum Technology Development Fund
NPDC	Nigerian Petroleum Development Commission
NNPC	Nigerian National Petroleum Commission
SEM	Structural Equation Modelling
MIM	Model Implied Moment

ML	Maximum Likelihood
CR	Critical Ratio
SE	Standard Error
RMSEA	Root Mean Square Error of Approximation
AGFI	Adjusted Goodness of Fit Index
GFI	Goodness of Fit Index
NFI	Normed Fit Index
TLI	Tuckler Lewis Index
CFI	Comparative Fit Index
PNFI	Parsimonious Normed Fit Index
PGFI	Parsimonious Goodness of Fit Index
LM	Lagrange Multiplier
CFA	Confirmatory Factor Analysis

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Declaration

I declare that the work contained in thesis is my own original work. Sources where knowledge, concepts or ideas were adopted from have been properly cited and referenced.

Abstract

The Nigeria's economy has benefited enormously from its oil and gas sector. However, despite the economic impact accrued to the nation from the sector, there are still safety and health concerns among its employees. Unsafe behaviour mainly influenced by poor safety culture escalates the risk of injuries and accidents at workplaces and requires proper management. This study aimed to evaluate safety behaviour and its impact on safety performance among Nigeria oil and gas workers. To achieve this aim, both quantitative and qualitative research methods were adopted. Validated questionnaires used in studies 1 and 2 were distributed via JISC Survey (Bristol online survey) platform and self-administration. For the first study, 462 frontline employees participated in the survey. Structural equation modelling was perform using the data set and, the out from the analysis found safety management practices had a significant relationship with both safety participation (p <0.000) and safety compliance (p <0.000). In addition, work experience was found to have a significant relationship to safety participation (p <0.003) but not with safety compliance (p >0.109).

Quantitative survey was undertaken to achieve the second study objectives. At the end of the survey, 1004 frontline workers drawn from 14 oil and gas companies took part in the survey. Data were analysed by performing structural equation modelling and findings revealed that management commitment, safety communication, safety motivation, and employee involvement were found to have a significant relationship (p = <0.005) to both safety compliance and safety participation, except for only safety training and safety participation where no relationship was established.

A qualitative face to face interview was conducted among twelve different employees (both management and frontline employees) drawn from the industries. Thematic analysis of the qualitative data based on the interview reveal gaps around the different elements of safety culture in the industry and how it impacts safety performance of employees.

Based on the paucity of data within the study area, the work has advanced up to date data around the impact of safety culture on workers behaviour in oil and gas industry in Nigeria. In addition, the study is considered timely and relevant. Based on internet research, it has covered the

research gap within the region and advanced tangible recommendation around the establishment of safety leading indicators for employee's safety performance in Nigeria oil and gas industry.

The study concludes that timely strengthening of workplace safety culture and visible management approach to safety is important for occupational safety improvement in the industry. In addition to this, there is the need for policy realignment to aid in the promotion of safety culture and adherence to safety standards within the industry as practiced in other countries.

1.0 CHAPTER ONE: INTRODUCTION

1.1 Fatalities of Nigeria Oil and Gas Workers

Nigeria's oil and gas industry falls within the industries in developing countries with one of the highest estimated accident rates (Hamalainen et al., 2009). The nature of the work and the conditions in the oil and gas industries result in many accidents, sometimes accompanied by injuries and deaths (Uwaoma and Ordu, 2016). Annual report from the Department of Petroleum Resources (DPR) shows that the death toll of workers in the Nigerian oil and gas industry from 2010 to 2015 was 217 from the 298 incidents available on public domain. Despite the industry's enormous contribution to the growth and development of Nigeria through revenue generation, employment, local expenditure on goods and services, foreign exchange reserves, including contribution to domestic products as well as energy supply to commerce and industry (Uwaoma and Ordu, 2016), there are grounds to believe safety consideration within the industry is not enforced fully just as findings reveal of the 217 incidents on records between 2010 to 2015 show 148 were work-related. Further results from this data also reveal that the fatality rate in the industry increased by 244% from 2010 to 2015 (Adugbo, 2017).

Previous study by Ezenwa (2001) investigated fatal injuries across Nigerian factories between the period 1987-1996, and findings of the study showed that the highest case fatality rate per worker (16.6%) occurred in the petroleum industry. In addition, Hamalainen et al., (2009) reckoned that Nigeria's yearly work-related death rate was around 24 fatalities per 100,000 workers, which ranks as one of the highest globally. Despite these findings, the study and previous reports have been disputed as grossly underreported and viewed as inaccurate across the industry (Okoye and Okolie, 2017).

Despite the number of oil and gas companies operating within the nations upstream and downstream sectors, the in-house data and information regarding occupational fatalities and injuries from operations are limited and, most at times, non-existent, making the report in public domain scarce (Hamalainen et al., 2009; Okoye, 2016).

It was obvious from literature, factors responsible for health and safety data in Nigeria has been mainly attributed to insufficient enforcement of policy, limited safety officers or occupational health services expert, political influence, lenient penalty for violation of health and safety laws, and lack of effectiveness and accountability in the enforcement of OSH rules and regulations (Okojie, 2010; Umeokafor et al., 2014).

1.2 The Oil and Gas Environment and Workers Health and Safety

The working environment in the oil and gas industry is characterised by complex operations and activities, structural design and equipment, alongside numerous chemicals; hence, there are increased opportunities for human and organisational errors (Taiwo, 2010; Kassotis et al., 2016). The fundamental tasks carried out across different industry sectors (downstream, midstream, and upstream) are mainly exploration, drilling, construction, production, processing, distribution, and offloading, all of which differ in the types of equipment and technology employed. As such, there is an increased risk of accidental fire and explosions, fatigue, chemical spillage, trips, falls, burns, and including several health effects, of which most of them tend to be latent even to the stage of post-retirement from active service (Ezejiofor et al., 2014; Zhu et al., 2015; Li et al., 2016). Interruptions in oil production because of accidents, spills, and fires may also result in substantial economic and property losses for the industry and the whole nation (Uwaoma and Ordu, 2016). Ojo (2020) stated in the year 2016, the Nigerian government launched a one-billion-dollar clean-up project of an area contaminated with oil spillage in the Niger Delta region of Nigeria. Demonstrating the safety and environmental impact caused by the industry within the nation.

1.3 Health and Safety of Oil and Gas Workers in Developed Countries

In developed countries such as the United States of America (USA) and the United Kingdom (UK), accidents still occur in the oil and gas industry (Liu et al., 2020). In the USA, over 300 oil and gas workers have lost their lives. As a result, injuries in the oil and gas drilling industries and related fields, as shown in data from 2008 to 2017, were reported by the US Department of Labour's

Bureau of Labour Statistics (Mason et al., 2015). The UK oil and gas annual 2019 report revealed that, between the year 2000 and 2018, there were 26 fatalities in the UK oil sector, and 47 major injuries were recorded from 2011 to 2013 (Alkhaldi et al., 2017). Work-related injuries and accidents alone cost the global economy 4% of its total GDP, because of this, the International Labour Organisation (ILO) in 2015 released a report on "employees' health and safety" on the need for the industries to invest more efforts in improving the health and safety of employees at work (Alkhaldi et al., 2017). According to the ILO report, more than 2.3 million occupational accidents happened yearly across the globe, as well as an estimated loss of life of more than 6000 employees was recorded daily (Liu et al., 2020). The rate of work-related accidents and injuries differs across countries depending on the country's industrialisation level. Precisely, the losses recorded regarding work-related accidents tend to be more in developing countries than developed countries (Takala et al., 2014; Liu et al., 2020).

Over the past decades, extensive improvements in occupational safety in several countries have been achieved by improving employees' safety behaviour across all levels of the organisation. As part of the safety drive, it was evidenced that human behaviour is a major contributor to occupational accidents (Zubar et al., 2014; Kvalheim and Dahl, 2016; Zhang et al., 2020), management efforts at promoting positive safety behaviour can go a long way in reducing the number of fatalities witnessed in the sector especially in Nigeria.

1.4 Workplace Safety behaviour among workers

The present study builds on the work of Heinrich (1941), an early pioneer studies in the field of behavioural safety established that, 85% of workplace incidents and accidents are attributed to the unsafe workers behaviour. As part of Heinrich's contribution, encouraging safe behaviour at the workplace should be viewed positively as an important part of health and safety management since behaviour turns procedure and system into a reality. Safety behaviour is defined as the absence of an undesirable event that involves an unplanned and unacceptable loss (Dartey-Baah and Addo, 2018). In addition to Heinrich's work, report by HSE (2002) further showed that between 80% to 90% of all incidents and accidents that occur at the workplace are attributed to

the unsafe behaviours of workers. For instance, where employees fail to hold on to handrails when ascending or descending stairs or improper storage of equipment after completing a task are all unsafe behaviours, and depending on the condition, such action can lead to an accident. Furthermore, the outcome from Fernandez-Muniz et al. (2014) study based on a causal test model that assessed one hundred and eighty-eight different industrial sectors revealed employees' behaviour as a highly important factor in the improvement of occupational safety outcomes.

Both (Heinrich, 1941; Fang et al., 2015) investigated the causes of accidents within diverse' organisations and their findings revealed overwhelming cases of accidents are a function of the unsafe act and linked to workers' behaviour; for example, failure in using protective devices or in situations where safety devices are not available when workers are carrying out their jobs. Safety behaviour interventions have been carried out by several studies, focusing on the oil and gas industry in several countries and their findings revealed that the most effective way to improve workers safety behaviour and safety performance is through the strengthening of workplace safety culture (Boughaba et al., 2014; Nordlof et al., 2015). A positive culture within an organisation improves employees' behaviour, which can help in preventing injuries at the workplace, including major disasters (Frazier et al., 2013).

Although there is no universal definition of safety culture, Frazier et al. (2013) define safety culture as the value, attitude, beliefs, risk-perception, and behaviours as they relate to employees' safety. In addition, Nævestad (2017) opined that a positive culture incorporates the purposeful relationship that exists between management and the employees, which helps in improving safety behaviour across the workforce. It has been revealed that one of the ways to approach safety culture change could be by looking at the related concept of safety climate, which is referred to as the manifestation of the shared perceptions of organisational safety policies, practices, and procedures, both formal and informal (Zohar, 2010; Nielsen, 2014; Wallace, 2016). Other triggers for workers' unsafe behaviour are ascribed to the workplace as psychosocial risk factors that influence workers' behaviour, safety, and health response. These might include failures of several management systems associated with each incident, such as

workplace stress, workload, job demand, and job resources (Rowden et al., 2011; Tang et al., 2018).

1.5 Importance of behavioural safety

Evidence from safety literature discussed in section 1.4 above is validated because the improvement of safety behaviour has always been instrumental and vital in increasing the overall safety performance and reducing accidents in several industries (Okoye and Okolie, 2017). Behavioural safety is not only important in ensuring the wellbeing of employees, but it also has a positive impact on productivity, decreases health and safety cost, reduces the chance of prosecution or public reputational damage, reduces absenteeism of workers, and reduces the likelihood of reduced profitability of the organisation (Okolie and Okoye, 2012; Okoye, 2016). The advantage of Behavioural Based Safety was argued by Frazier et al. (2013) to outweighs its costs. For instance, organisations in the US lose approximately $170 billion yearly due to injuries at the workplace, and the associated cost reduces with time as organisations continue to view safety as an investment rather than an expense (Saad, 2016). This suggests that there should be no reason why Nigeria's oil and gas industry should not adopt this strategy to help reduce workplace accidents and injury. Nevertheless, there has been a continuous degeneration of safety performance in the oil and gas industry, particularly in developing countries such as Nigeria (Uwaoma and Ordu, 2016).

In line with this scenario, the proposed study hypothesised that lack of promotion of positive safety culture among oil and gas workers in Nigeria might negatively impact employee's safety behaviour. While several studies carried out on the impacts of oil exploration and exploitation on the environment in Nigeria, to the researcher's knowledge, no study has looked at safety culture and behaviour within the oil and gas sector in Nigeria despite a significant increase in injuries and fatalities recorded (Ehiaguina and Moda, 2020).

1.6 Aim and Objectives

The overall aim of this study is to evaluate employees' existing safety behaviour and safety performance and advanced framework to enhance safety behaviour and performance among Nigeria oil and gas employees in the Niger Delta region.

The following objectives have been advanced to fulfil the study aim,

I. To investigate the existing safety culture and behavioural safety practices within Nigeria's upstream, midstream, and downstream oil and gas industry.
II. To explore factors that influence employee's safety behaviour in organisations within the oil and gas sector in Nigeria.
III. To examine the causal relationship between the identified factors and workplace safety performance among employees in the Nigeria oil and gas sector.
IV. To translate research findings into applied recommendations for policy improvement in enhancing safety behaviour and performance within the Nigerian oil and gas industry.

1.7 Justification for the Research

With its human resource and workforce, the Nigeria oil and gas industry can benchmark and secure international safety standards and policies, making business operations and activities in the industry safe. However, the scarcity of publicly available data shows no clear mechanism in collecting and storing data related to accidents and injuries of workers (Seleye-Fubara and Bob-Yellowe, 2006; Ehiaguina and Moda, 2020). The need to establish a clear cause-effect regarding accidents in the workplace environment and promote a safe culture tends to be a fundamental issue for the industry (Kadafa, 2012).

According to Idubor and Oisamoje (2013), safety issues in the Nigeria oil and gas industry are attributed to the chronic underutilisation of safety policies. They strive to implement and adhere

to health safety policy standards that form the safety culture. This implies that, despite the awareness of the Occupational Safety and Health Administration (OSHA) by individual oil and gas companies in the nation, as well as their health and safety rules and policies, these rules, standards, and policies may still not be adequately implemented (Okoye, 2016). In furtherance, Edwards et al. (2013) argued, the influence of safety culture overlaps organisational culture and safety; it as well focuses on the individuals within an organisation and the manner they view the safety requirements that they are to comply and adhere to, including the way they accept these requirements as part of their work scope in the workplace. The way forward for management in the Nigeria oil and gas industry is to create a workplace environment that accepts and encourages the development of a positive safety culture for it to be accepted, as this will help determine if applied safety measures will be a failure a success. One way to enhance workplace safety culture is to recognise the impact of workers' untypical or unsafe behaviour in resisting any changes in their workplace environment, particularly when these changes are not compatible with their own culture. With this realisation, management in the Nigeria oil and gas industry must find suitable strategies in implementing safety standards, policies, and strategies that are aligned with the organisational culture for it to be effective (Ehiaguina and Moda, 2020).

Regardless of the availability of means or funds in implementing an effective safety culture that will have a positive impact as regards the safety performance of the industry, there is a significant increase in the number of serious injuries and deaths of Nigeria oil and gas workers (Okoye and Okolie, 2017; Ehiaguina and Moda, 2020); therefore, highlighting the need and importance of health and safety in the sector. Therefore, there is a need for research to be carried out to develop a mechanism to aid toward improving workplace safety culture and improving the safety behaviour and performance of workers in the industry informed the study development.

1.8 Research Questions

The following research questions have been developed to guide and direct the research argument and help generate the necessary data required to evaluate the objectives and aims.

I. To what extent does unsafe workers' behaviour in the Nigeria oil and gas industry impact their safety performance?

II. Does organisational safety culture influence workers' safety behaviour in the Nigeria oil and gas industry?

III. What are the main elements used to develop a positive organisational safety culture that could significantly impact workplace safety within the Nigerian oil and gas industry?

IV. What safety policies and practices do Nigeria's oil and gas industry implement to promote safety in their business environments?

1.9 Scope of Research

Even though the Health and Safety department of the organisation needs to ensure that health and safety practices are effective and accomplished, the scope of this study is specifically limited to investigating the impact of safety culture on worker's safety behaviour. The rationale for limiting the scope of the study to safety culture is because of the impact of safety culture on the lives of humans, properties, and safety behaviour of workers in the global oil and gas sector. Specifically, emphasis is placed on the degree to which oil and gas organisations in the Niger Delta region of Nigeria have adhered to safety culture principles and how these organisations have managed risk and safety within the industry. The Health and Safety Executive, 2014 highlights that "*organisational safety culture is a result of group and individual values, perceptions, attitudes, competencies as well as behaviour patterns which determine how committed and also the proficiency of the health and safety management of an organisation*" (Agwu and Olele, 2014:434). The evaluation or assessment of safety culture, in this case, will include the way safety requirements and measures have been adopted in the workplace and how it influences the safety behaviour of employees. It would also determine the compliance level on the organisation as regards set safety rules, standards, and policies.

1.10 Thesis Structure

Chapter one - Introduction: The first chapter introduces the background study, the aims and objectives, the research questions and the scope of the research, and the justification of the research. This chapter also gave a detailed overview of the research study and the context and basis for the next chapter.

Chapter two - Literature Review: The chapter presents the review of relevant secondary data on factors that influence workers' behaviour across different industrial sectors. The literature review also provided details on the different components of workers' safety behaviour in the oil and gas industry. The relationship between safety culture and safety climate was explored, including the related concept of organisational culture and the different types of safety culture conceptualisation. The different elements that constitute a positive safety culture in the oil and gas industry and its impact on work-related safety behaviour of workers, including the challenges imposing its implementation in the workplace was also examined. Other factors, such as psychosocial risk factors that were found to influence employee safety behaviour, which in turn impact employee safety performance, were also discussed.

Chapter three - Research Methodology: The study's research methodology was presented in this chapter, which included the philosophy of the research study, its strategies, data collection method, and the data analysis method. Chapter three of this research study presented several philosophies that the research study put into consideration and how these philosophies may or may not apply to the study. This chapter also presented the research approach of the study in terms of its deductive and inductive methods. The study's research design was also presented in this chapter, with an in-depth focus on the mixed method of data collection, which was the research method adopted. A detailed explanation of the research strategy, including case studies, interviews, and the study method, was presented in this chapter. The research tools for the research (questionnaire and interview) were also presented in this chapter, with emphasis on the

data gathering and collection process. A detail on ethical considerations, including the methods used for reliability and validity of data, were also presented in this chapter.

Chapter four – Results Analysis: The results were presented in this chapter, including the summary, the procedure, and the materials used during the research. The result analysis from the questionnaire (quantitative data from both pilot and full study) of the research study was also presented in this chapter. Interview analysis focusing on participant's responses under established themes from the interview transcripts concerning the aim of the research was presented in this chapter. Answers that may or may not support the safety policies and safety culture in the Nigerian oil and gas industry were also presented in chapter four of the research study.

Chapter five - Discussion: The chapter presents key findings in the light of the data generated and analysed from qualitative (interviews) and quantitative studies undertaken concerning the study research aim and questions. Possible acknowledgement on safety issues was presented, including details on gaps in the safety measures adopted in the Nigeria oil and gas industry.

Chapter six - Conclusion: Finally, the last chapter presents the study's conclusion by summarizing the implication of the result. The study's strengths and limitations were also be presented under this chapter, including recommendations for practice, theory, knowledge, policy improvement, and future studies in the Nigeria oil and gas industry.

2.0 CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

Related literature within the field of occupational safety focusing on workplace factors that influence employees' safety behaviour across different industrial sectors is reviewed in this chapter. The review provided details on the different components of workers' safety behaviour in these industries, including the role of safety culture on workers' safety behaviour in the workplace. The relationship between safety culture and safety climate was explored, including the related concept of organisational culture and the different types of safety culture conceptualisation. The different elements that constitute a positive safety culture in the oil and gas industry and its impact on work-related safety behaviour of workers, including the identified challenges that contribute to negative safety behaviours in workplaces, were examined. Other factors, such as psychosocial risk factors, were found to influence employee safety behaviour, which in turn impact employee safety performance. The chapter concludes that workplace safety culture has a significant role in workforce well-being but will only guarantee safety when vital elements constituting a positive safety culture are strengthened.

2.2 Safety Behaviour

In the oil and gas industry, the term safety is commonly described as a secure environment where the workers of the organisation are protected on their jobs and projects by mostly eradicating the possibilities of incidents occurring, which will therefore result in either major or minor injuries and accident, while also limiting the risks of a possible lawsuit or regulatory retribution in an organisation (Fernandez-Muniz et al., 2014). According to Okoye (2016), safety can easily be described as the mixture of behaviours designed to invariably increase or decrease the risk of harm, with "safe" meaning out of danger and "unsafe" meaning at high risk of danger. According to Frazier et al. (2013), safe and unsafe behaviour methods may be different as it largely depends on the organisation and its management and employees in the organisation based on the level of necessity of work operations. A study by Kvalheim and Dahl (2016) viewed safety behaviour as

the perception of an organisation's safety performance, taking into consideration every step and activity that enhances the implementation of safety. In furtherance, Dartey-Baah and Addo (2018) refer to worker's safety behaviour as the absence of an undesirable event that involves an unplanned and unacceptable loss.

Highlighting the importance of positive safety behaviour at work, Uryan (2007) explained that an employee's attitude towards safety could determine in one way or another how they comply with the organisations' safety policies. Therefore, when an employee's demeanour and character towards safety is positive, they adhere to the safety guidelines and precautions in the workplace, thereby avoiding work-related hazards (Wallace, 2016). In support, Ismail and Hashim (2012) affirmed that employees' safety problems are most often attributed to employees' negligence or dangerous behaviours, and several of these safety problems can be both avoided and resolved if these unsafe behaviours are spotted and monitored. In the same vein, several studies have identified unsafe human behaviour as the most common cause of workplace accidents and injuries in workplaces (Zhang and Fang, 2013; Choudhry, 2014). For instance, Hamid et al. (2008) discovered that workplace accidents occurred mostly because of the workers' ignorance, the inability of workers to adhere to work procedures, and a poor attitude to safety. Similarly, Fernandez-Muniz et al. (2014) developed a study using a proven model on one hundred and eighty-eight organisations mainly located in Spain. Using structural equation modelling technique, the findings showed that employee behaviour is highly important in advancing proper safety outcomes (Fernandez-Muniz et al., 2014).

Contrary to previous findings (Hamid et al., 2008; Fernandez-Muniz et al., 2014; Wallace, 2016) suggesting unsafe behaviour do not always result in injuries or accident, sometimes behaving without safety may improve productivity, and on the other hand, acting safe may still lead to an accident. In this regard, Cooper (2009) explained that partaking in safety shortcuts to save time and cost does not generally lead to an accident and sometimes increases productivity (i.e., productive behaviour unauthorized). However, the cost of a single accident may overshadow the profits gained from shortcuts (Wallace, 2016). Accordingly, several studies conclude that safety behaviour may be categorized into two components: safety compliance and safety participation

(see figure 3) (Neal and Griffin, 2002; Hale and Borys, 2013; Griffin and Hu, 2013; Dahl and Kongsvik, 2018). As a result of this classification, other authors inferred that safety behaviour is considered as a leading indicator that can be used as a safety performance assessment tool in organisations in a proactive manner to develop ways to prevent future accidents, detecting areas with deficiency and evaluating the usefulness of safety programs (Griffin and Hu, 2013; Dahl and Kongsvik, 2018).

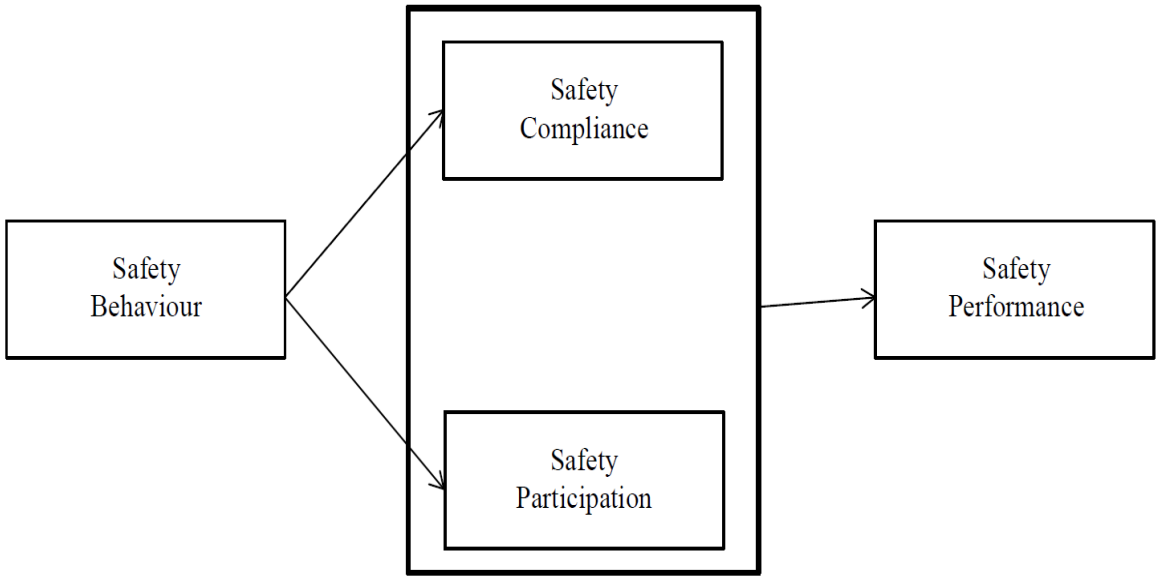

Figure 1: Illustrates the component of safety behaviour as a measure of performance (Source: Neal and Griffin, 2000).

2.3 Components of Safety Behaviour

2.3.1 Safety compliance

Safety compliance is defined as following established safety policies and guidelines and participating fully in the mandatory safety behaviours (Kvalheim and Dahl, 2016; Dahl and Kongsvik, 2018). According to Dartey-Baah (2013), safety compliance focus on behaviour tailored towards ensuring work safety excellence is met at the least. This may include complying with all

safety precautions, doing exactly as told in a safe and timely manner and using appropriate safety tools and equipment (Mullen et al., 2017; Dartey-Baah and Addo, 2018). Studies of Dahl (2013) revealed that repeated conclusions from accident investigations across different industries showed a lack of compliance. Safety rules and procedures violations are often important contributing factors to industrial accidents, and these vary between industries. This demonstrates that adherence to safety rules and procedures is important in maintaining safety at work, and there is a need to investigate why workers violate safety procedures (Dahl, 2013). In this light, Safitri et al. (2020) concluded that workers violate safety procedure mainly when there is an existence of the opportunity to violate or having the belief that the rules have been broken or not in place, all of which are attributes of a poor safety culture, which is necessary to be discussed to enhance and ensure workers comply with safety measures.

2.3.2 Safety participation

Unlike safety compliance, safety participation is referred to as the efforts and practices exhibited by individuals or workers that may or may not have a direct impact on eradicating workplace hazards but help to create an atmosphere that is supportive of safety (Griffin and Hu, 2013). According to Clarke (2006), safety participation is more than just the normal norm of avoiding accidents that may occur to workers, ensuring safety and putting procedures in place to improve workplace safety. This further explained that safety participation involves the active facilitation and communication of organisational goals and objectives on safety procedures and a safe work environment by companies (Mullen et al., 2017). In addition, safety participation was noted by Jiang and Probst (2016) to be wide-scale voluntary in nature and involves the need-be attitude of workers other than that expected from them when performing their job roles. However, over the past decade, safety studies are drawing attention to the relevance of another component of safety behaviour called mindful safety practice, considered paramount to the safe operation of high-risk industry like oil and gas (Skjerve, 2008; Kvalheim and Dahl, 2016; Dahl and Kongsvik, 2018).

2.3.3 Safety mindfulness

Mindful safety practice (i.e., knowledge-based reasoning), as described by (Kvalheim and Dahl, 2016; Dahl and Kongsvik, 2018), is a situation whereby employees rely on their capability to be mindful of uncertain elements in the surrounding and act in the occurrence of the danger respectively. In addition, Dahl and Kongsvik (2018) stated that in some cases, there might be an incorporation of conscious safety practices into the company rule book, or it can be added to the core part of activities, for instance, ensuring that before the commencement of any task, the risk factor must be evaluated and analysed. However, conscious safety practice cannot guarantee behaviours that will positively affect dangerous situations, safety awareness, and appropriate use of judgment (Skjerve, 2008).

Evidence from various other studies has shown that safety participation, safety compliance, and safety mindfulness are vital aspects to safety behaviour that need to be considered when improving the safety performance of employees at work (Clarke, 2006; Dahl, 2013; Griffin and Hu, 2013; Kvalheim and Dahl, 2016; Dahl and Kongsvik, 2018). Notable, Fernandez-Muniz et al. (2014) disclosed a significant effect on compliance with safety standards and procedures when workers willingly put in the conscious effort to improve and maintain health and safety at work. Based on this submission, safety participation is viewed as motivation to workers to comply with safety standards. In addition, a study by Christian et al. (2009) revealed that safety compliance and participation have a great outcome in limiting work-related hazards in an organisation. Furthermore, Dahl and Kongsvik (2018) work that considered the relationship between the safety climate factors as well as mindful safety practices of frontline workers involved in the Norwegian oil and gas industry and concluded that just like participation and compliance, mindful safety practices should be used to promote the enhancement of positive safety climate.

Although safety behaviour itself has been a major cause of accidents at work, considering its component as a safety enhancement tool is crucial to improving workers' safety performance (Simons et al., 2015; Guo et al., 2016). However, poor safety culture is also a major factor that influences negative safety behaviour among workers and can result in accidents. Therefore, safety culture is considered a fundamental prerequisite for effective management of employees'

behaviour related to safety in workplaces (Cooper, 2009; Lu and Tsai, 2010; Edwards et al., 2013; Boughaba et al., 2014; Nordlof et al., 2015; Nævestad, 2017).

2.4 Safety Culture

In 1986, the International Nuclear Safety Advisory Group (INSAG) launched a report on the Chernobyl power plant accident investigation in Ukraine, which later originated the term safety culture, where it provides adequate information on how accidents as such cannot be fully avoided no matter the level of organisational barriers put in place (Guldenmund, 2000; Kim et al. 2016a; Antonsen, 2018). According to Choudhry et al. (2006), when accidents during work time occur, there is a high probability for organisations to become vulnerable to failure. Such vulnerability does not just only originate in organisations due to technological failure, environmental factors, and human error, but in many cases, it is usually the existing organisational standards as well as policies that have consistently in the past shown to lead to pre-existing disaster (Choudhry et al., 2006). Nevertheless, safety culture has now been implemented to individual accidents and has come to be attributed to three major components. First is the behavioural component such as the use of Personal Protective Equipment (PPE), following operating procedures, etc., applicable to individuals of observable behaviour. Second is the psychological component that aims to analyse the perception of the individuals and the group. Lastly, business procedures and structures are all components of organisational analysis of business operations (Lefranc et al., 2012; Boughaba et al., 2014). Ever since the INSAG disaster, the initial clarification of what safety culture is and several elements that strengthen the earlier comprehension have been developed (Edwards et al., 2013; Nordlof et al., 2015).

2.4.1 Definition of safety culture

Many types of research in safety culture literature around the definition of safety culture have led several contributors to argue about the lack of a universal definition of safety culture (Choudhry et al., 2007; Edward et al., 2013; Frazier et al., 2013). Different definitions have been

developed across studies, while expanding of safety culture as it is different in the way culture is designed (Antonsen, 2018). As a result, many scholars, with their studies, have re-defined safety culture in ways they relate to the terminology (Edward et al., 2013; Frazier et al., 2013). In the INSAG report, safety culture is defined as "*the collection of individuals and organisations characteristics and attributes which means, as a superseding importance, significant attention is needed on safety issues in high-risk industries*" (Choudhry et al., 2007: 998). Two major points were highlighted by Nielsen (2014) as it relates to the definition advanced by INSAG. First, while safety culture is viewed as placing focus around a good attitude, it is also being viewed as a positive safety management approach as established by organisations. Secondly, positive safety culture means ensuring that safety is seen as the highest priority. As such, the INSAG report summarizes the necessity to give real value to safety culture now that the term is frequently used (Choudhry et al., 2007).

According to Lee and Harrison (2000), the concept of safety culture is that a safety management system is also a social system, and to ensure its achievement, the scope, employee's understanding, and dedication to guaranteeing its work is essential. The concept of safety culture has developed to conceptualise and address this new focus (Lee and Harrison, 2000). In line with this, the United Kingdom Health and Safety Commission developed one of the most common definitions. The safety culture of an organisation is the "product of individual and group values, attitudes perceptions, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of an organisation's health and safety management" (Antonsen, 2009). Nevertheless, despite the lack of consensus around universal definition and model of safety culture, recent studies agreed to a common definition of safety culture "as an organisational culture that places a high priority on safety-related beliefs, values and attitudes behaviours as they relate to employee's safety" (Frazier et al., 2013; Nielsen, 2014; Nævestad, 2017; Nævestad et al., 2018). Considering this, Wahlstrom and Rollenhagen (2009) suggested that, to ensure an easier understanding of what safety culture means, an official definition needs to be enforced with a threat of sanction that would be used both academic and industry-wise. The study of Lawrenson and Braithwaite (2018) acknowledged the strategy as an effective one as it will enable operators to have a more confident way of navigating their safety culture and by

which they can also compare it to how other operators attain their safety which will therefore create an acceptable standard of safety culture.

In recent years, the importance of safety culture in curbing workplace-related injuries and accident have been increasingly discussed in occupational safety literature, (Li and Hale, 2016; Danielsson et al., 2019) which will be discussed next.

2.5 Importance of Safety Culture

The significance of setting up a safe working environment is generally accepted across safety literature. However, investigations found that meeting the rules and standards of government regulations is not enough to sustain a safe working environment in the industry; there needs to be a radical and extensive change in the oil and gas industry's safety culture to limit the occurrence of accidents and injuries in the workplace (Parker et al., 2006; Kilaparthi, 2014; Okoye, 2016). Further to this, (Mearns and Yule, 2009; Olsen, 2010; Ek et al., 2014; Zaira and Hadikusumo, 2017) stated that positive safety culture is not only a useful improvement to safety behaviour, but numerous benefits arise from having a positive safety culture in every organisation. This comprises absenteeism of workers, happier workforce, improved productivity, profitability and quality, client and stakeholder satisfaction, reduced insurance premiums and claims, reduced risk of crimes, and a lot more.

Nigeria's oil and gas sector contributes majorly to the economic development of the country, and there is high demand for energy production. Even though there is a decline in crude oil prices, onshore and offshore oil and gas productions will continue. Hence, the safety of workers and limitations of major accidents will still be a top priority of the industry, its regulatory bodies, and the public at large until a safer method of operating without any concerns is properly developed (Kadafa, 2012; Okoye, 2016; Ehiaguina and Moda, 2020).

Reviewed studies conclude safety culture as a distinct problem. As a result, it has been argued that safety culture is viewed as an underlying condition of organisational culture, whereas it is better seen as a fragment or section and not a culture (Frazier et al., 2013; Edwards et al., 2013;

Kilaparthi, 2014; Nordlof et al., 2015). Because of the similarity between these concepts, organisational culture would provide a better opportunity to investigate. Moreover, due to the close relationship between these concepts, organisational culture would appear to provide a useful avenue to explore the meaning of culture in safety culture (Edwards et al., 2015; Nordlof et al., 2015).

2.6 Organisational Culture

Organisational culture has received significant attention in the literature, and just like safety culture, many definitions have been presented across studies (Edwards et al., 2014). Fisher and Alford (2000) stated that there are over 164 meanings of the term organisational culture. However, several descriptions of organisational culture, is often used in literature, which is ''*shared values and beliefs that interact with a company's people, organisational structures and control systems to produce behavioural norms*'' (Edwards et al., 2013:4; Nielsen, 2014:8; Nævestad et al., 2018: 45). In the light of this, Schein (1990) earlier provides insight to a common definition of organisational culture across safety pieces of literature. Instead of giving a distinctive definition of organisational culture, Schein proposed that any group that has shared a similar interest over an extended period may have in one way or another developed a culture indirectly. As such, organisational culture is the tradition that is possessed by only members of a particular organisation. However, from the definition of (Schein, 1990; Tear et al., 2020) argued that since organisational culture is simply about a specific culture exhibited by members of a group, and as such, there is a clear relationship between organisational and safety culture, therefore, hypothetically it can also be said that safety culture has ideologies from a more deep-rooted concept of culture. Hence, it is rather unusual that the establishment of the conceptual framework and theoretical basis of safety culture literature hardly ever progresses far off from brief discussions of the organisational culture literature (Mannion and Davies, 2018). In addition, Fisher and Alford (2000) stated that several organisational culture authors have had to try to convey the concept of culture in an easier way for understanding because the business world has had difficulties in understanding this field.

However, it is necessary to put out both organisational and safety culture in a way the business community will accept, which will therefore increase how it is being applied and guarantee a high level of dependence on how it is translated to the original concepts (Nunen et al., 2018). Furthermore, positioning safety culture solely upon interpreted concepts of culture gathered from organisational culture literature can heighten the chance of compounded error that will result in the loss of actual content from the culture literature (Muls et al., 2015). As such, it is practical to briefly refer to some of the patterns and conceptualisations of culture contained in anthropological and cultural psychology literature to discuss the significance of culture in safety culture for adequate translation of these conceptualisations to the safety setting (Guldenmund, 2000; Edwards et al., 2015). In this view, (Hopkins, 2006; Neal and Griffin, 2006; Brinkmann, 2007; Guldenmund, 2010) discovered three conceptualisations of culture, which are the pragmatist, normative, and the anthropological. These identified conceptualisation approaches provide three-wide classifications of which many studies about culture lie (see summary in table 1 below). The unique nature and viewpoints of these approaches provide functional commencement of discussions concerning culture in safety culture.

2.6.1 Analytic or Normative Conceptualisation of safety culture

The normative conceptualisation of culture holds that safety culture is something that only organisations who uphold safety as an overriding priority have, rather than merely determining the level of commitment to safety (Edwards et al., 2014). In this view, Hopkins (2006) argued that an organisation with the uppermost dedication to ensuring safety could be said to have a safety culture. Over the years, however, this conceptualisation of safety culture has advanced, with people admitting that safety culture has no middle position or compromising stance but is to a much greater or lesser extent existent in an organisation (Coze, 2019). For instance, Parker et al. (2006) gave a list of characteristics that define the five types of safety cultures: pathological, reactive, calculative, proactive, and generative. Despite this, the normative component of this conceptualisation does not change.

According to Leaver and Reader (2019), in safety culture evaluation, this instrumental proposition is a prominent one and most frequently used precisely in organisational safety environment by using a quantitative survey. When using this conception, emphasis is made more on the present. For instance, the first line of duty for professionals in the safety field when using a normative-like conceptualisation of culture in the implementation of safety culture is to investigate the existence and supremacy of the current safety culture in an organisation. If the results by the safety professional identify the absence of safety culture or inadequate safety culture, the professional is then required to build up a strong safety culture in the organisation. Although, if the case is the opposite, that is, the professional discovers that the safety culture of their organisation is strong, then all that is required from the professional is to put the proper processes in place that will maintain the culture (Edwards et al., 2015; Leaver and Reader, 2019). The reason is that the construct of conceptualisation simply claims that culture must be possessed by a person or a community (Brinkmann, 2007). In both instances, safety culture will be an instrument or approach utilized in an organisation by creation and maintenance to enhance or sustain safety performance. A study by Haukelid (2008) observed that this type of conceptualisation is usually assessed by using quantitative measures of the safety climate of workers and is popular, specifically within the administration for literature, regarding safety culture.

According to (Choudhry et al., 2007; Nævestad, 2017), the prominence of the formation of safety culture as a resolve for bad safety performance is, nevertheless, not without deficiencies. Firstly, it is not suitable to concentrate on management and organisational approaches for all sectors and settings. Although many safety culture research works have been centralized on closely regulated and firmly supervised industries, some industries do not have the same privilege. For instance, a company has little to no influence on the day-to-day conduct of its employees in a lot of industries associated with the transport of people and freight. Such industries may be less responsive to the present focus on organisational practices, policies, and procedures. As such, the deep-rooted dedication to ensuring employee safety regardless of external motive may be of greater importance. Secondly, developing a strong force on safety culture could lead to the disregard of existing culture in an industry unattached to cooperative methods and schemes,

which can restrain safety measures put in place to improve or develop a company's safety culture (Choudhry, 2007; Antonsen, 2009; Nævestad, 2009; Edwards et al., 2013). It is paramount to tour other conceptualisations of safety culture that emphasises developing an understanding of the outcome of culture on safety to assist with spotting techniques that can help to limit safety incidents (Edwards et al., 2015).

2.6.2 The anthropological conceptualisation of safety culture

The anthropological conceptualisation of culture holds the notion that culture is inherited by all and constitutes various elements that guarantee that behaviour is repeated (Brinkmann, 2007). In contradiction to the normative conceptualisation, (Halligan and Zecevic, 2011; Yorio et al., 2019) stated that this outlook of culture centres on the shared beliefs of safety-related behaviours, values, or assumptions among workers of an organisation other than assessment of attributes which are present or absent in a person or community. In support, (Brinkmann, 2007; Antonsen, 2009) referred to this definition as a perfect example to explain the meaning of an organisational safety culture notable around the anthropological and cultural psychology literature. Furthermore, this method seems to support the use of ethnographic and qualitative research analysis (Nævestad, 2009).

However, (Glendon, 2008; Yorio et al., 2019) stated that though the existence of this method, some studies that have used a qualitative method in investigating safety culture as a lot of authors with strong viewpoint focus their studies on the outcome of organisational culture of safety, instead of simply on the safety culture. According to Edwards et al. (2013), although culture has a strong anthropological conceptualisation in the theoretical discussion of safety culture, it is still frequently been ignored when carrying out research studies on safety culture, as there are possible reasons for this. One of the reasons can be that attitudes are mostly seen as the realm of safety climate (the way an employee sums up his/her perceptions and evaluations concerning the importance of organisational safety) instead of safety culture (Guldenmund, 2000; Zwetsloot et al., 2020). Although the main difference between the anthropological conceptualisation of safety culture and safety climate depends on the target of these values and

beliefs, however, research on safety climate normally emphasises on attitudes of an employee as well as perceptions concerning structure, procedures, and processes an organisation uses on safety, and also the perceived priority the organisational leadership and management have on safety (Neal and Griffin, 2002; Jiang et al., 2010; Zohar, 2014; Aven and Ylonen, 2021). On the contrary, in the safety culture anthropological conceptualisation, the target of shared beliefs, values, and attitudes can be much extensive. It encompasses all factors directly relating to safety or which may have a bearing on behaviours concerning safety. As a result, in situations where safety culture is fundamentally about the organisation, which also involves individuals, the safety culture anthropological conceptualisation will not be restricted to environmental factors (Zwetsloot et al., 2020). Another major constraint to applying safety culture, according to (Schein, 2010; Kilaparthi, 2014), is the idea that behaviour is the only product of culture is false, as it is also an outcome of contextual variables. Therefore, there will be a limitation of the validity of the concept when the only aim of safety culture is to serve a more extensive purpose of safety science by supplying a way to refine safety performance, concentrating wholly on psychological variables, without originating a mastery of the organisational framework within which behaviour occurs and restricts the prediction of the logic behind the concept.

2.6.3 A pragmatist conception of safety culture

In contrast to the previous conceptions' views discussed above, (Reckwitz, 2002; Guldenmund, 2010) discussed that pragmatist conceptualisation is essentially about practices, which is based solely on the view of practice theory. Other community-based models have been researched to articulate behaviours and social orders concerning cognitions, regarding either repercussion to persons or the way of the community. However, Reckwitz (2002) practice theory reveals that social order is more about substantial practices and not merely about mental attributes and interactions. In this theory, practices are how individuals are treated, objects being handled routinely, and the steps taken to understand the world around us (Reckwitz, 2002). Although practice theory had strong opinions on behaviour instead of cognitive factors, (Edwards et al., 2013; Zwetsloot et al., 2020) still argued that behaviour is only seen as cultural 'practices' when

attributions can be made to prove the values and reasons of which behaviour relates to. This conceptualisation is inextricably related to the anthropological conception of culture, which is focused solely on deep-rooted belief and values.

From the excerpts of the above discussion, there are many ways of interpreting the concept of culture in which results broadly in different meanings of knowing the purpose of researching the core components which form culture and of culture itself (Neal et al., 2000; Guldenmund, 2000; Reckwitz, 2002; Edwards et al., 2014). However, the three conceptualisations described above do not primarily explain the vast array of the possibilities of culture, but they can serve as the fundamental tools used in exploring safety culture to a large extent. As a result, a more recent study by Amernic and Craig (2017) argued that neither of the previous descriptions is convincing or encompassing. Although from the research they conducted, safety culture refers to the continuous development of underlying assumptions, values, attitudes, and beliefs shared among a group in an organisation leaning to an environment that is on a mission to restrain from harm, this definition is a tentative one that has a combination of both elements.

Table 1: Summary of Normative, Anthropological, and Pragmatic viewpoint on safety culture

Major approach	Time Focus	Expected information focused on recovering.	Assessment strategy and methods
Normative approach	Present	Quantitative information on the safety climate	Safety climate scales questionnaire
Anthropological approach	Past	Qualitative information	Ethnographically inspired methods (e.g., observations, focus groups, interviews, etc.)
Pragmatic approach	Future	Safety culture maturity (level)	Behaviourally Anchored Rating Scales (BARS).

According to Nielsen (2014), it is difficult to influence culture directly because of the unintentional nature of the basic assumptions and the indistinctiveness of the concept of culture. As earlier highlighted in different studies in section 1.4, one way to approach safety culture change could be by looking at the related concept of safety climate, which is the manifestation of the shared perceptions of organisational safety policies, practices, and procedures, both formal and informal (Zohar, 2010; Nielsen, 2014; Wallace, 2016).

2.7 Safety Culture and Climate

The lack of difference or differences between climate and cultural concepts has been widely debated by experts (Guldenmund, 2000; Nævestad et al., 2018). Although the two terms "culture and climate" are used interchangeably when discussed in different disciplines (Nævestad et al., 2018). Although safety climate is an impression of safety at a given point in time, they refer to safety culture as the primary belief system that creates a climate. In Wallace (2016) words, safety climate is a set of perceptions that employees share regarding safety prioritisation in the organisation. According to (Zohar, 2010; Tang et al., 2018), these perceptions set out the frame of reference for workers on the kind of behaviour that is expected, rewarded, and supported. Hence, the behaviour of employees will tend to align with these perceived expectations (Tang et al., 2018). Studies of (Zohar, 2010; Wallace, 2016) further refer to safety climate as a powerful tool that can drastically shape safety at the workplace.

1In (Zohar, 2010; Vinnem et al., 2010) understanding, organisational climate is how a leader perceives safety culture as just the exterior part of the deep-rooted cultural levels. However, the distinction between safety climate and safety culture is debatable, although (Nielsen et al., 2013; Nævestad et al., 2018) argued that the safety culture of an organisation is regularly applied when researching the concept of climate. In the perspective of (Neal et al., 2000; Zohar, 2014), near-miss reporting, accidents, injuries, and work-related illness, all examples of measurable indicators which are known to be empirical are sometimes referred to as safety climate. In tune with this reasoning, Neal and Griffin (2004) propose the knowledge that safety climate provides an atmosphere for safe behaviour to be exhibited. Also, safety culture can be determined by an

index of safety climate. According to Flin et al. (2009), these determinants are frequently described as skills that are not technically inclined as they indicate an added necessity of competence for employees. Lastly, safety climate is connected to safe outcomes of injuries and work-related sickness that may or may not occur. The connection between safety indicators and safety climate is very essential in this regard. An example will be ongoing research that points out that perception of safety among employees in the workplace plays a crucial role in limiting the chances of accidents and injuries and, most importantly, fewer reports of rule violations (Neal et al., 2000; Mearns et al., 2003).

Contributions to the overall reduction of a workplace accident by the improvement of employee's safety behaviour have been achieved in safety literature through the concept of safety culture or climate. Notably, the study of Kvalheim and Dahl (2016), who researched to analyse the correlation linking safety climate and safety behaviour using four most common features of safety climate construct that influence safety compliance of workers with safety procedure. Their findings revealed that there was a significant association between the different safety climate constructs such as work pressure, safety supervision, safety system, safety competence, and safety compliance. However, Wallace (2016) argued that although the safety climate constructed has an impact on employee safety behaviour, it is not always in the same strength, for he found management commitment to impact more on safety participation and safety outcomes.

A study by Zohar (2010) asserted that with a positive safety climate, workers tend to incline to behaviour that is supported, expected, and rewarded. However, climate favouring production over safety will have a negative effect on employee's safety behaviour (Wallace, 2016). Furthermore, Dahl and Kongsvik (2018) examined the link connecting safety climate factors (that include; safety system, pressure at work, safety competence, safety leadership, and safety practice) and mindful safety practices of frontline workers in the Norwegian oil and gas industry and conclude safety culture/climate can be applied as an improvement tool for safety behaviour regardless of the safety behaviour component (safety compliance, safety participation, and mindful safety practice) targeted for improvement. However, to improve safety climate and or

safety culture in a context favourable to each of the different components of safety behaviour, it is relevant to understand which safety climate construct priority should be given. In conclusion, the climate is a perceived entry point to associate with culture, as the concept that is connected to the development of culture is noticeably measurable (Zohar, 2010). According to (Clarke, 2006; Olsen, 2009; Nordlof et al., 2015), it is paramount in ensuring that there is a continuous improvement effort put in place to limit incidents in the oil and gas industry and not just broadly accepting the establishment of a safe working environment. Hence, until the perspective of a better way of sustaining safety is created, and executed, and shared by all parties involved, the weight of guaranteeing and ensuring the safety of workers and ways of avoiding major hazards will lie on the industry, public, and its regulators (Hoffmeister et al., 2014). For this study, the articulated element of positive safety culture discussed is from the excerpt on Hudson's (2001) model on safety culture maturity. The dimensions that form the framework used to identify the elements associated with the phases of the safety culture model were drawn from crucial scholarly reviews of research done on safety culture (Parker et al., 2006, Filho et al., 2010; Vindkumar and Bhasi, 2010, Frazier et al., 2013, Mohammadfam et al., 2017).

2.8 Safety Culture Maturity Model

A good number of efforts are ongoing into creating the best way in seeking out a general method of improving safety now Ambituuni et al., (2014), and it is perceived that both behavioural and cultural issues need to be discussed to achieve this improvement (Filho and Waterson, 2018). Though it is a good idea, the diversification of the safety culture across the industry may limit its usefulness (Vassem et al., 2017). Strong safety culture may be required to improve different techniques from companies or installations during the early stages of creating their safety culture. Hence, a safety culture model has been created to determine an organisation's current level of safety maturity and help recognise an action needed for improving their culture (Filho et al., 2010; Ulrich and Kear, 2014).

A study by Hudson (2001) suggested five stages of the safety culture maturity model (figure 4) designed to provide a solution toward attaining better workplace safety. The safety culture

maturity model was considered suitable for use in Nigeria organisations due to the last criteria that the organisation should have a Safety Management System (SMS), ensuring major accidents are not caused by technical failures and that the company follows the health and safety law in constrain for general use in Nigeria.

The framework by Hudson's model has been implemented in other studies carried out within petrochemical, oil and gas, and public health organisations and was found useful to achieve reliable results (Hudson and Willekes, 2000; Hudson, 2007; Filho et al., 2010). The five dimensions of the safety culture model are each described below. Table three encompasses eight different elements: management commitment, leadership style, employee involvement, personal accountability and inquiry attitude for safety, safety communication, continuous improvement and learning, training, and safety motivation. These elements were also consistent with the previously discovered factors in other major scholarly reviews of safety culture studies and the major framework in other companies grounded in empirical research (Vinodkumar and Bhasi, 2010; Frazier et al., 2013; Choudhry, 2014).

In comparison to Hudson's (2001) model, a safety culture maturity model was also developed by Fleming (2001) to assist companies in detecting the level of maturity of their safety culture, particularly in the oil and gas sector. This model made use of the same software engineering that was based on the capability maturity models, which also has five different maturity levels: emerging, managing, involving, cooperating and continually. Management commitment and visibility; learning organisation; communication; shared perceptions about safety; productivity versus security; safety resources; trust; participation; training and industrial relations job satisfaction are all part of the safety culture of maturity model elements. The justification used in ranking these elements is based on the organisation's safety culture maturity (Fleming, 2001). The average level attained by an organisation after being evaluated is used to determine the most suitable level. It is proposed that organisations progress sequentially through the five levels by building on the strengths and removing the weaknesses of the previous level. Hence, Fleming (2001) noted that the significance of the safety culture maturity model is to bring about a various number of standards to organisations which include: An adequate and sufficient Safety

Management System where most of the unforeseen accidents are not initiated by technical failure. What drives safety is not the idea to avoid prosecution, but rather, it is the desire to ensure that accidents are prevented, and the company is in full compliance with the health and safety laws. However, Fleming (2001) safety culture maturity model was created as a testing tool. There is no proof that all organisations follow an order of maturation and that using averages is the proper way to establish the maturity level as there are models that don't have empirical evidence to support them (Filho et al., 2010). Fleming and Lardner, (2002) himself warns that a great amount of research is needed to be done on his safety culture maturity before it can be used in this manner.

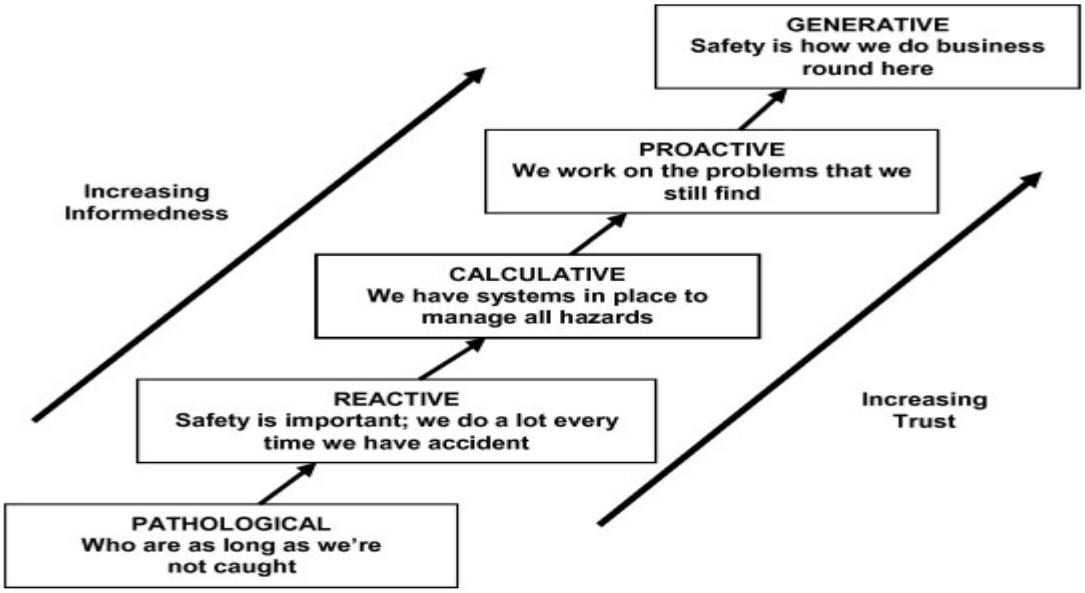

Figure 2: Safety culture maturity model showing the development stages (source Hudson, 2001).

Hudson (2003) described each stage of the safety culture model as follows; *Pathological:* safety is an issue developed by employees. Both the business and the hope of not getting caught by the regulators is what drives it. *Reactive*; organisations have started taking safety more seriously

because there is only one consequence after which are incidents. *Calculative*; a huge amount of data collection of safety is driven by management systems. Nevertheless, workers don't look for safety, but management is a major drive, and it is compulsory. *Proactive*; a challenge is something that was not foreseen with improved performance. Human resources engagement starts to move the program apart from a strictly top-down approach. *Generative*; there is active involvement at all stages. Safety is seen to be an essential component of the business. Organisations are grouped by severe unrest as opposition to complacency (Hudson, 2003).

2.9 Elements of a Strong Safety Culture

2.9.1 Management Commitment

Management commitment is a key element under safety culture practice to ensure that safety in the workplace is successfully achieved (Ek et al., 2014; Kilaparthi, 2014; Skeepers and Mbohwa, 2015; Zaira and Hadikusumo, 2017). According to Mearns and Yule (2009), fostering a safety culture and performing safety practices in an organisation is rather difficult without management, which indicates that the management of safety is the backbone for the intervention in ensuring the best and efficient safety practices in the workplace. A quantitative survey was undertaken by Olsen (2010) to determine the likelihood of recognising safety culture, in general, / climate concept in both public health and oil and gas sectors in Norway revealed that the most significant contributing factor was management support for actions towards promotion of workplace safety. However, the stand was argued against based on the researcher's view, where they opined cultural safety change should not be controlled or viewed as a linear top-down process; instead, it stems from every sector of the organisation (Cooper, 2000; Choudhry et al., 2007; Kilaparthi, 2014). Furthermore, the study of Boughaba et al. (2014) expounded the correlation between safety culture maturity and safety performance of workers in two different oil companies in Algeria. Their finding revealed that the commitment to safety by the management played a fundamental role in the determination of employees' safety behaviour and consequently in the occupational accident rate. A study by Parker et al. (2006) noted that managers must have attitudes that support safety. Thus, it is important for employees

to see and understand that. When the attitudes and behaviours of senior managers are perceived to be positive in terms of safety, it gives rise to the need for workers to see and develop safety behaviour that influences their individual safety performance.

On the other hand, a negative perception of management's commitment to safety can erode workers safety behaviour (Nævestad, 2017). In this view, Nævestad et al. (2018) found evidence that positive safety culture values can penetrate an organisation through senior management effort by demonstrating attention and commitment through safety communication. Secondly, developing respectful work environments by creating a reason to raise concerns to ensure all employees feel free and safe to air out their opinions in ways that will improve safety.

In the view of Choudhry et al. (2006) states that the best way to display commitment by members of management is by allocating time, resources, walk the talk, inspections, partaking in risk assessments and consultative committee meetings, and lastly, by completing actions. Therefore (Clark, 2006; Bahn, 2013) conclude that leaders (management and supervisors) need to devote more of their attention and time to employees. Employees are likely to show added interest in maintaining a safe and healthy culture at work when they see the interest and responsibilities of management for incident and prevention of injury; it helps promote the commitment and participation of management in safety which can also improve the safety culture of an organisation (Beus et al., 2010).

However, (Huang et al., 2010; Ye et al., 2020) stated that when a supervisor ignores safety processes whenever there is a delay in production schedule or people are punished for their mistakes, it causes employees to lack safety commitment. According to (Zohar, 1980; Nordlof et al., 2015), some organisation awards and regularly acknowledges conflict under safety. Hence, safety culture and safety climate depend solely on constant action by management and a positive leadership style towards safety in the oil and gas sector (Kongsvik et al., 2011; Kim et al., 2020).

2.9.2 Safety Leadership Style

Leadership styles have appeared to have a notable effect on employees' safety behaviours in several literature reviews on employee safety at work and, by extension, the safety performance of an organisation (Christian et al., 2009; Dahl, 2013; Pilbean et al., 2016). There are several definitions of a safety leader throughout literature owing to the dynamic nature of the concept (Darty-Baah and Addo, 2018; Setiono et al., 2018). Nevertheless, the definition mostly documented across studies is from (Griffin and Hu, 2013; Muller et al., 2015; Skeepers and Mbohwa, 2015; Pilbean et al., 2016; Smith et al., 2016), which indicates that a substantial part of leadership is a social process of control and communication between one and two parties (a leader and a follower) that is aimed at attaining a common goal and objective.

The significant connection between safety leadership and safety performance towards a positive safety climate (figure 5) has been well documented (Hoffmeister et al., 2014; Martinez-Corcoles and Stephanou, 2017; Zuofa and Ocheing, 2017). In addition, Nielsen et al. (2013), in their study in the Petro-maritime sector on safety climate directory for organisations, revealed that employees appear to have positive leadership behaviours when they feel a strong sense of safety climate in the organisation and employees who have a less positive view of safety climate show lower risk levels. A study carried out by Skeepers and Mbohwa (2015) argued that leaders must present actions and behaviours that will enhance the approach, and overall, the safety performance of employees is important in assessing whether the proper culture desired is being created.

In this vein, Pilbean et al. (2016) stated that the management of organisations is the ones who create and sustain a culture, not the employees. An important principle of safety leadership according to (Conchie et al., 2013; Skeepers and Mbowa, 2015; Sheehan et al., 2016), recommends that senior workers in any organisation, no matter the level of leadership, location or position, should centre their attention on ways to continue improving the safety of its employees through methods of communication, training and seeking their engagement (discussed in sections 2.8.3; 2.8.5; 2.8.7 below).

Over the years, the significance of leadership to workers safety has been evident through the establishment of safety leadership construct, which is transformational and transactional leadership explored in sub-sections below (Hoffmeister et al., 2014; Mullen et al., 2017; Wu et al. 2016; Darty-Baah and Addo, 2018)

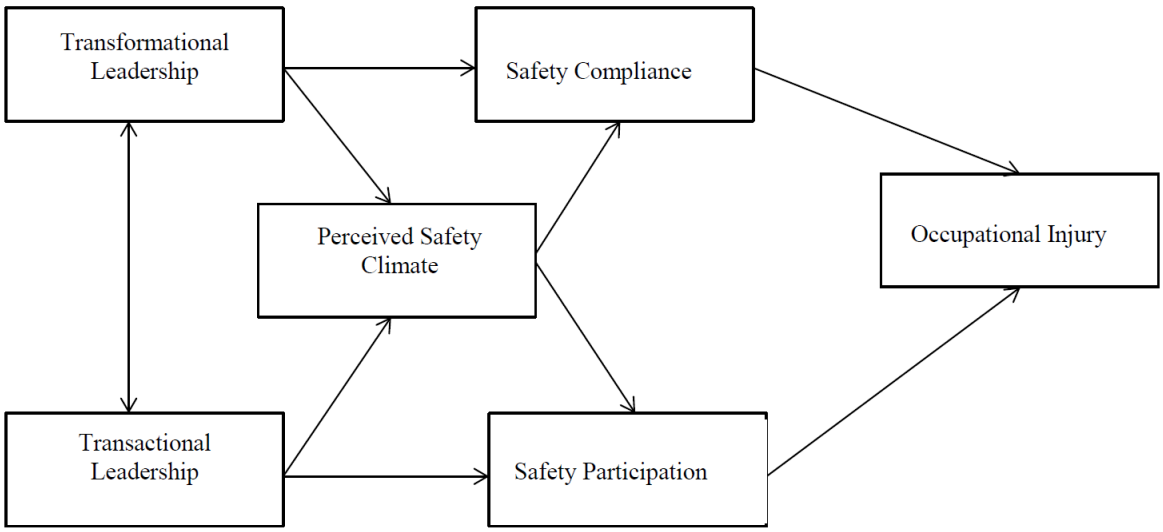

Figure 3: Illustrates the relationship between leadership, perceived safety climate and safety performance (Source: Clarke, 2013).

***2.9.2.1Transformational leadership*:** Transformational leadership style, according to (Griffin and Hu, 2013; Fernandez-muniz et al., 2014; Pilbean et al., 2016), is a method by which a great level of motivation and morality is done when both the leaders and followers carry each other along. Previous studies have concluded that this leadership style is seen to be hugely encouraging because in the process a leader is interacting with the follower on their values and beliefs, it motivates followers to attain a higher level of dependence and improve at tasks assigned without needing to be supervised (Muller et al., 2016; Darty-Baah and Addo, 2018). Transformational leaders are much more invested in the interest and development of their followers; they motivate them in ways that go beyond short-term interests, stressing essential needs that are of higher value (Hoffmeister et al., 2014; Smith et al., 2016) hence changing the interest of the follower from being self-centred to have a general interest. It was concluded by Dartey-Baah and

Addo (2018) that four facets make up leadership style which has been developed over some time; they are idealised influence (Admirable behaviour exhibited by leaders that are exemplary to followers). Inspirational motivation (communicate a version of safety inspire safety behaviour); Intellectual stimulation (encouraging workers to make use of creative thinking and innovation); and individualised consideration (displaying esteem regards and concerns for employees as individuals). Findings by Christian et al. (2009) revealed that transformational leadership has a stronger effect on employee safety participation than safety compliance. To support Christian et al. (2009) findings, a cross-sectional study of Smith et al. (2016) on the influence of leadership on employee safety in different fire departments revealed that transformational leadership has a more powerful association with safety involvement than safety compliance. Thus, this type of leadership gives more room for employees more avenue to be productive, prepare for upcoming barriers and find solutions to existing challenges.

***2.9.2.2 Transactional leadership*:** The word transaction demonstrates a trade between two or more people (Dartey-Baah and Addo, 2018). Hence, the transactional leadership style, according to Pilbean et al. (2016), interests' follower's closed-minded concerns. This leadership style depends on "exchanges" between a leader and subordinates, where the leader encourages the performance of subordinate with awards (Hoffmeister et al., 2014; Wu et al., 2016). In a similar view, Smith et al. (2016) noted a common reliance on mutual benefits in transactional leadership. This leadership style includes three facets: contingent reward (recognising and providing the right reward for positive behaviour and conveying the reward to employees. Active management by-exception (MBE-A) approach proactive-focuses on preventing and maintaining established routines and procedures and existing beliefs and traditions), and passive management-by-exception (MBE-P) approach reactively, focuses on corrections after the fact) (Hoffmeister et al., 2014; Bartey- Baah and Addo, 2018). It was found by Martinez-Corcoles and Stephanou (2017) that safety participation is indirectly influenced through safety climate, and safety compliance is directly influenced by functional transformational leadership. A study by Hoffmeister et al. (2014) debated that transactional leadership, about its dimensions of contingent reward and MBE-A,

has increased prospects in instilling safety compliance instead of safety participation of its remedial character ensures a strong compliance behaviour through punishment and incentives. On the other hand, many studies (Fernandez-Muniz et al., 2014; Smith et al., 2016) disclosed that there was no notable relationship between transactional leadership and the two safety behaviours generally.

Although there has been debate among different literature on transactional and transformational leadership, which is most effective in improving safety outcomes, Clarke (2013) debated that the only way safety leadership can be useful is if it consists of both transformational and active transaction leadership. Findings from the study revealed that both leadership constructs were significantly related to safety compliance and safety participation.

On the other hand, Hoffmeister et al. (2014) argued that though the surface of transactional and transformational leadership is highly intertwined, they are different in the way they are adopted. Studies of (Conchie et al., 2011; Wu et al., 2016; Bartey-Baah and Addo, 2018) suggest that some facets under the same leadership construct could be more major than others for forecasting behavioural safety outcomes. In line with this, (Hoffmeister et al., 2014; Smith et al., 2016) investigated the effect of the facets under transformational and transactional leadership on the components of safety behaviour on an individual level. Finding revealed safety participation was based on an idealised impact but not safety compliance, while individualized considerations and active management by exception frequently accounted for the least amount of variance. However, their research stressed idealised behaviour as the major indicator of safety participation. Shockingly, a study by Dartey-Baah (2013) also discovered a good relationship between idealised influence and safety compliance and safety participation, while only operational management had a positive influence on safety participation but not on safety compliance.

The above studies advised leaders to participate in various activities, and if workers participate in safety engagement, safety compliance could be determined by the behaviour the leader is modelling. Consequently, it is principal to differentiate between these two types of safety behaviours, as different facets of leader behaviour may influence them (Hoffmeister et al., 2014;

Smith et al., 2016; Dartey-Baah and Addo, 2018). According to Conchie et al. (2011), management should not be assumed that safety leadership style and attitudes would be passed through the organisation. The administration of how these attitudes is passed on to employees is required by engaging them to guarantee that managerial commitment to safety is correctly perceived (Conchie et al., 2011; Ek et al., 2014).

2.9.3 Employee Involvement in Safety

A crucial aspect during the safety culture assessment process is the willingness of employees to participate to have a profound idea on activities that need to be followed up, (Kilaparthi, 2014; Biddison et al., 2016), considering the importance it provides when employees feel the sense of empowerment, as they engage actively with their work processes and safety-related processes (Frazier et al., 2013). Both (Christian et al., 2009; Nævestad et al., 2018) concluded that positive organisational results such as reduced work-related injuries could be displayed when employees engage in safety, have all the required resources, and impressively, general safety culture is more related to workers engagement by complying to the laid-out rules and procedures. Boughaba et al. (2014) propose an effective safety management system (SMS) with a mechanism for employee engagement. Employees need to have a sense of involvement to ensure a positive safety culture, ownership, and commitment. It encourages them to have feelings such as self-worth, belonging, and value (Wold and Laumann, 2015). It was revealed by (Conchie et al., 2011; Raines, 2011) that employee engagement in safety behaviour can be improved by trust in management, thereby reducing accidents. Employees should be involved in safety training, safety communications and contribution and wearing of Personal Protective Equipment (PPE) (Choudhry et al., 2006). Nonetheless, although the workers play an important role, they may be unwilling to participate (Wold and Laumann, 2015).

With this, Nordlof et al. (2015) found out that workers might hesitate to be a part of the safety culture assessments because employees' contributions to safety concerns are often treated nonchalantly by the management, making them discouraged to be involved in safety contributions in the future. Their findings further revealed that organisations could decide

whether to stop production due to safety concerns asked by employees (Nordlof et al., 2015). Nevertheless, when something critical occurs concerning safety, be it a grave near miss or an accident, an immediate response to improve implementations is done (Nordlof et al., 2015).

It was also stated by (Griffon, 2016; Singer and Vogus, 2013) that in the workplace, whenever a safety problem occurs, workers already know where a lot of them come from. However, if they are not involved by asking for their suggestions, they do not feel obliged to getting involved in the safety program." Additionally, workers worry that if they provide feedback on safety issues or even give a bad comment, it could jeopardise their employment, create chaos in the workplace and double their work or co-workers. A study by Griffon (2016) further showed the importance of employee involvement in safety culture assessment during the investigation of Baker Panel's safety culture oil refinery in the US. As a result, a disastrous fire accident caused by an explosion resulted in many casualties, including the death of 15, leaving 170 people injured. The board recognised that workers might hesitate to trust and be a part in the panel discussion on safety culture survey, interviews, and meetings because of frontline employees not having a feeling of "psychological safety," i.e., to be ready to reveal difficult conditions or events and not be embarrassed by their colleagues or punished by their superiors. Indeed, Ek et al. (2014) stated that emotions such as that are the root and the first cause of improvement. Therefore, employees on the front line and all crucial stakeholders are expected to stay involved or be aware of the ongoing processes as soon as the safety culture assessment has been completed.

According to (Kilaparthi, 2014; Khubrani et al., 2017), many organisations fail to communicate the results of the self-assessment back to employees, who are very much presumed to deduce that the assessment was a ceremonial exercise carried out to cooperate with outside demands and that no meaningful changes will occur. Though seeing that communication and respect are key elements of safety culture, it is very visible that a safety culture assessment must communicate politely with employees during the process of gathering information and when the results are announced, and the plans of how to improve. By this, the interest of employees and effort to change will be maintained and will shape the culture concerning how management and employees treat each other as part of the same team (Frazier et al., 2013; Kasda, 2017). However,

companies are very mindful of the reports they produce in order not to reveal themselves to regulatory sanctions or legal actions asserting negligence (Frazier et al., 2013). In the view of Nielsen (2014), making safety a priority entails executive reminding employees of their accountability and inquiry for safety, displaying leadership by encouraging the movement of information important for organisational learning, the reason being over time, the price of withholding problems might have increased rather than just facing them early on as the price would have been less.

2.9.4 Personal Accountability and Inquiry Attitude for Safety

Personal responsibility is referred to as the perceived responsibility in the workplace concerning safety issues. Whereas employees are solely responsible for their safety and risky behaviour, which is part of their job requirement (Frazier et al., 2013; McCall and Pruchnicki, 2017)**.** Based on this, employees and management should as well possess an inquiring attitude towards safety, and this will be dependent on frontline employees' willingness to reveal mistakes and near misses and to communicate their thoughts and opinions to top management for work processes to be improved as regarding safety (Tangirala and Ramanujam, 2008; Kilaparthi, 2014). In addition, Henriksen and Dayton (2006) specified that leaders create an atmosphere by which followers can feel free to discuss the source of safety problems, encourage their attitudes, and commit to their responsibility of identifying risk and enhancing work procedures. Sadly, most times, frontline employees feel disinclined to report errors, particularly the mistakes from the commission, because they may be feeling that they are not responsible for safety than supervisors/managers do (Harvey et al., 2018; Amalia, 2019). Perhaps because of this, Nordlof et al. (2015) expressed that employees should not depend on or expect their supervisors or the company itself to be responsible for their safety when they are on their work shift; they need to be accountable for their safety, this is so as safety is based on the decisions and understanding of an individual when they are carrying out their task at work.

For example, a study by Blatt and colleagues (2006) discovered that medical residents indicated their views in precisely only fourteen per cent of cases of reliability errors. Residents only felt to

speak up thirty-nine per cent of the time, knowing fully well that there was a better way to hinder patients from getting harm, which is of much concern (Blatt et al., 2006). These examples of employees not talking immediately affect the outcome of work by limiting how managers have access to critical information of work. This is often caused by the counter effect and what may happen when spoken about, including the fact that mistakes resulting from taking steps are mostly linked to a much bigger sanction relative to the ones that resulted from inaction (Blatt et al.,2006; Henriksen and Dayton, 2006; Tangirala and Ramanujam, 2008).

Previous research of Pate-Cornell (1990) found these conditions to occur most particularly in the oil and gas sector. Rather than notifying opinions and thoughts when unsafe conditions are met, workers are expected by site managers to find other ways when there is a short delay in the production schedule, though officially, they claim the opposite. Talking helps in improving safety and safety culture is by identifying hazards and by making it possible to talk about, learn from and altogether stay clear from similar errors in the future (Frazier et al., 2013). A study by Naveh et al. (2006) also found out that a key element of a well-developed safety culture was at a soaring level, at which errors were being reported. Furthermore, speaking up helps give a more precise method of creating a proper cause of action. Consistently speaking up and raising concerns in work plans gives a large range of previous experiences regarding what works and what does not (Tucker and Edmondson, 2003; Amalia, 2019). Similarly, improved relationships formed among subordinates and their supervisors in an organisation helps to improve safety culture by encouraging constructive and open communication as regards safety and errors, which enables workers to learn from incidents and show more commitment to safety (Hofmann and Morgeson, 1999; Biggs et al., 2013). Such a high-quality relationship also helps in sustaining the chronic unease required in maintaining an effective safety culture as well as safe performance (Flin and Fruhen, 2015).

2.9.5 Safety Communication

Safety pieces of literature recognised the usefulness in communication; that is, reporting accidents, hazards, and incidents help in improving safety culture (Antonsen, 2009; Li et al.,

2018). Poor safety communication has earlier been identified as means of creating conflicts and confusion among employees in an organisation (Kilaparthi, 2014; Lyndon et al., 2015). There is a high chance that when health and safety procedures are not properly communicated, staff members misinterpret and may ignore it most times. By this, staff members would begin to have unintended interest in their jobs, which may lead to accidents and serious injuries (Kilaparthi, 2014). To acknowledge this fact, the study of Amernic and Craig (2017) explores the role that CEO language played towards safety culture in the Deepwater Horizon oil drilling disaster in Mexico. Their investigations revealed that the communication about safety was in a way that was unpredictable with the persistent safety culture, clearly stating that safety communication should be channelled in the right medium and, in a way, it should be understood in all levels of the organisation. According to Jiang et al. (2019), components of an Organisation's Safety Management System need to be consistently updated, communicated, and applied to employees across all levels of the organisation. The study of Li et al. (2018) refers to a safety management system as a strategy, procedure, or policy and activities followed or implemented by the management of an organisation aiming at the safety of their employees.

It was further argued by (Antonsen, 2009; Frazier et al., 2013; Wold and Laumann, 2015) that it is not enough for an organisation to have a safety management system in place, understanding the best medium to communicate safety information to employees in a way that is user friendly, understood, or easy to access in the petroleum industry is paramount. For instance, Wold and Laumann (2015), in their qualitative study on the communication of safety management system using workers in the oil and gas sector in Norway, found that employees preferred face-to-face communication. Workers saw this mode of communication to be more practical, interactive, and limit misunderstanding when compared to the IT-based safety management system that was currently used in the organisation as a way of conveying procedures, checklists, and descriptions regarding safety, which resulted in less motivation and misunderstanding to safety practices. Similarly, Nielsen (2014), in his quasi-experimental study, previously revealed that positive safety performance is linked to cordial and regular communication between managers and workers.

More recently, Nævestad et al. (2018) recommended that the position assumed by supervisors in managing the communications of their staff towards safety should be closely watched, knowing that supervisors are the mediators among the workforce and the organisation. It was proposed by Zohar (2010) that when the safety attitudes and safety actions of senior management are characterized as negative, it may show that not only is there an absence of communication of safety, but as well, more importantly, no confidence in management commitment of the part of their employees' safety. According to Arslan et al. (2016), other factors that may hinder effective safety communication across all levels of employees in the organisation could be barriers in language or dialect among the workforces. This seems to be a threat to safety in the workplace, thereby advising organisations to take drastic measures in improving this weakness to avoid any possible accidents or incidents from happening due to misunderstanding or insufficient communication and, in this way, enhancing their safety culture (Arslan et al., 2016). To this, Wold and Laumann (2015), in their study, found that one of the more specific complaints the employees had was the language used to communicate the company's safety management system. In the study, employees recommended they prefer safety information to be conveyed in their local dialect rather than in the English language. They also thought academic English was written in difficult and hard to comprehend grammar.

Several authors have recognised the importance of devising a workable means to convey safety information, considering a top-down communication, whereby management display to the frontline workers and mid-management that a positive safety initiative is important for the company's success (Dollard and Bakker, 2010; Kilaparthi, 2014). According to (Frazier et al., 2013; Oah et al., 2018), giving priority to safety by leaders and active dissemination of safety information to employees encourage them to participate in safety practice, report errors and incidents. However, Skeepers and Mbohwa (2015) argued that though most organisations try to put in a substantial number of attempts in communicating how devoted they are to safety in the workplace; still, it would appear in many instances that employees think that management is not dedicated to their safety but rather to production. As a result, they are unwilling to exert effort, not assisting co-workers with issues related to safety or reporting of error or incidents useful continuous improvement and learning in the organisation (Skeepers and Mbohwa, 2015).

2.9.6 Workplace Safety Continuous Improvement and Learning

Continuous improvement involves a continued attempt to identify subtle details and unveil potentials that have been unrecognised and therefore establish these potentials to pursue a safer performance (Ammouri et al., 2015; Elmontsri et al., 2017). According to (Parker et al., 2006; Cho and Choi, 2018), management research has recognised practices for introducing a continuous enhancement orientation through a well-organised learning practice referred to as after-event reviews (AERs). AERs is referred to by (Ellis et al., 2006; Frazier et al., 2013) as collectively managed discussions of previous experiences that instruct learners to consider the basic causes of their failures and accomplishments and therefore derive performance enhancement lessons. In other words, Ellis and Davidi (2005) stated that when people partake in AERs, experiential data is being elaborated on, taking cognisance of unforeseen loss, interruption, or even major discrepancies between expectations and reality. This evidence has been shown in the study of (Ely and Meyerson, 2010; Mearns et al., 2010) on the significance of organised learning and AER-like activities in high-hazard companies, including offshore oil and gas production and air traffic control.

According to Wagner et al. (2013), AERs are most educative when it takes place right after the event and include everyone who participated in the operation. Their organised format directs participants to collectively create a large representation that integrates their interpretations. It was indicated by (Ellis and Davidi, 2005; Fan et al., 2016) that AERs can also be a powerful vehicle for elaborating success, mainly when success might be a near failure in disguise. Elaborating is most beneficial when feedback has been given without any justification whatsoever and when the review is continued until a mutual understanding has been reached (Ron et al., 2006; Fan et al., 2016). During success elaboration, AERs analyse the internal logic of the mental model of task performance to recognise possible misalignments among acts and the circumstances under which they were performed.

It was stated by (Vashdi et al., 2007; Ammouri et al., 2015) that employee's reflection can also be enhanced through frequent or daily orientation sessions that analyse whether if the work of the day fulfilled the necessary criteria and targets and whether it offered lessons for subsequent

operations. Such questions asked may be what the reason for the occurrence was, and the lessons that can be learned to have a better outcome of the operation next time. According to (Tucker, 2007; Mazur et al., 2015), the continuous improvement further promotes safety culture when frontline employees report incidents, accidents, injury and reflect on minor but significant issues (e.g., rectifying co-workers' error, loss of materials, and lack of adequate staff), experience an increased sense of effectiveness, and developing substantial level of confidence in the organisation's leadership. Their reflections strengthen the other critical elements of safety culture by conversing with top managers and those in positions to address the systems involved. However, Ek et al. (2014) admitted that an important aspect of a safety culture is the creation of just-culture or trust in management or organisational leadership, in which feedbacks given on incidents and accidents are considered just. This builds an open and reporting culture.

In contrast, Nordlof et al. (2015) argue that failure or reluctance to reporting incidents or accidents may not only be attributed to a lack of trust between employees and management. Their study made them discover that most of the time, workers view documenting reports on incidents as tiresome and, most times, uncertain of how to go about writing it. The workers communicated that if they are to give an account of everything that happens, it means they would be writing the whole time (Nordlof et al., 2015).

To learn from accidents and incidents, effective safety management systems all require the combination of safety information from the operational production system and provide a foundation for continuous safety improvement (Ek et al., 2014). For instance, a study by Oltedal and McArthur (2011) showed in the maritime sector, under-reporting has been seen to be a major issue. The authors found that a higher reporting level in the Norwegian merchant fleet was associated with improved safety training, a transparent and trustworthy relationship among the crew members, constructive risk assessment activities conducted, and feedback on reported events. On the other hand, lower reporting was linked to a lack of commitment to safety from shore personnel (Oltedal and McArthur, 2011). Embarrassment about making mistakes or being foolish was also found in the study of Nordlof et al. (2015) to be another reason why employees do not report incidents. The employees expressed that the fact that the mistake happened is

humiliating enough and that they are not eager to write a report that explains the mistake they committed.

Furthermore, research on AERs has shown that improvement through lessons learned frequently spread across the organisation (Ron et al., 2006; Burstrom et al., 2014), building the coherence and shared perceptions that constitute safety culture. Continuous improvement through organised learning practices can as well assist in ensuring a more respectful work environment, encourage concerns to be raised, and improves work processes such as cross-checking orders. These practices aid managers in providing a more substantial and actionable review and cross-functional (e.g., operators and engineers) communication and enhancements to processes at work such that everything is in order (Vashdi et al., 2007; Ammouri et al., 2015). For example, a study by (Pisano et al., 2001; Fan et al., 2016) found that debriefing practices in surgical teams led to modifications in the ways procedures were arranged and teams were staffed, which then led to more success in executing new technology and improved safety.

Finally, AERs can simultaneously enhance devotion to safety actions and behaviour and an atmosphere for raising concerns. For example, AERs reinforce psychological safety by treating mistakes and near-misses as acceptable processes to learning (Lipshitz et al., 2002). At the same time, AERs create a clearer understanding of actions that cannot be accepted and strengthen personal accountability. According to (Dekker, 2009; Tsao and Browne, 2015), leaders can achieve this by establishing precise “red rules” that must be followed. If the rules are not adequately followed, there would be an immediate pause on all work activities until compliance is achieved. Thus, not only do AERs explain “never” acts formalized by “red rules,” but they also create conditions of greater accountability for leaders and peers. Additional accountability, however, does not imply extra humiliation and blaming but rather strengthens the principle of mutual responsibility to keep everyone on a secure path (Tsao and Browne, 2015).

2.9.7 Safety Training

Health and safety training is one of the evident roles which need to be fulfilled by the oil and gas industry to enhance the members of the organisation's level of awareness and understanding towards issues of health and safety (Nielsen et al., 2013; Strauch, 2015; Vierendeels et al., 2018). According to (Christian et al., 2009; Stemn et al., 2019), the role of health and safety training in the context of safety culture have been used to make employees aware of the dangers and risk involved with their assigned responsibilities and task. Moreover, such training procedures also enlighten employees on safety procedures and control measures for preventing such dangers or risks, thereby demonstrating the company prioritise safe work practices (Stemn et al., 2019).

Safety training was referred to by (Feng et al., 2014; Gao et al., 2019) as a program that includes all mandatory safety information, sufficient practice, and consistency that yield direct and indirect benefit for the organisation, that may include reduction of risks, threat and dangers and improvement in the current health status of employees. In this view, Arslan et al. (2016) found that workers were at continuous health and safety risk because they were not provided with training on how to cope with work-related fatigue. This potential risk may threaten the safety culture. It was also argued by Nordlof et al. (2015) that no amount of safety training is too much for workers and their study found that newly employed employee creates a more unsafe workplace because of insufficient amount of training and time allocated for training.

Training programs may also lead the oil and gas sector to experience a reduction in the number of absenteeism cases of employees caused on account of health problems and in the case of compensation claims (Choudhry et al., 2006; Kilarparthi, 2014). In addition, the oil and gas industries will witness a significant enhancement in the level of motivation and trust of workers and members (Kilarparthi, 2014). According to Wallace (2016), safety training in organisations is fundamental and crucial in occupational health and safety development. However, without a high level of employee motivation, safety training may not have an effective impact. For instance, a meta-analysis by Christian et al. (2009) found that employee selection and preparation would increase the dispositional factors associated with safety culture (safety motivation and safety knowledge), which can successively decrease the number of accidents and injuries in the

workforce. Finally, (Choudhry et al., 2006; Zaira and Hadikusumo, 2017) stated that training could enhance safe behaviour and that the long-term benefits include the right for workers to operate without harm so that they can continue to provide earning for both the company and for the family.

2.9.8 Safety Motivation

Motivation is one of the most important elements of a positive safety culture for every organisation, whether public or a private sector; motivation plays an important role in the safety success of the organisation (Zameer et al., 2014; Lim et al., 2018). Motivation in relation to safety at work is all about creating an interest and involvement in safety on a personal level regardless of the position an employee holds in the organisation (Andersson and Paqarizi, 2016). According to Lu and Yang (2010), safety motivation also has to do with the extent to which a senior manager creates a system to motivate and encourage workers' safety behaviours. Nonetheless, (Chen and Chen, 2014; Lim et al., 2018) argued that there exists no universal definition of safety motivation, but the definition mostly articulated across studies is the one from Neal and Griffin (2006), which they referred to as attitudes and views that are connected to the factors that determine safe or unsafe behaviours. According to Chen and Chen (2014), this definition explains the causality between motivation and behaviours. It is presumed that the more motivation workers have towards safety, the more they are willing to practice safe behaviour. To this effect, the previous study by Lu and Yang (2010) examined the importance of safety leadership and safety behaviour in container terminal operations for effective safety management. Their finding revealed that safety motivation and safety concern positively influenced self-reported safety behaviour (i.e., Safety compliance and participation). However, De-Koster et al. (2011) argued that safety motivation should have distinct effects on each component of safety behaviour, which made an earlier study of Neal et al. (2000) hypothesize that safety motivation should have a greater relationship with participation instead of compliance because activities that are participated in are regularly voluntary, whereas compliance is generally mandated. Contrarily, their findings revealed that the relationship between motivation and compliance was greater than the

relationship between motivation and participation. Conversely, the authors explained that the findings might be due to the study limitation, as the scale used in calculating motivation did not cover all the aspects of motivation relating to safety performance (Neal et al., 2000).

More recent studies (Skeeper and Mbohwa, 2015; Panuwatwanich et al., 2017) further noted the importance of safety motivation on workers safety behaviour by stating that it can lead to accident and reduction in injury, improvement in employee relations, protection against business interruptions, improvement in reliability and productivity, building up public trust, building organisational capability and compliance with the law. However, in most organisations, the increase in employee productivity and efficiency are the primary aim of motivation (Merchant and Van-der-Stede, 2012). In this view, Maslen and Hopkins (2014) stated that when the management of an organisation focuses the motivation system on high efficiency and productivity, it gives room to indirect incentives for a greater emphasis on the production rather than the safety of employees. In this regard, Maslen and Hopkins (2014) recommended that the same way organisations motivate for factors such as productivity, safety should not be excluded in that same vein.

The consequence of breaching safety motivation is an example in the dramatic case of the BP oil spill in the Mexican gulf in 2010 (Andersson and Paqarizi, 2016). They discussed that, among other things, the safety objectives included in the firm were weak or in conflict with other goals within the company. The BP oil spill brought about tremendous adverse consequences on human lives, the environment, and later expensive lawsuits (Andersson and Paqarizi, 2016). Nevertheless, safety in the workplace is way more than financial repercussions; it is a part of the basic human value interest that shapes the principles of modern society. According to (Pordanjani and Ebrahimi, 2015a; Panuwatwanich et al., 2017), the outcome of employees working in a dangerous work atmosphere may lead to early retirement from work or the whole business together with health problems or even an impaired quality of life.

Creating real motivation to improve safety has been a hotly debated subject for years, and in consonance with (Krause, 2007; Kapp, 2012; Zohar, 2014), approaches towards safety motivation

in the organisation fall roughly into two categories, which is the transactional and transformational approach which are discussed in the next subsection below.

2.9.8.1 Transactional and Transformational approach: Transactional approaches to safety motivation attempt to create inspiration by offering something in return when an employee work and shows interest in safety improvement (Griffin and Hu, 2013; Pilbean et al., 2016). According to McDermott et al. (2018), activities in this category include gratuity or awards for group performance, rewards, or incentives for the performance of safety activities, including safety as a metric in the performance and compensation of a leader. In Gupta and Shaw (2014) view, using incentives and awards to encourage employees can add interest to an organisation's hazard control program and strengthen the workforce's self-protection behaviour (San et al., 2012; Gupta and Shaw, 2014). In addition, San et al. (2012) stated that a well-organised reward system should be categorized by a high level of visibility in the organisation, offering recognition that can help amend behaviour.

It was suggested by Zameer et al. (2014) that, giving a group or individual's goods, merchandise, or even cash resulting from actions (such as incident frequency) or participation in safety activities are all included in forms of incentives. Following Choudhry (2014) view, using systems like outcomes-based incentives, (i.e., reward me or punish me) for things which employees have little or no control over like the practices of a workgroup on another shift; this can dissuade reporting of injuries and influence the creative classification of incidents, provision of weak feedback and reinforcement for safety activities, and creating a sense of entitlement that erodes the value of safety performance. In addition, even when the incentives are tied to fundamentally valuable activities (for instance, safety observations or hazard reduction), offering an exchange undermines the integrity of these activities over the long term (Choudhry, 2014).

In effect, these activities are being treated as though an additional effort was done, whereas it is how the work is expected to be performed. In this situation, mechanical actions are being stimulated by the incentives (e.g., attending safety meetings, doing the needed observation) without completely guaranteeing that the activity is impactful or sustainable (Hopkins and

Maslen, 2015). The assumed motive for partaking in the activity shifts from the actual benefit in carryout such to the "reward", and therefore, if the reward is removed, there will be no obvious reason to continue (Krause, 2007). Using this method, a culture in which safety is trivialized is established, other than one in which safety is regarded as a significant measure of a company on the part of profitability or production (Hopkins and Maslen, 2015).

Earlier, (Kim, 2018; McDermott et al., 2018) are of the opinion that, safety incentives could be more functional at the senior level to a certain extent. Often, leaders oversee the means to produce actionable results, and in the end, they are responsible for them. Transactional motivation can, however, promote overemphasis on tactical thinking. For example, if a leader is appraised and compensated on a particular metric (e.g., reduced rates of accident recorded or injury or cases of workers compliance), they are likely to concentrate on that area with the exclusion of broader issues such as the real values required to be an effective safety leader. Therefore, relying on this approach can possibly encourage leaders at an intrinsic level (McDermott et al., 2018).

Unlike the transactional approach, in the experience of (Lu and Yang, 2010; Kapp, 2012), the transformational approach is a more functional technique of motivation, and it is the involvement of employees, groups, or leaders in the true process of improving safety. Studies of (Darty-Baah, 2013; Muller et al., 2016) are other examples that have found this approach to be highly motivational. According to (Kines et al., 2011; Ahmed and Faheem, 2020), the reason for engagement motivation focuses on having people linked to the organisation's safety processes at each stage, making them feel control and participation, and actively doing things to enhance safety on behalf of the organisation. In other words, the employee is attached to the job on a personal level. In the same vein, Dartey-Baah and Addo (2018) explained that engagement motivation is the connection between an individual's multi-level (the intellectual, emotional, and creativeness) and psychological levels and the work they do. The most productive way to do this is by involving them, assigning them real duties to make the mechanisms and process work (Smith et al., 2016).

In conclusion, transactional motivation is unsatisfactory since the fundamental motivations that encourage participation in any job activity are not addressed (Krause, 2007). The most important driving factors related to work do not have anything to do with salary, benefits, or other external elements, as indicated by (San et al., 2012; Zameer et al., 2014). Incentives are necessary but giving them only puts the organisation in a neutral position. Accomplishment, appreciation, and the job are most essential for driving interest in work efficiency. Financial and other substantial incentives, while they are more appealing in the short term, do not appeal to this drive over a long time and cannot produce inspiration on a personal level all on their own (Krause, 2007). Overall, the implementation of a safety culture in the oil and gas environment is not an easy task, according to (Galis et al., 2018; Iqbal et al., 2019), as there can be different challenges opposing its successful implementation.

2.10 Challenges in the Implementation of Safety Culture

There are several issues encountered while implementing a safety culture in the oil and gas industry work environment. According to (Quartey and Puplampul, 2012; Agwu and Olele, 2014; Nayak and Waterson, 2017), the initial challenge involves the ambiguous concept of safety culture, followed by the fragmented and diverse nature of the industry, management commitment, and employee involvement, which are discussed in the next subsections below.

2.10.1 Safety culture as an ambiguous concept that is difficult to measure

The concept of safety culture has been in existence for over 25 years, and there are diverse definitions and measures articulated across studies (Nayak and Waterson, 2017; Gao et al., 2019). Nonetheless, each industry segment and each company must put into consideration the meaning of safety culture in its context; the behaviours that are critical to sustaining such a culture; the implementation of an effective measurement system that requires more resources and thought rather than merely adopting standard tools (Bahari and Clarke, 2013; Vassem et al., 2017). It was stated by Frazier et al. (2013) that in many oil and gas industries, safety culture is compared with

having a Safety and Environment Management System (SEMS). Safety and Environment Management System (SEMS) are basically management tools and strategies that include other processes such as goal setting and measures for continuous improvement. As such, it is about roles and responsibilities, essential but not adequate to certify a positive safety culture, which complements SEMS by expanding on why and how to manage safety (Frazier et al., 2013). In addition, Edwards et al. (2013) mentioned that until the definition of safety culture is done in the context of a particular organisation, including its employee behaviours as well as management practices, the assessment and specification of the concept will be a challenge, so also the effort in trying to effectively improve the safety culture. The work of Ariss (2003) further explained the complexities of the safety operation system of companies in the oil and gas industry. The author highlighted that most oil and gas companies globally have appreciated the importance of a safety system and have also implemented it. However, the complexity and difficulties companies encounter in the implementation of safety systems discourage other companies in the development and implementation of safety systems. A good example in this context is that of Esso's Gas plant, which had a plant explosion incident in 2005 in Melbourne due to the complexities in the company's safety management system. Furthermore, the safety management system of the company had so much complication that the employees and personnel had challenges in handling and using it. Difficulties and challenges of this nature prevented employees and other personnel from understanding the threatening signs and dangers the system depicts, which led to the huge explosion (Ariss, 2003).

2.10.2 The Fragmented and Diverse Nature of the Industry

The activities carried out in the oil and gas industry are heterogenic, including drilling and production, which are done under several varying organisational arrangements, including diverse groups of subcontractors and contractors to unmanned smaller platforms with one or two crewmembers (Onyi-Ogelle, 2016). Due to this heterogeneity and competition, Agwu and Olele (2014) stated that setting uniform rules, achieving industry-level agreement, or perhaps sharing information can be challenging. Furthermore, according to Khdair et al. (2011), the economic

costs, benefits, and cultural values surrounding safety may also differ across operational activities, including seismic, construction, drilling, production, and logistics (air and marine). However, larger contractors and operators recognise the value of investing in safety, especially as regards the long-term cost to operational activities and organisational reputation when they fail to do so (Kim et al., 2016b). On the other hand, smaller sub-contractors, contractors, and operators tend to vary in how they approach safety (Kim et al., 2016a).

A contribution made by Marcella et al. (2013) expressed that some oil and gas industries have outstanding internal communication as regards safety and a dedicated and advanced approach in achieving it. On the other hand, other oil and gas companies may maintain a mindset and practices focused on a minimum safety level. For instance, inadequate safety training, selecting contractors based on low cost without considering their safety records. As a result, those without the capacity to afford the near-term costs of safety investments may hold back information regarding unsafe practices and accidents to minimise additional costs (Marcella et al., 2013). In addition, previous studies noted other key issues to be the interface between organisational safety and national culture (Mearns and Yule., 2009; Cigularov et al., 2013; Reader, 2019). This includes the combined programming of the mind developed because of growing up in a particular country, for example, legislation, political regime, level of planning and education, power distance, masculinity, and femininity and so on). However, findings from the empirical studies on the effect of national culture on safety performance and behaviours indicate a low impact, but it will be useful for future studies to address the problem of fundamental national values on safety culture (Mearns and Yule, 2009; Kilaparthi, 2014).

2.10.3 Management commitment to safety

The understanding, engagement, and commitment of top management personnel of organisations in the oil and gas industry differ regarding how they develop and sustain a strong safety culture (Ek et al., 2014). While there are pockets of excellence, leadership problems still exist in areas such as setting strategy, initiative deployment, attaining business goals while modelling safety as a value (Vinodkumar and Bhasi, 2010; Gutberg and Berta, 2017). According

to Zohar (2014), management that rewards productivity but fails to constantly recognise safety performance, or managements that give more relevance and importance to production than safety, end up creating an environment where safety culture erodes. Another main problem mentioned by Clarke (2013) that can derail an organisation's safety culture is leadership transition. They further explained that most times, new leaders, and managements do not have a good orientation on the importance of safety and fail to take full responsibility for its enactment, even with the implementation of a good system. In consonance with Kilaparthi (2014), most top management in oil and gas firms believe that it is no need to allocate resources that will be used to cultivate safety culture and values since personnel and employees will learn it from experience while carrying out their daily activities. This approach from the top management in the oil and gas industry has always been a major problem in implementing a safety culture. Adequate financial, human, and technical resources are required in implementing safety culture. However, failure to appreciate the importance of safety culture results in delays and interruption in the implementation process of safety culture in the oil and gas industry (Boschee, 2014; Iqbal et al., 2019).

2.10.4 Employee involvement

The absence of employee involvement is also another major issue that affects the development and implementation of safety culture in the oil and gas industry (Huang et al., 2010; Quartey and Puplampul, 2012; Ek et al., 2014). The authors explained one of the main reasons that make workers in the oil and gas industry show less genuine participation and involvement when implementing safety culture is associated with the announcement of incentives which is usually based on the reduced cases of injuries and accidents. Workers get rewarded or receive incentives when fewer cases of injuries are reported, originating the feeling that safety culture assesses their performance in conformity with the number of injuries and accidents (Speegle, 2012; Shirali et al., 2016; Ehiaguina and Moda, 2020). The process workers adopt to reduce the occurrence of accidents is not considered and rewarded. Processes only receive a reward when it successfully prevents injuries and accidents; otherwise, workers might be discouraged to implement safety

culture and values (Speegle, 2012). A further ramification of such a reward system, according to Ahmed and Faheem (2020), is that it may discourage workers from reporting incidence, leading to their less engagement in using a safety system for documenting risks and dangers. This ignorance on the worker's part and deficient safety records may hamper the organisation from learning from the previous incidence for a greater enhancement in their safety management practices, consequently hinder the growth of a positive safety culture in the workplace. However, it is not possible to create or change the safety culture of an organisation overnight or within a short period but, the safety culture of an organisation is developed with time because of history, workforce, work environment, management leadership, health, and safety practices. These factors are much likely linked with the safety culture of an organisation (Frazier et al., 2013; Kilaparthi, 2014). Even though the eight elements of a strong safety culture reviewed in this chapter is supported by research, however, studies of (Hope et al., 2010; Zohar, 2014; Pordanjani and Ebrahimi, 2015b) argued that, apart from the discussed above elements, other factors such as psychosocial risk factors have been found to also influence on employees' safety behaviour, which in-turn impact of their safety performance. According to (Clarke, 2010; Leka et al., 2011), psychosocial factors focus on how work is designed, managed, or organised concerning environmental and social context, including its effect on the psychology, physiology, thinking process, and relationship of members of an organisation.

2.11 Psychosocial Factors

In the oil and gas industry, psychosocial risks can have a significant impact on the outcomes of health and safety; hence, it is crucial to handle these risks in a similar way as other operational risks (Bergh et al., 2018). Psychosocial risk factors were referred to by Dormann et al. (2018) as factors that may influence employee's psychological responses to their work and workplace conditions. In recent years, findings from research and studies about occupational accidents show that psychosocial risks do not only affect an individual's health and safety but as well affects the safety culture of the organisation (Idris and Dollard, 2011; Tang et al., 2018). It was revealed by (Huang et al., 2010; Nielsen et al., 2013) that a safety culture /climate survey is not complete

without the measurement of these factors. In line with this, Hope et al. (2010) stated that indicators of safety culture/climate on their own has a limitation, hence it only explores limited features of safety shaping organisational factors and fails in facilitating further analyses concerning how the outward manifestation of safety is shaped by the underlying culture. Psychosocial factors cover a large facet from personal dimensions such as workload and work-life balance to organisational dimensions (Moncada et al., 2014).

The association between safety culture or climate and psychosocial work stressors (Figure 6) was found by (Flin et al., 2000; Nævestad, 2017; Tang et al., 2018). The authors described the association between safety culture/climate and psychosocial factors by amplifying that fundamentally, the driving factor behind climate is a culture that governs the norms, values, and expectations of members of an organisation that ultimately affects their attitudes, perceptions, and intentions (three key features of climate). According to Tang et al. (2018), culture and climate mainly concern systems involving humans, which means in a purely technical system consisting of only machines, these features are usually downplayed. On the other hand, psychosocial factors, which include psychological and social factors, shape culture in a social-technical system. Hence, an organisation is often seen as a socio-technical system when there is an interaction between humans and machines, which applies to the oil and gas industry. About this, evidence from Nævestad et al. (2015) study on the association between psychosocial risk factors and safety culture shows that workers whose safety culture score report is low usually have increased work pressure which leads to stress, known as one of the main impacts of psychological risk factors in the high-risk industry.

Figure 4: The relationship between culture, psychosocial factors, and climate in a socio-technical system (Source: Tang et al., 2018).

Psychosocial factors consist of different categories, which may include work pressure (workload, work pace, work schedule, and time constraint), job demand (role ambiguity and job insecurity), and Job resources (organisational culture and function) (Bergh et al., 2014; Moncada et al., 2014; Pordanjani and Ebrahimi, 2015a). According to Bergh et al. (2018), job demands refer to psychological, physical, mental, and including psychological costs, while job resources refer to psychological, physical, social as well as organisational aspects of a job that supports the accomplishment of goals and objectives at work, minimise job demands and help in stimulating the growth and development of employee (Bronkhorst, 2015; Bergh et al., 2018). These psychosocial risk factors are all contained in the psychosocial work environment of an organisation (Hystad et al., 2013; Raslear et al., 2013). According to Bergh et al. (2016), the psychosocial work environment usually has a link with the organisation management and design of work as well as its social and organisational context, which can cause physical and psychological harm that affects the performance of the organisation.

Psychosocial risk factors have also been found to be a leading cause of work-related stress and fatigue, which in turn result in major physical health problems for employees (Leka et al., 2011; Parkes et al., 2012; Bergh et al., 2018). This is evident in the study of Hystad et al. (2013) when

they investigated the effect of safety climate and the psychosocial work environment (job demand and job control) on the reported fatigue of seafarers working in the oil and gas re-supply industry. Their findings showed that both organisational climate and psychosocial work environment were directly significant to work fatigue. According to (Parkes et al., 2012; Sneddon et al., 2013), oil and gas works have various crucial work features that influence fatigue, such as prolonged work hours, sleep disturbances because of motion noise, and night work. However, (Chan, 2011; Hystad et al., 2013) mentioned that fatigue has been an under-researched issue in the oil and gas sector when compared to other industrial sectors. Findings show that work-related stress is the second most common work-related health issue that affects workers (Rowden et al., 2011; Trivellas et al., 2013; Alosaimi et al., 2016). Furthermore, work-related stress is also a responsible factor in accumulating extra expenses for companies and countries since it has a direct impact on productivity because of presenteeism and absenteeism (Brattig et al., 2014; Bergh et al., 2016).

According to Dias et al. (2016), occupational stress happens when an individual is not able to meet the demands their job requires, which results in discomfort, distress, behavioural changes, negative feelings, and sleep disorders. Investigated was carried out by Rennesund and Saksvik (2010) on how psychosocial work environment (organisational feature of job, work pressure) may relate to job stress of employees in a production company in Norway. Using a quantitative approach and their findings shows that norms guiding performance, attendance, productivity level, and work pressure in the work environment are directly and positively linked to job stress experienced at the individual level (Rennesund and Saksvik, 2010).

Work pressure is made up of excessive workload, including excessive work-pace and time constraints, which has become a causal factor for unsafe work behaviour and occupational accidents (Bailey et al., 2015; Pordanjani and Ebrahimi, 2015b). According to Bronkhorst (2015), work pressure increases individuals' chances of sustaining injury and accident, especially when the shortcut work method is adopted. Furthermore, (Bronkhorst, 2015; Amponsah-Tawaih and Adu, 2016) stated that when it involves factors such as time constraints, workers tend to have the perception that taking risk is part of their job. In other words, workers realise they have

limited time to follow safe practices. In addition, there is a high tendency that work pressure can result in increased psychological stress among workers, which also increases the possibility of occupational accidents (Bronkhorst 2015; Zadow et al., 2017). Hence, workers are likely to overlook safe procedures in situations when prompt action is required. These unsafe behaviours and shortcuts often become the norm because, in most situations, workers can carry out their tasks much more effectively and quickly. To support this fact, the study by Lusa et al. (2002) found that working overtime increases the risk of accidents amongst firefighters in 71 fire brigades in Finland. Their findings indicate that the risk of job-related accidents is higher for workers who work more than 70 hours per week compared to workers who work below 50 hours per week (Lusa et al., 2002). Findings from Storkersen (2017) study on ten coastal cargo vessels sailing along the coast of Norway shows that 33% of the participants reportedly took risk most of the time while carrying out their job, while approximately 40% violate procedures in carrying out their job particularly because of the demand of efficiency. Hence, this implies that safety behaviour is influenced by work pressure. Other exogenous factors seen to influence workers safety behaviour in the Nigeria oil and gas industry is associated with poor and ineffective enforcement of existing health and safety regulations in the sector (Umeokafor et al., 2014).

2.12 Health and Safety Regulations in the Nigeria Oil and Gas Industry

In Nigeria, the Minister of Petroleum Resources is responsible for making regulations on matters relating to oil prospecting licences (OPLs) and oil mining leases (OMLs), including matters relating to safe working, enquiries into accidents and the prevention of pollution of water courses and the atmosphere (Kadafa et al., 2012; Raji and Abejide, 2014). In this regard, some of the main regulations enacted to guide the safe operation of the Nigeria oil and gas industry were Mineral Oils (Safety) Regulations 1963. This regulation prescribes standard safety measures and imposes duties relating to safety of operations on holders of OPLs and OMLs. The Petroleum Refining Regulations 1974 require measures to be taken that will prevent and control environmental pollution and ensure that all on-site personnel have suitable protective clothing, equipment and appliances as approved by the Department of Petroleum Resources.

Another piece of regulation considered for the enhancement of safety within the industry is the National Oil Spill Detection and Response Agency (Establishment) Act 2006 which prescribes guideline and responsibilities in dealing with waste emanating from oil production and exploration and its potential effect on the environment.

National Environmental Standards & Regulations Enforcement Agency (Establishment) Act, 2007 generally empowers the National Environmental Standards & Regulations Enforcement Agency (NESREA) as government agency to preserve and maintain public health and welfare as well as ensure the prohibition of the discharge of hazardous substances into the air, land, and waters of Nigeria (Raji and Abejide, 2014; Ewulum et al., 2020). Oil facility operations in Nigeria are encouraged to also comply with several International Standard, including ISO 14000 (a series of environmental management standards developed and published by the international organisation for standardisation (ISO) and OHSAS 1801/IOS45001 as a means of demonstrating their commitment to health, safety and environmental issues related to their operations (Ayoola, 2011; Oruh and Mordi, 2018).

The Department of Petroleum Resources DPR a national regulatory agency in Nigeria is tasked with the primary statutory responsibility of ensuring compliance to existing laws, regulations and guidelines in the oil and gas industry by every stakeholder (Kehinde and Banjo, 2014). Regrettably, lack of enforcement is the major challenge deterring the effectiveness of health and safety regulations in Nigeria. This negatively impact on workers safety behaviour, and can lead to increase in accident, injury, and fatality rates if nothing is done to improve occupational safety and health (OSH) in Nigeria. As a result, more should be done to improve enforcement of OSH regulations, as this will improve the status of OSH (Umeokafor et al., 2014; Waziri et al., 2015). Accordingly key Issues to enforcement of OSH Regulations in Nigeria have been noted to be lenient penalty for violation, political influence, corruption, and bribery, inadequate funding, insecurities, inadequate information, poor technology, and economic growth, as well as safety culture and national culture (Okojie, 2010; Diugwu et al., 2012; Idubor and Oisamoje, 2013) to which offenders often base their action on this premise. Efforts of the government in addressing these lapses have been expressed as not impressive and does not signify governmental

commitment to OSH (Idoro, 2011; Idubor and Oisamoje, 2013). Hence the need for Governmental support or commitment be enhanced and success from such action on the government side will hugely contribute to the improvement of OSH enforcement in Nigeria oil and gas sector (Diugwu et al., 2012).

Having reviewed diverse occupational safety literature relating to endogenous and exogenous factors influencing workers' safety behaviour in this chapter, the next chapter will present the methodology adopted for this research.

3.0 CHAPTER THREE: METHODOLOGY

3.1 Research Methodology

Research methodology is the procedure by which researchers go about their work of describing, explaining, and predicting phenomena (Mohajan, 2018). According to Kumar (2019), it can also be referred to as the study of methods by which knowledge is gained and design an achievable plan for the research goal earlier considered. Saunders and Lewis (2012) argued on the importance of adopting the right methodology in working through identified research problem and as it is vital for the researcher not only to know the research methods necessary for the research undertaken but also the methodology. In the light of this, a detailed design of research methodology was included in this research to help facilitate the dissemination of the research philosophy, strategy, methodology, and methods that have been considered principal for this research at hand. Moving forward, a methodological framework that sets out the approach adopted in structuring the research pathway used is explained in the next section.

3.2 Methodological Framework

It was noted by Saunders et al. (2009) that several researchers fail to rely on or recognise the philosophical stand of their research, instead, they rush into decision making about the method for collection of data to adopt and how it will be analysed. In the light of this, Reed et al. (2021) opined the adoption of philosophical assumptions should be rooted around the researcher's decision making, which makes it easier to bring sets of beliefs or worldviews to the research project. As such, the prerequisites of a good research exercise entail that the researcher's worldview or assumptions are argued well and made explicitly clear. This will give readers the awareness of the possible sources of influence on the researcher (Reed et al., 2021). To guide researchers on the best approach to design a research project, the "research onion concept" as developed by Saunders et al. (2015) help providing a stepwise clarification of what each research process should focus upon thus, clearly ascertaining a transparent manner to decide for a research project. These ten research philosophies, as outlined by Saunders et al. (2009),

demonstrate the construct of knowledge development from the researcher's perspective (figure 7). However, this became so cumbersome for researchers to decide on the ideal philosophy they could adopt. As a result, a review was made on the onion theory (Figure 8) by (Saunder and Tosey, 2013).

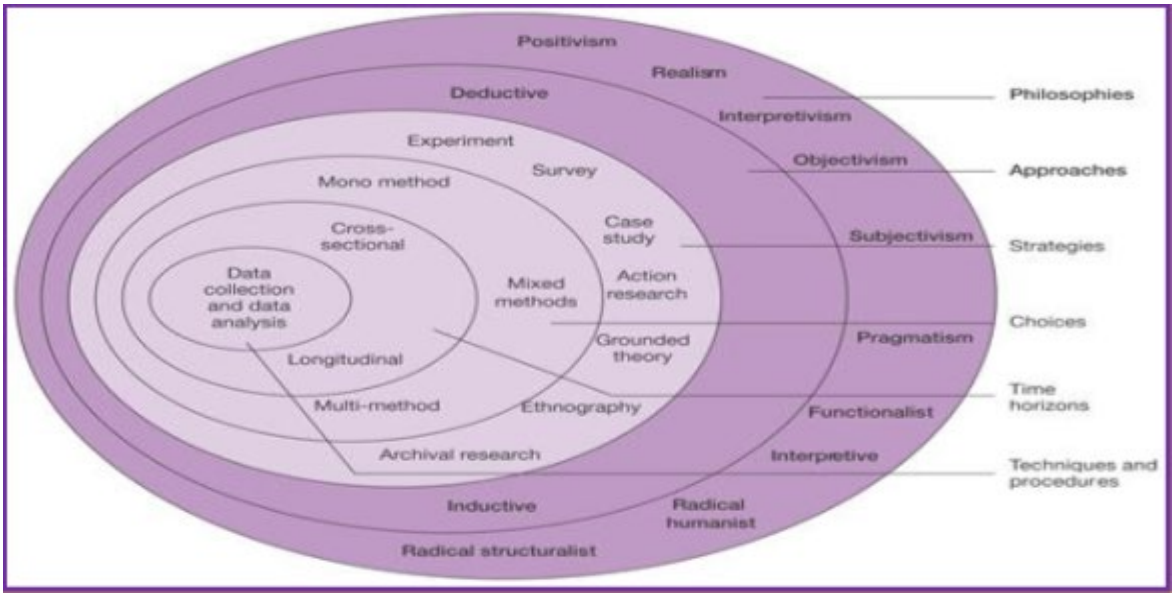

Figure 5: The framework for research based on onion concept (Source: Saunders et al., 2009)

Over the years, Sunders and Tosey (2013) crucially improved the clarity of the onion concept. This improvement revealed that the researcher’s knowledge, coupled with decisions concerning the processes taken for the research methodology, its method of data collection, and analysis, forms the core issue towards understanding the research philosophy (Saunders et al., 2007; Saunders and Tosey, 2013). Using this argument, it was permissible to consider positivism, interpretivism, realism, and pragmatism as possible research's philosophical perspective before deciding on the philosophical stance to take in this research (figure 2).

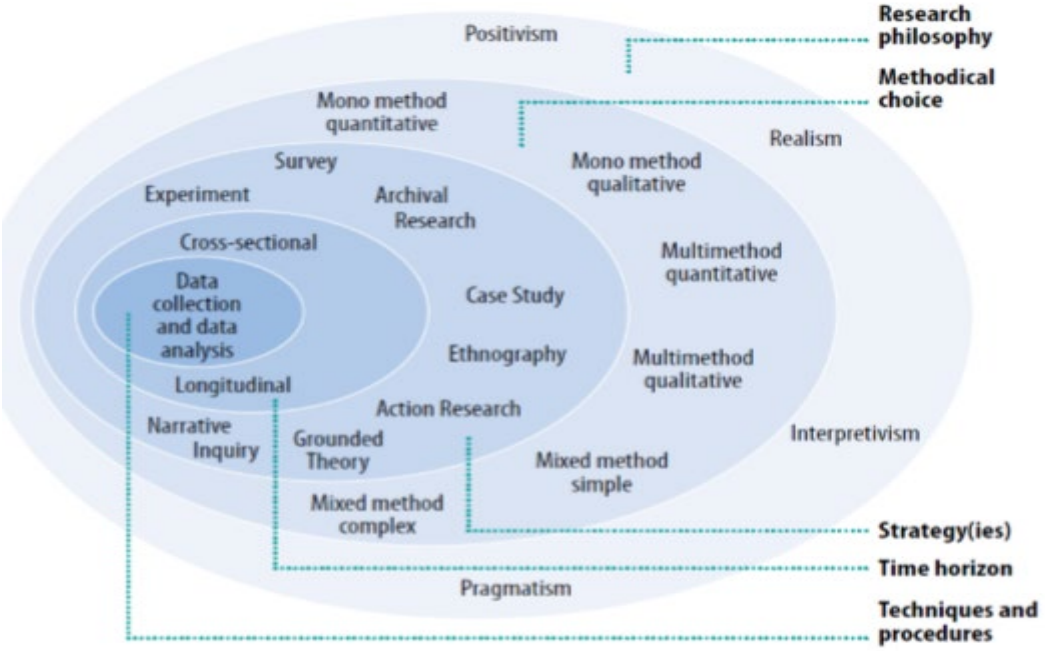

Figure 6: Research Onion (Source: Saunders and Tosey, 2013).

3.3 Research Philosophy

Research philosophy refers to the formation of knowledge, also with the specific quality of knowledge (Saunders et al., 2007). Such perspective may be too broad; however, Saunders et al. (2015) further explained that the general concept of research philosophy is also the reason why researchers set out to undertake the study in the first place. As such, understanding research philosophy can assist the researcher to clarify and understand the method being adopted, gain information and help the researcher with various issues and methods in their study, as well as help with filtration of unrelated studies (Collins and Hussey, 2009). Overall, the practical implications usually guide the selection of research philosophy.

3.3.1 Positivism

Positivism is a philosophy that has its root in natural science, where the emphases are placed around trends and patterns rather than individuals (Park et al., 2020). Positivists prefer quantitative research, such as large-scale questionnaire surveys, since it offers good representativeness and reliability of data under consideration (Rivas, 2010). The positivism approach has an atomistic and ontological perspective of the world in general, as it relates with observable aspects around events, which relate to each other regularly and directly (Saunders et al., 2015). Even if using scientific reasoning may be ideal for this research, the issue of safety behaviour in this research also borders much more on the social-cultural perspective, where individual perception on the factors influencing worker's safety behaviour will be explored to make an informed conclusion. Therefore, it will not be appropriate to rely on positivism as a sole or key philosophy for this research.

3.3.2 Realism

According to Zachariadis et al. (2013), realism is a research philosophy that depends on the idea of independence of reality from the human mind. It takes its root from the hypothesis generated around the scientific approach to knowledge development. Scientific realism has to do with the belief that the world can be understood through a range of theories. As such, realism estimates the associated matters in the global setting that can create the results believed and viewed by the people (Easton, 2010). This philosophy can be viewed from two major perspectives. Firstly, direct realism, which portrays the world through personal human senses. Secondly, critical realism focuses on the fact that human sensation and images of the real world has been deceptive and usually does not portray the real world (Roberts, 2014). Based on this, realism aims at addressing two major issues; firstly, it strives to promote realism as being the truth, such that once the reality has been shown, it is independent of the way the human mind thinks about it. The second is that realism strives to develop the understanding of human behaviour (Roberts, 2014; Fletcher, 2017). Applying realism as a philosophical approach towards the present research can be difficult because safety culture and the way it is perceived by people would be difficult to

be de-associated from human thinking in an objective way (Saunders et al., 2009). Therefore, this philosophy was not considered a fit for this research.

3.3.3 Interpretivism

Early contributors opined that Interpretivism as a philosophy articulates the way researchers distinguish the perception people may hold around research issues and the way the same issue would also be viewed by natural science (Weber, 2004; Leitch et al., 2010). This philosophy aims to analyse the complex and intricate individuals and different people experiences and their effort at understanding the same objective reality in various ways and have their very own different reasons for acting in the world. Thus, scientific methods are inappropriate (Saunders et al., 2015). Interpretivism heavily depends on the perspective of social scientists endeavouring to model the subjective element of the research procedure to enable them to understand the importance of any social action (Chowdhury, 2014). Although this philosophy type has qualities that can enable the researcher to evaluate safety culture and behaviour and assess the social-related data, however, interpretivism does not work with quantitative research method which forms part of mixed method of data collection for this study (Saad, 2016).

3.3.4 Pragmatism

Pragmatism assumes that the best way to go about research by any researcher who has inquiry questions is the use of research questions rather than focusing on research methods; through this, the value that researcher adds to knowledge and its processes can fall in place (Morgan, 2014). This means that pragmatism is contrary to the argument that a researcher needs to explicitly state what they think may impact their study by adopting any research method they feel may work best for the research problem under investigation (Servillo and Schreurs, 2013). For a pragmatist to effectively commence research, it would require an apparent research question that can deliver issues devoid of any uncertainty and investigate the problem from various perspectives, depending on the purpose or objective of the inquiry (Maarouf, 2019). With this stance,

pragmatism is often known to be able to drive knowledge claims in mixed methods research (Creswell et al., 2011). Based on this assumption and considering that the present research has different research questions to investigate and adopts mixed methods of data collection, pragmatism philosophy was considered as better approach and has been chosen to fit best for the study.

3.3.5 Justification for adopting the philosophy of pragmatism

Pragmatism believe that people have their discrete interpretation of the world. Regarding the manner of enquiry, pragmatism espouses the two extremes usually adopted by positivists/post positivists and those interpretivists supports (Servillo and Schreurs, 2013). The former accentuates quantitative methods as opposed to interpretivists' qualitative approaches. Not surprisingly therefore pragmatism has been acknowledged as the bedrock of mixed-method research (Servillo and Schreurs, 2013). With this philosophical stand, the researcher's centre of attention is to emphasise the real figures and facts in accordance with the research problem (Parvaiz et al., 2016). Based on the position mentioned, the present study considered pragmatism philosophy as the preferred approach over the others with the rationale and justification that this research needs to be approached from a philosophical framework where the researcher sees knowledge as a complex phenomenon which should be interpreted in an individual unique manner to better understand the meaning of the question under study (Saunders et al., 2007). In addition to pragmatism philosophy, the establishment of any conclusions would be based on widespread interpretation of available information, largely collected using several data collection methods.

The pragmatism paradigm is adopted to enter the social world of the oil and gas industry of both private and public stakeholders and to engage with the stakeholders. In-depth information regarding considered factors as well as strategies and commitment issues on policies redirecting focus on the main issue of safety behaviour and safety culture can be generated. The interpretations of collected data will serve the overall purpose of the significant issues in safety standards in Nigeria's oil and gas industry and therefore must be considered by the policymakers in the country, including major businesses and corporations in the region.

3.4 Research Approaches

The research approach relates to sets of plans applied in conducting the research, which includes the advancement of the research idea from broader assumptions into a more concise path for the study, specifically on data collection, to its analysis, further to the interpretation of the data (Opie and Brown, 2019). According to Johnston (2014), such plans include several decisions that need to be conducted in a specific manner. The decisions frequently comprise a set of logical approaches considered relevant to the topic (Johnston, 2014). Before choosing an approach that is best for research, the researcher would have to consider the philosophical element chosen for the research, the research design, and the method of data collection and its interpretation (Soiferman, 2010). In addition, the experience of the researcher and the research audience should be put into consideration (Soiferman, 2010). According to Creswell et al. (2011), all efforts researchers make during the organisation of a research process are summarised easily as either deductive or inductive. Saunders et al. (2009) further stated that no stringent rule mandates a researcher to adopt one of the approaches to reasoning, considering that the researcher's approach to reasoning may depend on how the research project is perceived and developed. The next sections below explain the two research approaches and their implementation, followed by the justification of the reasoning adopted for this research.

3.4.1 Inductive approach

Inductive reasoning is referred to as a bottom-up reasoning or cause and impact reasoning, seeking to propose theory towards the end of the research based on observation of patterns or trends. Gill and Johnson (2002) illustrate inductive reasoning where research is generated from a specific instance to develop a general conclusion. This means that conclusion is part of what inductive reasoning has set out to achieve (Figure 9). It was added by Creswell et al. (2011) that when researchers want to develop their interest in particular information, they may not actually focus on anything until data is gathered. The gathered data is not prearranged; thus, the data itself may guide the researcher to the development of theory. As reasoned by Liu (2016), the preliminary step of examining the world requires the collection of data that can lead to the

development of theory. The final phase is when a researcher finds an association that could lead to theory creation (Gill and Johnson 2002; Creswell et al., 2011). However, inductive reasoning was found not applicable for this research because the researcher designed this research to start with a hypothesis before arriving at a true or valid conclusion.

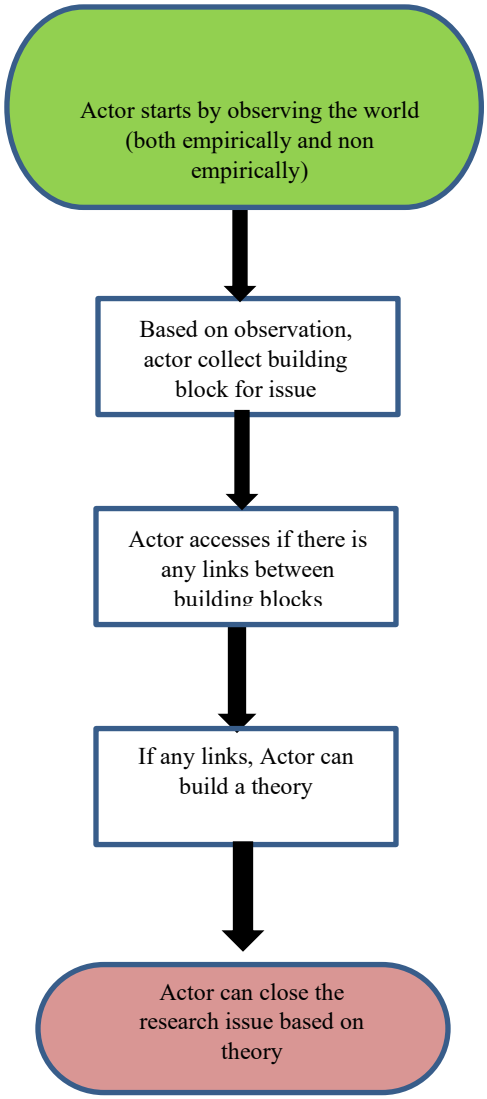

Figure 7: Illustration of inductive reasoning applied to a research procedure (Source: Gill and Johnson, 2002).

3.4.2 Deductive Approach

Deductive reasoning is viewed by (Gill at al., 2008; Jebreen, 2012) as a circumstance whereby researchers design their reasoning to begin with the explanation of the actual problem that informs their search development leading to hypothesis development. During the procedure of setting the research hypothesis and the problem, the researcher could establish a stand or decide on what to comment or disapprove after data collection and analysis. Usually, these views expressed by researchers about research ideas are deduced or developed from the information they could have obtained from other related studies (Creswell et al., 2011; Pandey, 2019). Nonetheless, in this case, the researcher needs to design the research process for a reliable data gathering procedure to agree or censure the theory of the research problem aligned with in the first place (Saunders et al., 2009). Figure 10 illustrates the mechanism for testing such theory, which entails the development of study aim and objectives, research question or hypothesis that makes up the critical part of the study to test the theory and come up with proof-based results (Servillo and Schreurs, 2013; Pandey, 2019). Deductive reasoning was adopted for this study because it aligns with the mechanism used in safety culture research and its impact on workers' behaviour from the place of work to a research project.

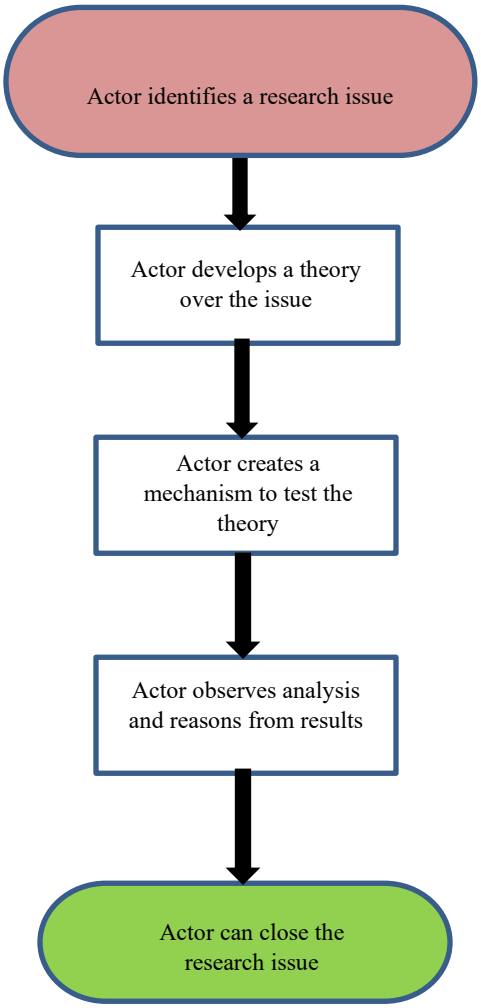

Figure 8: Illustrates the procedure for applying deductive reasoning to a research process (Source: Gill and Johnson, 2002).

3.4.3: Justification for Adopting Deductive Reasoning on this research

Deductive reasoning was adopted for this study, based on the assumption that it will help develop the research in a stepwise pattern, from the identification of a problem to aim and objective development (Azungah, 2018). Earlier, Creswell and Clark (2017) opined that because of the top-down approach of deductive reasoning, i.e., from theoretical to hypothesis development, leading to data gathering to sustain or contest theory, it presented a more

determined approach. Furthermore, considering that deductive reasoning proffered a practical way to build up the research proposal, including seeking funds and supervision for the research, it was crucial to ascertain how the study was developed (Pandey, 2019).

3.5 Philosophy of Knowledge

Knowledge is the understanding or awareness of an event. It could be facts, skills description, and information acquired through education or learning, experience, and discovery (Lehrer, 2018). In philosophy, knowledge is described as axiology, epistemology, and ontology (Zukauskas et al., 2018). According to Hothersall (2019), researchers need to explain what they believe about knowledge, how it evolved, and its significance. In so doing, it makes it easier to give details on how the philosophy of knowledge can relate to the research they employ so that it can be replicated by other scientists (Singh, 2015). Figure 11 below illustrates that the three different philosophies of knowledge may appear to be distinct when under examination, but they influence the research in various ways. Thus, they need evaluation with this reasoning in mind.

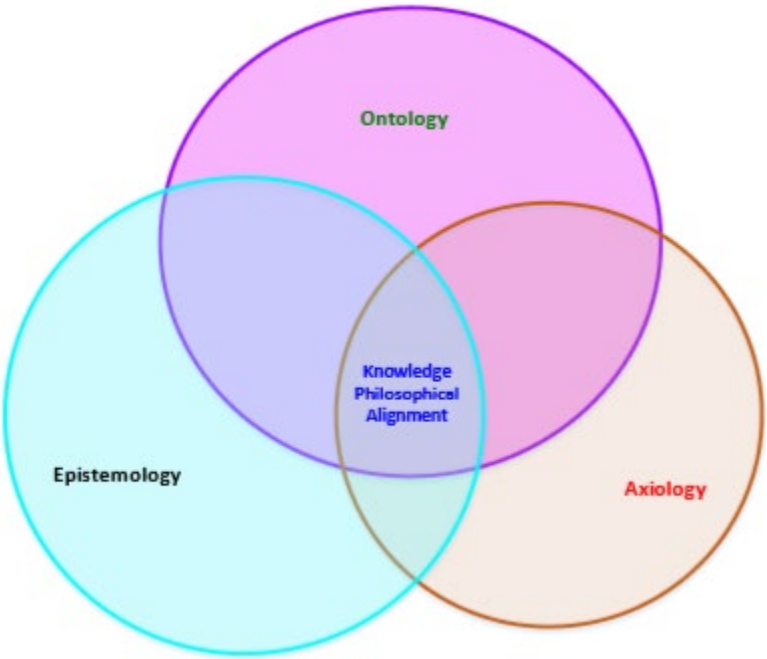

Figure 9: Knowledge of philosophy alignment and trinity (Source: Durant-Law, 2005).

3.5.1. Epistemology

Epistemology, a branch of philosophy, is concerned with how knowledge is developed, its justification, and the reality of the belief (Singh and Walwyn, 2017; Rahman, 2018). This means that the sources, arrangement, and strategies for attaining knowledge are vital for researchers in enabling them to demonstrate what is relevant and useful in terms of knowledge (Dana and Dumez, 2015). It was added by Bolisani and Bratianu (2018) that, epistemology emphasised on finding how individuals know what they know, and it covers several conceptions, including concept construction, logical reasoning, and related memories. In addition, Campbell (2018) affirmed that the knowledge of epistemology is important because it enables researchers to institute what is factual or false by establishing the best means of evaluation as well as of instituting and/or gaining knowledge about the world. However, epistemology research does not explore explanations of actions and perceptions of different participants who are involved directly in examining reality. Rather, it considers the understanding of how they comprehend

their world, which makes the approach lean towards positivism, not regarding individual interpretations of people's actions (Aliyu et al, 2015). However, the focus of this research is not on the ease of demonstrating the procedure used to gain knowledge clearly and validly, but rather the concern is focused around how to gain knowledge that is constructed socially through interpretation of different views and ideas from participants who are directly involved in the research, aligning with interpretivism philosophy that was justified in this research.

3.5.2 Ontology

Ontology is defined as the philosophy that studies how knowledge exists. It is also known as the study of being (existence) that deals with the nature of reality (Stevens et al., 2010). Several questions are related to this philosophy, like the type of things that exist, the category they belong to, and if objective reality does exist (Hao, 2011). It was explained by Sureephong et al. (2008) that ontology philosophy is a belief system that reflects on an individual's interpretation about what makes up a fact. In addition, it is related to the central question of if social entities should be observed as subjective or objective, which is specified as two major aspects of ontology. To this effect, ontology is a useful philosophy in terms of how to consider reality, as it will enable researchers to choose if the research should be based on a purely objective or subjective form of ontology (Al-Saadi, 2014). Choosing any of these forms may not be discounted; because the researcher's reality has been articulated in the best form they feel can correspond to the scenario (Al-Saadi, 2014). The ontology philosophy is intensely important to this research because it assures the reasoning that the choice made for how the research has been conducted or implemented is the best way after a profound consideration of the impact of safety culture on worker's safety behaviour in Nigeria oil and gas industry generally.

3.5.3 Axiology

Axiology philosophy focuses on values, regularly impacts the research procedure, and is pointed out in the established results (Viega, 2016). According to Shirt et al. (2012), in axiology, there is a

direct focus on the purported value of matter such; as wisdom, human life, freedom, knowledge, love, self-fulfilment, well-being, and justice. Axiology is important to the quantitative research field even though it also has a direct bearing on a research's ethical context. This offers a useful foundation for making clear the assumptions of several research paradigms and provides the basis for comprehending (Suprapto, 2021). In axiology, the research purpose is being established, and in some cases, research relates to the development of a higher understanding of how things work, how people usually function and behave (Viega, 2016). Axiology applies to this research in different ways, as the study focuses on the safety of workers in the oil and gas industry and those that use its environs to help drive a striving industry. Hence, the axiology philosophy is essential to information generation that can influence the safety of workers in the Nigerian oil and gas industry.

3.5.4 Impact of philosophy of knowledge on the research process

The integration of axiology, epistemology, and ontology philosophies is vital to bring into line the reasoning of a research project argued by Edelheim (2014). Thus, it can be stated that the value of the trinity of knowledge philosophy has been considered important for the chosen overarching philosophy of interpretivism. The next section below will discuss the research strategy that derives from research philosophies and approaches discussed in this study.

3.6 Research Strategy

Research strategy is a stepwise plan of action on how the research will be carried out from topic to procedures by the researcher to prevent ambiguity and generate excellent results and reports (Bell et al., 2018). Six different types of research strategies are identified by Saunders and Lewis (2012), which will be explored next.

3.6.1 Action research

Action research is a type of research that is usually carried out in the education sector during an organisation or activity to enhance the method and approach of the involved parties (Stringer, 2013)**.** Action research has several goals; one of its goals is to examine the inference of change in an organisation; by this interaction and communication with different individuals and parties within an organisation, employees can efficiently set up judgments on their decisions and actions in the organisation setting (Raupp and Hoffjann, 2012). According to Punch and Oancea (2014), for a researcher to meet their goal in the action research setting, they need to develop several skills such as careful planning, improved observation skills, and critical planning. The second goal of action research is that it helps to empower the researcher by getting them involved in the study process or face the change implications within the studied organisation (Jungmann et al., 2015). Stringer (2013) added that the main theme of the action research strategy lies in the whole process of identification of issues, planning, and acting in research.

Furthermore, action research may indicate that a research's implications go beyond immediate research and may also be conducted by members of an institution that may generally participate in the data collection, planning, and implementation process (Jungmann et al., 2015). Finally, McNiff (2016) mentioned that action research is being carried out to establish ways for improvements in service quality in an organisation. Action research can also aid in advancing practice, as it would cover assessment and critical reflection based on information or proof gathered (McNiff, 2016).

3.6.2 Ethnographic Research

Ethnography is the logical study of individuals and culture. It is designed to survey cultural phenomena of the studied society from the point of view of the studied subject (Bryman, 2016). It is a type of research rooted firmly in the inductive approach. In most cases, during this type of research, the researcher is present in the real-life environment to interact or observe the research participants (e.g., qualitative method) (Hammersley, 2018). Ethnography applies to

research considering languages, behavioural meanings, and the relations among the people sharing culture and issues relating to dominance (Creswell and Garrett, 2008). As stated by Hammersley (2018), the traditional form of ethnography deals with the cultural anthropology setting, where the anthropological ethnographers most times co-exist with the studied society or people over a long time to learn about people and culture. However, the anthropologist is only interested in obtaining information that will maintain their reasoning on a precisely designed problem (Creswell and Garrett, 2008). Recently, the scientific methods to ethnography are now applied to a more critical model, schools, or several types of theories that apply ethnography, such as feminism, cultural studies, functionalism, and postmodernism (Hulst, 2020). These methods of ethnography, such as interviews, observations, and surveys, must improve their knowledge of the design problem (Creswell and Garreth, 2008).

3.6.3 Grounded Theory Research

Grounded theory research is a logical methodology, mostly in social science, involving theory construction through a systematic gathering of data and its analysis (Kolb, 2012). This type of research, just like ethnographic research, also operates inductively (qualitative) and likely starts with a question (Dougherty, 2017). A study by Glaser and Strauss (2017) stated that in grounded theory, when collected data is reviewed by the researcher, repeated ideas, elements, or concepts become clear and are tagged with codes obtained from the data. The more the collection of data are re-reviewed, codes will be assembled into concepts and further into categories which then forms the foundation for the new theory (Glaser and Strauss, 2017). Therefore, grounded theory research differs from the traditional research model, where an existing theoretical framework is identified by the researcher and proceeds to data collection to show how the theory applies or does not apply to the fact under study (Kolb, 2012).

The study of Chong and Yeo (2015) believed that sometimes theories applied are at times unfit for the participants being studied. Grounded theorists have a common notion that theories must be grounded on information from the field, mainly on actions and several social. However, Creswell and Poth (2016) have in recent times come up with a grounded theory that is more

constructivism based, in effect establishing another associated conceptualisation procedure. As a result of these conceptualisations, grounded theory has gained more popularity in its application in different fields of attention, including nursing, sociology, education, and psychology. Guetterman et al. (2019) have also offered an additional perspective on the grounded theory that further suggests that social conditions should become a facet of consideration with grounded theory.

Summarily, in grounded research, the researcher wants to understand if the major findings of the study link to theories which depict central phenomena, reasons, conditions, effect, and strategies (Creswell and Poth, 2016). These explicit elements give structure to the research and any considered phenomena, permitting a deep understanding of any topic or associated framework.

3.6.4 Experimental Method

Experimental research is any research carried out with a scientific approach, whereby some set of variables remain constant while other sets are being measured as the subject of an experiment, and this has allowed for ahigh level of internal validity (Kagel and Roth, 2016). This type of research is mostly rooted in quantitative research methods, for instance, conducting laboratory tests (Zikmund et al., 2013). Experimental research is truly successful when the researchers verify that changes in the dependent variable are exclusively due to the influence of the independent variable (Saunders et al., 2009). In addition, Campbell and Stanley (2015) stated it is vital for experimental research to develop the reason and impact of a phenomenon, meaning it should be clear that impacts observed from an experiment are a result of the cause as the event that occurs naturally can be confusing to establish conclusion by a researcher. An example could be when a cardiology student researches to know the impact of food cholesterol on the heart and found that most heart patients have diabetes or are not vegetarians. Therefore, they are facet (causes) that can lead to a heart attack (impact).

3.6.5 Survey Method

The survey method in research requires the collection of different data from study participants based on the answers to questions they are asked (Nardi, 2018). There are two major ways of establishing a survey method; conducting interviews and questionnaire administration explored in sections 3.8.1 and 3.8.2 below (Fox et al., 2009; Nardi, 2018). This method type is essential during data gathering from several participants within the academic sector, including teaching and leadership (Rea and Parker, 2014). However, surveys are not considered a supreme tool for academic and learning settings; however, a well-designed survey can help enhance conceptualisation of teaching issues (Nardi, 2018). The major strength of the survey method is in its versatility and application to a large population to ascertain a clear image of the populace and its associated qualities (Rea and Parker, 2014).

3.7 Case Studies

Case studies involve an in-depth, multi-sided approach and detailed assessment of a subject of study (Hancock and Algozzine, 2016). Due to this, researchers can shed light on aspects of human behaviour and thinking that would be impractical or unethical to study in other ways (Antonsen, 2017). In other cases, it is referred to as a comprehensive research method (Saad, 2016). In conducting a case study research, the studied case may be an organisation, existing of a specific place or time, individual, event, or action (Gerring, 2006). This approach is mostly adopted by social scientists, particularly in political science, psychology, law, and medicine, and in nature is considered qualitative (observations and interviews), leading to a narrative description of experience or behaviour (Ritchie et al., 2013). Various kinds of case studies are distinguished based on the amount for the bounded case (multi-parties or groups, single) or the objective for the case study (Hancock and Algozzine, 2016).

3.7.1 Single Case Studies

The single case involves studying single subjects throughout the study duration (Baxter and Jack, 2008). The primary aim of the single case study design is to evaluate the impact of a range of interventions in applied research. In most cases, only one opportunity is available to observe the single case study research (Yin, 2011). It is necessary to have clear and specific methods of research doing this type of case study research, to avoid any issues during the research (Baxter and Jack, 2008). The single case study is often adopted in psychology, human behaviour, and education in which the subject serves as the researcher's control, instead of using another individual or group (Gustafsson, 2017). Most individuals use a single case study research design because these designs are sensitive to single organism dissimilarities versus group designs sensitive to averages of groups (Yin, 2011). Research using a single case study design will regularly have some large subjects in the research. However, since the subject serves as their control, it is referred to as a single case research design (Gustafsson, 2017).

3.7.2 Multiple case studies

This type of case studies design enables a researcher to explore the observable fact under study by using replication strategy in terms of repeating processes for the diverse cases (Stake, 2013). It implies that a conclusion from one case should be evaluated and contrasted with the findings from another case (Stake, 2013). Replication in this research design is carried out in two phases called the literal replication phase; where cases are selected to obtain similar results as far as possible, and the theoretical replication phase; where there is a selection of cases to explore and approve or disagree with the pattern acknowledged in the primary cases (Stewart, 2012).

In the multiple case study design, there are no stringent rules on the number of cases required to satisfy the conditions of the replication strategy (Vohra, 2014). However, on this note, Saad (2016) suggests considering six or more cases are sufficient, especially where the result can provide compelling evidence for the primary set of prepositions. In addition, since this type of case study design does not depend on representative sampling logic commonly used in survey

research, the specific criteria regarding sample size are not relevant (Saad, 2016). Instead, sample size depends on the number of cases needed to reach saturation, which collects data until no noteworthy new results are revealed. A study by Yamashita and Moonen (2014) suggested that sample participants should be explicitly selected to take in examples in which the studied phenomena are likely to be found. In effect, a single case study would apply if a case study is carried out in one organisation. Still, if it implies different organisations, multiple case studies would apply just like that of this research, which is the best approach when testing for constancy of a phenomenon or event over different settings (Urciuoli et al., 2014).

The unit of analysis for these different case studies was considered holistic; even though each organisation was made up of different departments, it was treated as a single unit of analysis to institute a single action plan (Rowley, 2012). In multiple holistic case studies, there is an estimation of a global unit evaluation carried out numerous times (Gustafsson, 2017). While for a single case study, the procedure unfolds just once in a single case (Stewart, 2012). This research applied multiple case studies because the researchers studied a particular problem or phenomena under different work settings. Using this approach can help understand and explain the different aspects of organisational safety culture practice in the Nigeria oil and gas industry.

3.7.3 Justification for using multiple research strategies

The major justification for adopting more than one research strategy is the decision to adopt a mixed methodology which was perceived to align well with the interpretivism philosophy chosen for this research (see section 3.3.4 above). The research has been designed to take on these strategies: questionnaire survey, interview survey, and multiple case study strategies. This study adopted the survey design because it explores a single phenomenon (the case) in a natural setting using various methods to obtain in-depth knowledge. The case studied within this research was about factors affecting the implementation of safety culture, the impact on workers' behaviour, and eventually on their safety performance. These same issues were assessed in the survey (questionnaire and interview), meaning that the survey was carried out to establish the impact of safety culture. Another justification for using multiple testing strategies is to increase the

likelihood of increasing the answer rate, allowing the researcher to generate more convincing and consistent results to the research question than if only one approach was used (Davis et al., 2011).

3.8 Methodological Choices

According to Taylor et al., (2015), research methodology mostly takes three forms as established by the theory of research such as qualitative, quantitative, and or a mixed methodology, which is referred to as a hybrid of both quantitative and qualitative methodology.

3.8.1 Quantitative research

Quantitative research emphasises objective measurement, statistical numerical, or mathematical analysis of information derived through surveys and mostly questionnaires (Walliman, 2017). This type of research pays attention by gathering numerical and simplifying it across sets of people or explaining a specific phenomenon (Patten and Newhart, 2017). Based on quantitative research methodology, it may be likely to obtain some physical representation of data by using charts, tables, leading to conclusions that are logical and supported by proof (Patten and Newhart, 2017). The philosophy that can allow such a research methodology would need to design their work under the positivism philosophy (Park et al., 2020). Thus, it becomes inadequate for a quantitative research issue and has its premise on social-cultural tendencies of people's behaviour and practice (Saad, 2016).

Questionnaire: A questionnaire as a quantitative method of data gathering is said to be inexpensive regardless of the questionnaire type you pick (Koponen et al., 2011). For instance, apart from the self-administration of a questionnaire, it can be emailed to participants or designed on the website in the form of an online survey (Edwards et al., 2009). Apart from being affordable, they are known to gather data in a practical way to target chosen groups and managed them in diverse ways. When collecting a large amount of data for any analysis, these

questions can be posed using a different format, such as close or open (Koponen et al., 2011). Questionnaires also help for easy and quick data collection with mobile and online tools, meaning that insight can be gained in 24 hours or less depending on the measures and reach of the questionnaire (Brace, 2018). Another advantage of a questionnaire is that data from a quantifiable source can be contrasted and distinguished from other samples, and it can also be helpful to measure change (Brace, 2018). Quantitative data from questionnaire surveys also allow for easy result analysis, with several built-in tools without needing to have a background in statistics (Patten, 2016). Questionnaires offer actionable data, which means that the more data you attain, the clearer the results (Creswell et al., 2011). The questionnaire also allows anonymity to be maintained by participants, increasing their comfort and truthfulness when responding (Saunders and Lewis, (2012). Another major advantage of a questionnaire is that it can assist in asking as many questions as you like regarding every aspect of a study (Saunders and Lewis, 2012).

However, there are also several limitations associated with a questionnaire. Most often, questionnaires respondents are not hundred per cent honest or may have hidden agenda with their answers due to several reasons, such as an attempt to protect the privacy and social desirability bias (Creswell and Clark, 2017). On the other hand, assuring participants that their privacy is valued, and the procedure will not require any personal identification can reduce the level of dishonesty (Brace, 2018). Another limitation is that when answering questionnaires, there is a possibility that some questions will be left unanswered by some participants, and this can alter the volume of responses required to perform analysis (Patten, 2016). In addition, it isn't easy to know if participants really understood or thoroughly read through the questions before answering (Edwards et al., 2009).

Nonetheless, if the questions are not complicated and short, this may avoid skipping, and better completion rates will be attained (Koponen et al., 2011). The questionnaire finds it difficult to capture the emotions and feelings of participants. However, using rating scales (Likert scale) allows for assertion in feedbacks fairly than multiple choices (Saad, 2016).

3.8.2 Qualitative research

Qualitative research methodology is a theory that uses the qualitative based data that is obtainable from the detailed analysis of the information from participants in the research; including the way the information is connecting the participants, their social networks, and many added informal ways to gain the information (Creswell et al., 2011). With qualitative research methodology, the researcher would consider the participants' perspective using general questions, gather data from respondents, answer analysis, and group them into themes, carrying out research using both subjective and objective means for as long as the situation allows (Creswell and Clark, 2017). In terms of securing answers to different questions in the research, qualitative research methods are not rigid. It also assigns much time to establish data analysis and implement social and human-centric information, thereby obtaining deeper analyses and views from the participants (Saunders and Lewis, 2012). This methodology lends itself well to the philosophy of interpretivism, which was considered cardinal for this research; an interview is a major technique used for data collection under qualitative research (Saunders et al., 2009).

Interview: Interviews are very useful to obtained detailed or in-depth information about perception, personal feelings, and opinions about participant about a topic of research (Saunders et al., 2009). Interviews usually achieve a high response rate, and respondent's words are usually recorded (Silverman, 2016). According to Boyce and Neale (2006), information received from an interview is likely to be more accurate than information from other techniques. The interviewer's presence on the spot can help clear up seemingly or incorrect answers by explaining the question to the participant. An interview is also a flexible approach because it allows for new questions if the need arises (Smith, 2015). One of the advantages of interviews is that the interviewer can control who or who not to interview, unlike in the mailed questionnaire approach (Lune and Berg, 2016). Another advantage is that the long time spent during the interview process allows the participant to become oriented to the investigated topic. Hence, remembrance of vital information can be facilitated (Lune and Berg, 2016). Interviews help catch participants off guard and secure the most impulsive reaction compared to if questionnaires are used. The language used to ask the questions can be switched to the understanding or educational level of the

participant been interviewed. As a result, it is very easy to avoid misleading or misinterpretations of questions (Taylor et al., 2015). However, the major weakness of an interview is that it is costly and time-consuming in setting up, conducting the interview, transcription, analysis, and reporting (Saunders et al., 2009). In addition, different interviewers may comprehend and transcribe interviews in diverse ways, and the efficiency of interviews relies on the specific skills and training of the interviewer. In the absence of this, the information recorded may be incomplete and inaccurate (Creswell et al., 2011). The interviewer's presence on the spot may stimulate participants' responses, at times to the extent that they provide unsure information that may also be imaginary to make it interesting (Gill et al., 2008).

3.8.3 Mixed Research Method

A mixed research method is a methodology for carrying out a study that entails obtaining, investigating, and incorporating quantitative and qualitative research (Zohrabi, 2013). One of the main advantageous features of carrying out a mixed research method is the chances of triangulation, i.e., using different means (data sources, methods, and researchers) to observe the same phenomenon (Fielding, 2012). According to Saunders et al. (2009), triangulation permits researchers to recognise areas of a phenomenon more precisely by reaching it from several vantage points using distinct techniques or methods. Since organisational safety culture and workers' behaviour have elements that can be researched, assessed, or measured using qualitative and quantitative research methodology, this research adopted mixed research methodology (Saad, 2016). It allows the researcher to implement the quantitative-centric research process that could fit the scientific-based data and, on the other hand, add or use social-based data that can articulate the way people feel and the way they relate to the information they are giving.

3.8.4 Justification for using Mixed Methods

The issue of safety behaviour of employees in the Nigerian oil and gas industry cannot be addressed using a single research method because there is a need to benefit from the possibility of gathering both qualitative and quantitative-based data; hence, it can be justified to use a mixed methodology (McCusker and Gunaydin, 2015). Using mixed methodology will ensure that the researcher gains breadth and depth of understanding, knowledge, and corroboration while limiting the weaknesses associated with using a single approach on its own (Creswell and Clark, 2017). For instance, descriptive statistics would justify the data, while the social aspects of the participants could add due to the debate (Antonsen, 2009). Therefore, it is envisaged that quantitative and qualitative research methodologies would complement each other even if the research philosophy were interpretivism (Brannen, 2017). The concurrent mixed research method was adopted in this study. This allowed the concurrent, but separate collection and analysis of both qualitative and quantitative data to be undertaken. In addition, it also enabled the researcher to relate and or compare findings created by individual method through the evidence they produce, and to validate and expand quantitative results with qualitative data for better understanding of the research problem (Ostlund et al., 2011).

3.9 Time Horizon

According to Saunders and Tosey (2013), the time horizon is defined as the whole period taken for research to be carried out. However, the driver for the time horizon has not yet been examined. Still, the accessibility of financial resources is exceedingly ranked for research and is needed for the research design regardless of the used methodology (McCusker and Gunaydin, 2015). There are two major types of time horizons: the cross-sectional and longitudinal time horizon (Saunders et al. 2007).

3.9.1 Cross Sectional

A cross-sectional study is also referred to as an observational study where researchers attain information about their participants without manipulating the study environment (Bryman, 2016). It is a type of study where a researcher addresses a research issue at a specific point in time (Creswell et al., 2011). According to Saunders and Tosey (2013), when a research issue is addressed by a researcher at a given point in time, they implement a snapshot view of the issue. Thus, they believe in taking a cross-sectional view because they stick to the issue for a short period. A notable example of cross-sectional research is a case study and survey. Because of the survey and case analysis, this study used a cross-sectional time horizon. The main advantage of a cross-sectional survey is that it enables the researcher to consider and compare multiple variables simultaneously. However, this type of study does not usually consider what happens before or after the snapshot of a single moment in time (Setia, 2016).

3.9.2 Longitudinal

A longitudinal study is also known as observational research, like a cross-sectional study (Caruana et al., 2015). In using the longitudinal time horizon, researchers carry out different observations of a particular subject over a very long period which could be years (Saunders et al., 2007). The key benefit of a longitudinal study is that it enables the detection of changes or developments in the characteristics of the population under target at both the individual and group level (Caruana et al., 2015). However, time is a huge disadvantage of a longitudinal study, as it takes a significant amount to gather the required information. In addition, it also takes a long time to gather before a result pattern can be made (Creswell and Clark, 2017).

3.10 Research Techniques

This research used a mixed-method approach to data collection, which included collecting and analysing qualitative (interview) and quantitative (questionnaire) data. Earlier defined in section

3.8.3 above, the mixed method helps to provide a wider perspective of research and help avoid the limitations associated with using a single method (Creswell and Clark, 2017). For instance, Skjerve (2008), who studied the use of mindful safety practices of workers in the petroleum industry, adopted a single data collection method (i.e., questionnaire). However, the author affirmed the shortcomings of the research were the single-use method, which has led to the bias of subjective findings. On the other hand, just like this study, previous studies of (Antonsen, 2009; Nævestad, 2017) adopted mixed-method research. They used this mixed method to investigate the safety cultural practice in the oil and gas industry and admitted that one of the strengths of their study was the ability to obtain robust data. They analyse the findings using descriptive statistics. For instance, descriptive statistics would justify the data, while the social aspects of the participants could add due to the debate ((Antonsen, 2009; Nævestad et al., 2017).

3.11 Sampling Method

Sampling is a technique that enables the researcher to deduce information about a population based on data from a division of the population without investigating every individual (Acharya et al., 2013). According to Jawale (2012), reducing the number of individuals in a study reduces the cost and workload. It may make it easier to obtain high-quality information, but this must be balanced against having a large enough sample size with enough power to detect a true association. Probability sampling (random sampling) was adopted in this study which involves starting with a complete sampling frame of all eligible individuals from which you select your sample. In this way, all eligible individuals have a chance of being chosen for the sample, and you will be more able to generalise the results from your study (Jawale, 2012). One of the main advantages of this sampling method is that it reduces selection bias during the recruitment of participants in research (Kondo et al., 2014).

3.12 Data Collection method (Quantitative survey)- Pilot study

3.12.1 Pilot study

A pilot study is a vital stage in a research project (Morin, 2013). It was carried out to help recognise possible areas of problem and deficiencies in the research protocols and instrument before implementing the full study (Hassan et al., 2006). Although conducting a pilot study does not guarantee success in the major study, but it does escalate the possibility of success (Morin, 2013). The original method for collecting data in this study is the qualitative and quantitative techniques (mixed-method approach). The pilot study, however, used only a quantitative method because it was not a complete study. Because of its methodological methods, quantitative analysis (questionnaire) was used, implying that the study is also regarded as reliable (Bryman, 2016). The quantitative method (questionnaire survey) was also used as a major approach for data collection by Skjerve (2008), who studied the use of mindful safety practices of workers in the petroleum industry. However, the author affirmed that the shortcoming of the research was using a single method, which led to a bias of subjective findings. On the other hand, it made the study's findings generalizable from using the method due to its larger sample sizes.

3.12.2 Quantitative survey: (questionnaire)-Study One

Study one survey was carried out by the distribution of closed-ended questionnaire electronically through Bristol online survey (BOS) platform to frontline employees in fourteen selected oil and gas companies (both multinational and local) located in the Niger Delta region of Nigeria, namely, Shell, NNPC, Schlumberger, Exxon-Mobil, Chevron, Total, NLNG, Conoco, Oando, Transcorp OPL, Addex, Statoil, Nexen Inc, Connoco, and Addex. The Criteria for selecting these companies include the location, size, and nature of the oil and gas activity undertaken. In addition, to compare safety culture among the multinationals and local oil and gas industries. Furthermore, frontline employees are selected for this study because they are in direct contact with health and safety risks in the oil and gas industry (Ehiaguina and Moda, 2020). They should provide relevant information on how safety culture is promoted, perceived, utilized, and potential lapses in the

approach that affects their safety performance at work can be obtained (Ehiaguina and Moda, 2020). The previous study of Skjerve (2008) also administered questionnaires to frontline employees in the oil and gas industry to obtain information on how safety management practices promote employee safety behaviour.

The questionnaire for the study contained two sections.

- Section one of the questionnaire consists of questions 1 to 6, which asked questions about demographic information such as age, gender, work experience, employment type, and job category.
- Section two: Consist of questions 7 to 51, containing information measuring workers' perceptions about the existing safety culture practice in the organisation. It covers the different elements of a positive safety culture in the oil and gas companies, which include management commitment (6 items), safety leadership style (10 items), safety communication and motivation (9 items), employee involvement (9), co-worker involvement (3 items) and safety training (8 items).

Each question was based on a Likert-type scale of five-point, where one refers to very low, and five refers to very high. The 51 questions that informed the questionnaire used were adopted from formerly validated questionnaires of related literature and theories (Zohar, 1980; Mearns et al., 1998). These sets of questions were, in return, used in other studies (Flin et al., 2000; Neal et al., 2000; Vinodkumar and Bhasi, 2010; Frazier et al., 2013) to achieve their study aim.

The scales were further developed by rewording some of the items to blend with local working culture and practices. However, care was taken to retain the theoretical meaning of the scales close to the operations made by the studies mentioned above. The questionnaire was addressed with a senior lecturer (my supervisor) for authenticity and confirmation of face validity.

After reflecting on each item's details, necessary changes were made where suggested by removing, rewording, simplifying, and substituting some of them. Additional two columns were being added to the questionnaire to enable participants to indicate any question they may have found difficult to understand and additional comments around the existing safety culture at work

that the questionnaire didn't cover. At the end of the allocated time for the survey, a total of 503 responses were gathered.

3.13 Data collection method (Quantitative and Qualitative survey)-study two and three

3.13.1 Study 2: Questionnaire survey

In the full study, just like the pilot study, a questionnaire was administered to frontline employees in the oil and gas industry but using a combination of online survey and self-administration. The online survey was carried out in eight selected oil and gas companies (both multinational and local) located in the Niger Delta region of Nigeria, namely, Shell, NNPC, Schlumberger, Exxon-Mobil, Chevron, Total, NLNG, and Oando (See table 2). While NPDC, Seplat, Lee construction, and Engineering and Viv Limited oil and gas companies where the four different companies where self-administration of questionnaire was conducted. In total twelves oil and gas companies were considered in the full study (See table 2). These companies also fitted into the criteria for selecting oil and gas companies to participate in this study (see section 3.12.2).

The questionnaire used in study two was made up of three sections (see appendix VII). Each question was based on a Likert-type scale of five-point, where one refers to very low, and five refers to very high. The 50 questions that informed the questionnaire used were adopted from formerly validated questionnaires of related literature and theories (Zohar, 1980; Mearns et al., 1998). These sets of questions were, in turn, used in other studies (Flin et al., 2000; Neal et al., 2000; Vinodkumar and Bhasi, 2010; Frazier et al., 2013) to achieve their study aim.

- The first section still comprised of questions 1 to 6, which asked questions about demographic information such as age, gender, work experience, employment type, job category, and name of oil and gas companies.
- The second section consists of questions 7 to 37, which contained information to measure the workers' perceptions about the existing safety culture practice in the organisation. These covered the different elements of a positive safety culture in the oil and gas

companies, which include management commitment (6 items), safety leadership style (6 items), safety communication (5), motivation (4 items), employee involvement (5) and safety training (5 items). Compared to the questionnaire used for the pilot study, most of the elements were calculated with fewer items. Most of the measured elements were isolated and measured separately, for example, safety communication and safety motivation.

The reason for this was to avoid the bias of question repetition, i.e., questions with the same meaning but in a different sentence, and to measure the individual effect of each element on workers' safety behaviour. Also, to keep the questionnaire at a reasonable length. According to Walsh et al. (2014), when a questionnaire is kept to a reasonable length, it may positively influence the response rate.

- The third section consists of question 38 to 50, which contained information on the different components of workers' safety behaviour at work. These include safety compliance (4 items), safety participation (5 items), and mindful safety practices (4 items). The section was not present in the pilot study. These questions were generated from existing questionnaires successfully used by safety studies to obtain reliable findings. Such studies are that of (Skjerve, 2008; Martinez-Corcoles and Stephanou, 2017; Mullen et al., 2017; Dahl and Kongsvik, 2018). The reason for choosing these questions is that they will help understand the different elements of safety culture's impact on workers' safety behaviour.

Online Questionnaire Survey: The questionnaire used in the pilot study was modified based on participant's feedback and issued raised about some of the questions which were not clear was amended. An additional section covering items around employee's safety behaviour was included to cover the study's outcome. These additions were reviewed and agreed upon for their inclusion to measure the wider issues as they surround employees' safety behaviour. After that, the questionnaire was used to design another online survey (JISC Survey), generated a link, and sent to the Overseas Scholarship Scheme department in PTDF (research sponsors) in charge of

scholars and research students for assistance to help facilitate data collection among affiliate companies.

Self-administration of a questionnaire: To widen the study participation, an exact copy of the questionnaire hosted online for the survey was printed in hard copy and self-administered by the researcher. Self-administration of questionnaires was undertaken among four different oil and gas companies located in the Niger Delta region in Nigeria (NPDC; Lee engineering, Viv Limited, and Seplat). To gain entry, each company received an introduction letter from the study sponsor, the Petroleum Technology Development Fund (PTDF), an introductory letter from the host community hosting the oil and gas company, and a similar letter from Manchester Metropolitan University. In some instances, the project's justification was explained and retained with the company's nominated staff regarding the research. During each scheduled meeting, participants' information sheets (see appendix I) were presented to the participant reminding each of the study rationales. The researcher's roles expect the company's participant to play as outlined in the information sheet and contact information regarding any complaint.

Furthermore, the participant information sheet stated that data collection would be done anonymously and confidentially. When the study was approved, the manager referred the researcher to the Health and safety departments to prepare approval letters and make logistic arrangements on dates and times to assess the site. However, this was to be replaced by another meeting; the reason being that they needed time to contact site managers about the research and its approval and arrange on the day that will be best appropriate for my visit. Upon our next meeting, times, and dates to assess the sites were provided. These were usually days when all employees gather for health and safety training in the organisation. A temporary access permit card that will last for the period allocated for the survey was also provided. On getting to the site, another visitor card/permit was given to me, including Personal Protective Equipment, and this was followed by site induction. Upon my arrival, the study approval letter and participant information sheets (hard copy) were being pasted on the company's bulletin board. The letter was to inform employees about the approval of the research, what the research is about. However, the researcher did another 15 minutes presentation to explain the participant sheet in

person, the role the company needs to play in the research, ensure that employees understand the message, and answer any unclarified aspect of the research.

During the presentation, participants were reminded that their participation is voluntary and free of pressure to participate. The research is conducted with the ethical principle of not causing harm to the employee and company's reputation. However, there was clarification of the study's advantage. In addition, to answer questions employees may have about the study.

The questionnaire was then handed to willing employees (frontline) to fill. There was no personal identifier information such as (name, email, house address, postal address, and staff number) on the questionnaire so that the questionnaire information remained anonymous. To avoid exerting pressure on the participants when completing the survey, the researcher maintained a reasonable distance away from the site of each participant but within reachable distance should there be a need for any clarification (Saris and Gallhofer, 2014). Each respondent was asked to drop the completed questionnaire into a collection envelope to ensure that the data is kept confidential throughout the process. No one had access to the completed questionnaires until the researcher had collected all questionnaires.

The reason for adopting both the self-administered and online survey for the questionnaire is that there are many case studies covered in this study. Thus, the allocated time for primary data collection (three months) will not permit the researcher to go around the companies one after the other due to the ethical procedures involved in assessing each of the companies. As a result, assistance from the research sponsors (PTDF) was sorted to obtain a high volume of responses. Organisations that administered themselves were not included in the list of companies to which PTDF distributed the online survey link to prevent confusion or participants responding twice to the same survey due to the procedure used.

Table 2: Characteristics of the oil and gas companies used as case studies for this research

Company	Type	Activity	Year found	Sector
1)NNPC	Multinational	Exploration and production	1977	Upstream and Downstream
2)Shell	Multinational	Exploration and production	1937	Upstream and down stream
3)Total	Multinational	Marketing and Distribution	1956	Downstream
4)Chevron	Multinational	Production	1961	Upstream
5)Conoil	Local	Distribution and marketing	1927	Downstream
6)NPDC	Multinational	Exploration and production	1988	Upstream
7)Viv Limited	Local	Support services in exploration and production	1993	Upstream
8)Lee Engineering	Local	Contract services in exploration and production	1991	Upstream
9)Seplat	Local	Exploration and production	2009	Upstream
10)Oando	Local	Distribution and marketing	2003	Downstream
11)Exonn-Mobil	Multinational	Exploration and production	1955	Upstream
12) Schlumberger	Multinational	Exploration and production	1926	Upstream

Note: NNPC: *Nigerian National Petroleum Commission and* NPDC: *Nigerian Petroleum Development Company.*

3.13.2 Study 3: Qualitative survey: Interview

Qualitative survey: (Interview): After self-administration of the questionnaire, the researcher also approached the organisation's managers, requesting to participate in the interview. Those that were willing took part that same day, while a few re-scheduled the next day for the

interview. All the interviewees preferred the interview to take place in their offices outside the organisation's high-risk area and where they believed they would be free from distractions. The researcher followed the guideline on conducting a successful interview by McGrath et al. (2018) during the interview process. Before the start of the interview, there was a brief self-introduction by the interviewer and the participant's information sheet (see appendix II) designed for the interview survey, which spells out the aim and objective of the study and how long the interview process will last, was handed to each interviewee and if willing to partake, were also handed a consent form (see appendix X) to read through and sign for permission to participate in the audio-recorded interview, also to remind them of anonymity, There was no personally identifiable information obtained from them because participation is entirely voluntary. Each interviewee was only assigned a code by the researcher. An audio interview was chosen because it enabled the researcher to focus on the interview, unlike the note-taking interview, which can be a distraction to both the researcher and the interviewee (Berazneva, 2014). Again, the audio files will serve as undeniable proof of authenticity of the field or site visit (Berazneva, 2014). However, if the recording quality is poor, e.g., speech overlaps, quiet volume, or interfering noise, it may not be easy to understand (Bailey, 2008). Confidentiality of information provided was also ensured by informing interviewees that no one apart from the researcher will have access to the interview transcript. During the publication of any article, no information will be published that will be directly traceable to them.

To make the interviewee more comfortable and familiar with the subject area, questions that asked information about the interviewee's position, key task, and work experience, and whether they feel the organisation has a good place to work were further asked. A study by McGrath et al. (2018) confirmed that opening interview questions with few easy questions is a good idea because it makes interviewees comfortable and at ease with the whole interview process. The other phase of the questions was on more specific areas and standard questions under different elements of safety culture. These were to help facilitate the analysis uniformity and develop a picture of how people think and act towards safety in the organisation, such as management commitment (4 items); safety leadership style (7 items); employee involvement (6 items); training /information (5 items); motivation (7 items); learning organisation (5 items).

3.14 Interview Participants

As part of the qualitative data collection method, willing participants such as managers/ supervisors and frontline employees from different oil and gas companies were recruited to participate in the interview process. In addition to frontline employees, the reason for selecting managers/supervisors is that they are believed to be entrusted with implementing various operational element in the oil and gas industry; there will be a likelihood of obtaining clarified information about safety culture and safety performance in the workplace (Dahl and Kongsvik, 2018). Also, to compare if there is a discrepancy on how safety culture is perceived at a different level of the organisation. A study by Nævestad (2017) interviewed managers and frontline employees to gather information regarding their research question. The interview sections lasted between the range of 20 to 59 minutes. A total of 12 participants took part in the interview process. It was discovered the total number was close to those also interviewed in the study of Saad (2016), who also adopted a mixed method of data collection in their study. Seven of the interviewees were managers, with most of them from the health and safety department, then supervisors two, while frontline employees three. These interviewees are from four different oil and gas companies. About 30 % of the interviewees are from NPDC, 25% from Seplat, 25% from Lee engineering, and Viv Limited made up 20%. All participants have work experience ranging from 5-50 years (see table 3).

Table 3: Characteristics of interviewees

Position	Work experience	Gender	Organisation
1) Manager	40 years in total	Male	NPDC
2) HSE manger	Over 10 years	Female	NPDC
3) Supervisor	15 years	Male	NPDC
4) Frontline employee	10 years in present organisation. But, over 50 years in total	Male	NPDC
5) Manager	30 years	Male	Seplat

6) HSE manager	Over 12 years	Male	Seplat
7) Frontline employee	6 years	Male	Seplat
8) HSE manager	9 years in present organisation. But, 23 years in total	Male	Lee Engineering
9) Manager	25 years	Male	Lee Engineering
10) Manager	6 years in present organisation but, over 30 years in total	Male	Lee Engineering
11) Manager	7 years	Male	VIV limited
12) Supervisor	3 years in present organisation but, 10 years in total	Male	VIV Limited

3.15 Ethical considerations Anonymity and confidentiality procedures

All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted following the Declaration of Helsinki. The protocol was approved on 21/11/2018 by the Health, Psychology and Social Care Research Ethics and Governance Committee, Manchester Metropolitan University Ethics Committee (Project ID: 1111).

3.16 Data analysis Method for Quantitative study (Study one and two)

Statistical analyses of participants demographic data and attributes were used to measure safety attributes in both study one and two using SPSS software Version 25. Percentage of responses from each item was used to measure the extent to which participants agree or disagree with the question asked prior to conducting the structural equation modelling. To assess the relationship among each attribute measured, Pearson correlation coefficient (r) and one-way ANOVA were applied to measure related safety attributes. Statistical significance was set at $p < 0.005$.

In addition, Confirmatory factor analysis was performed to investigate causal relations among latent and observed variables.

3.16.1 Descriptive statistics

IBM SPSS software version 25 was used to analyse the data and check the reliability of measured items in both the pilot study and the full study. Descriptive statistics was the first analysis performed with the data in this study. According to Marshall and Jonker (2010), descriptive statistics helps understand and describe the characteristics of a specific data set by summarising information about the given data. Descriptive statistics can be divided into a measure of variability (spread of data using tables, graphs) and a measure of central tendency (frequency of data using the mode, mean and median) (Marshall and Jonker, 2010). In this study, the program SPSS was used to analyse descriptive statistics of participants' demographic information, including age, gender, work experience, employment type, and job category. The percentage responses for each object were then used to measure safety management practices, safety compliance, and safe participation to understand the extent to which participants agree or disagree with the question before the structural equation modelling was carried out.

3.16.2 Reliability test

Study one and two conducted Cronbach's alpha reliability test using IBM SPSS was used across measured items under the different studied variable (both exogenous and endogenous variables) (see figure 12). Reliability is the degree of measure constancy, and a text is often regarded as reliable if it produces the same result when repeated under the same circumstances (Bonett and Wright, 2015). Lee Cronbach established Cronbach's alpha in 1951. It is one of the commonly used reliability measures in organisational and social sciences to test for internal consistency for a set of items (Tavakol and Dennick, 2011).

Testing for internal consistency enables researchers to know the extent to which all items are closely associated with the set of items measured under the same construct. It is usually linked to the test's inter-relatedness (Tavakol and Dennick, 2011). The alpha Cronbach's score is usually expressed in 0 and 1. Tested items with Cronbach's alpha of 0.70 to 0.95 are generally good (Bonett and Wright, 2015). Taber (2018) concludes that where alpha value is low, it could be due to poor inter-relatedness among heterogeneous constructs or items. If this is the case, some items should be revised or discarded.

In many cases, poor items with poor alpha value can produce an unreliable result and lead to poor model fit (Tavakol and Dennick, 2011). The easiest process to find items with low correlation is to compute an individual's correlation with the overall score test. To increase the alpha value of others, items with low correlation, i.e., values approaching zero, should be omitted (Taber, 2018). The highest alpha value of ~0.9 has also been recommended, and when an alpha exceeds this value, it is regarded to be very high (Bonett and Wright, 2015). A very high alpha score suggests that some of the test items may be redundant due to the testing the same question but in a different guise (Taber, 2018).

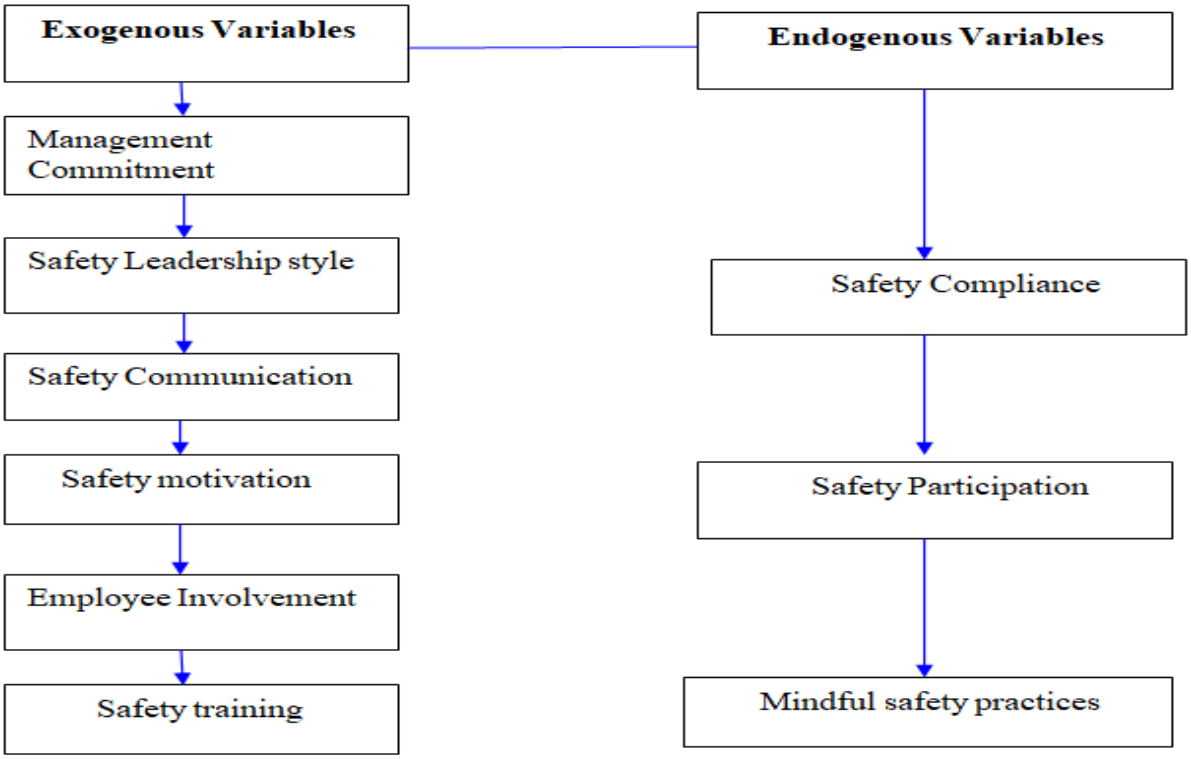

Figure 10: Exogenous and endogenous variables of the full study

3.16.3 Structural Equation Modelling

In the study, the analysis of moment structure (AMOS) graphics 4.0 software package was used to perform the structural equation modelling (SEM) to establish a causal relationship among exogenous and endogenous variables through model specification, identifying the path model, parameters estimation, and model modification. This software is reliable for SEM analysis because of the simple drawing tools in Amos that allow researchers to specify, view, and modify the model as well as examine any causal relationship (complex or simple) between independent variables (IVs) and dependent variables (DVs) (Jenatabadi and Ismail, 2014; Shek and Yu, 2014). Compared to other statistical methods, the use of SEM examining the relationship between variables is very important because it ensures reliability of measurement and identified relationship are free from measurement error due to it being evaluated and removed, allowing only common variances (Ullman and Bentler, 2003). Previous safety studies have successfully

adopted SEM to examine relationships among variables (Skeepers and Mbohwa, 2015; Pilbeam et al., 2016; Smith et al., 2016). According to Qureshi and Kang (2015), SEM is also known as causal analysis, causal modelling, covariance structure, simultaneous equation modelling, confirmatory factor analysis, and path analysis. The last two are referred to as distinct types of SEM (Nunkoo and Ramkissoon, 2012).

SEM analysis may involve both types of variables, the exogenous variables, and endogenous variables. These may be one or more variables, which may also be either discrete or continuous (Ullman and Bentler, 2003). SEM enables questions involving multiple regression analysis of factors to be answered at the simplest level where researchers propound the relationship between one-measured variables and other measured variables (Jenatabadi and Ismail, 2014). Furthermore, SEM involves diagrams that are fundamental because they enable researchers to hypothesize established relationships in the model and help clarify the researcher's ideas on the relationships between variables that are later translated into equations required for the analysis (Vinodh and Joy, 2012).

For this study, the process of SEM is in line with the four-stage process adopted from (Ullman and Bentler, 2003; Blunch, 2012), such as the specification and identification of the model, the model estimation, model modification or re-specification, and confirmatory factor analysis.

3.16.4 The specification of model

The term model specification is also known as the model formulation (Davcik, 2014). It was the first step of SEM carried out in this study. During the modelling process in both study one and study two, a specification of the set of hypotheses to be tested using diagrams such as rectangles or squares to illustrate all the measured variables (both exogenous and endogenous variables). In addition, a one-directional arrow was extended from the exogenous variable to each endogenous variable to illustrate the direct causal relationship among the measured variables.

3.16.5 Model Identification

Model identification relates to the possibility to uniquely estimate values of all the parameters present in an SEM (Bollen and Pearl, 2013). Where this is possible, the model will be known to be identified, and only identified model can be estimated and subjected to further analysis (Teo et al., 2013). When a model is identified, there will be a unique numerical solution for individual parameters in the model (Xiong et al., 2015). There are mainly three different model identification processes (just identified, over-identified and unidentified models). In this study, to know the category the model belongs to, there were two major considerations during their differentiation (Wang and Wang, 2019). That is the numbers of distinct sample moments and the number of distinct parameters estimated in the Amos software (these are the differences in total numbers of mean, variances, covariance, weight, and intercepts calculated in the model that gives rise to the value of the degree of freedom) (Teo et al., 2013).

When a model is unidentified, the number of distinct parameters estimated will be more than the number of distinct sample moments, making the degree of freedom less than zero (negative). In this case, estimations cannot be calculated if a model is unidentified and the system will not show any output (Xiong et al., 2015). For a model to be just identified, the number of distinct sample moments will equal the number of distinct parameters to be estimated. The degree of freedom will then become Zero, and the model will be referred to adjust identified or saturated model (Wang and Wang, 2019). According to Bollen and Pearl (2013), this type of model's output is unworkable to produce meaningful findings; the model needs to be further modified by adjusting the numbers of means, variances, and covariances calculated by the model to make it over-identified for a reliable analysis. In the over-identified model, the number of distinct sample moments is greater than the number of distinct parameters to be estimated, leaving the degree of freedom greater than zero (positive) and can then be subjected to further analysis. Over-identified models also imply that the model has sufficient information to recognise all parameters (Xiong et al., 2015).

3.16.6 Estimation of parameters

After a model is specified and identified, the population parameters were then estimated to reduce the difference among the measured and estimated population covariance matrices (Bollen and Pearl, 2013). The covariances, variances, and loading factors of the measured variables were analysed using the model-implied moment (MIM) to accomplish this goal. According to West et al. (2012), if the loading factor's value is below 0.05, it should be removed from the analysis as they can most times result in poor model fit. These parameters play a role in developing the estimates. Hence, the MIM estimators are also referred to as full information estimators (Maydeu-Olivares, 2017). The maximum likelihood (ML) estimators are the dominant example of full information estimators because it gives the most accurate estimates if the data is normally distributed. However, different studies have argued that the ML estimator still maintains its properties if the measured variables are obtained from non-normally distributed data with less multivariate kurtosis (Denoeux, 2011; Maydeu-Olivares, 2017). In this study, before the MIM parameters estimation, labels with "E" (errors) were assigned to the endogenous variables because for multiple regression, not everything is predicted accurately; thus, there are always residual errors (Streiner, 2006). The ML was applied in the Amos graphics software to yield optimal estimated parameters of all studied variables to assess the distributional properties. The Estimation of means and intercepts of variables was also applied. On the output tab, the history of depreciation was used, as well as a standardized calculation. The standardized estimates such as the covariances and weights and the un-standardized estimates such as the mean, variances, and intercepts were interpreted in the view text.

Furthermore, the correlation strength between exogenous and endogenous variables was evaluated to know their relationship under the regression weight. The critical ratio (CR) and standard error (SE) values were examined. SE measures how precisely the mean of the sample calculates the population mean. In contrast, the critical ratio is the value of the estimate divided by the standard error (SE). When this value of CR is greater than + or – 1.96, the relationship among the measured variable will be significant (Hooper et al., 2008).

3.17 Model fit

The model was being assessed after the estimation of the parameters to examine its fitness. The overall fitness of the model was assessed by using the ML, which usually depends on the chi-square (x2) test. The x2 value is the conventional measure for estimating the entire model fit and examines the minimum discrepancy among the sample and the fitted covariance matrices (Steiger, 2007). The value of the x2 is usually divided by the value of the degree of freedom (*df*), and there is no compromise concerning an acceptable percentage for this statistic; suggestions range from as high as 5.0 to as low as 2.0 (Barrett, 2007). When the test is relevant (p = 0.005), the null hypothesis is rejected because the data does not fit the model structure. A non-significant test (p = > 0.005) implies that the data fit the model structure, and the model is usually considered fit (Singh, 2009). However, in practice, the x2 test is too strict in situations where a large sample size of (N =500) participants. This finding has led to varieties of fit indices that supplement the x2 test, including controversies on the best way the overall model fit is assessed. The current practice is to report the x2, *df,* and P-value alongside several other fit indices during the assessment of overall model fit (Cangur and Ercan, 2015). Studies of (Hu and Bentler, 1999; Barrett, 2007; Hooper et al., 2008) have discussed other important absolute fit indices and additional fit indices to be considered during a model fit. The three popular ones considered in this study are the Absolute model fit, Incremental model fit, and Parsimonious model fit.

3.17.1 The Absolute fit indices

These measures establish how well a model fits or relates to the sample data and reveals the model's superiority without comparison to any other model (Nunkoo and Ramkissoon, 2012). According to (Hooper et al., 2008; Wang and Liu, 2015), Some of the important examples of the Absolute fit indices apart from the Chi-square test are the Goodness of fit index (GFI), the Root means square error of approximation (RMSEA), and the Adjusted Goodness of fit index (AGF1).

3.17.2 The Root mean square error of approximation (RMSEA)

This is another essential fit statistic reported under the absolute fit indices (Chen et al., 2008). The RMSEA lets us know how well a model with an unknown but high parameter estimate would align with the populations' co-variance matrix (Xia and Yang, 2019). The RMSEA has, in recent years, become one of the main informative fit indices because it is sensitive to several estimated parameters in the model (Xia and Yang, 2019). One of the main benefits of RMSEA is its capacity to estimate a confidence interval around its value. The possibility of this is a result of the known distribution values of the data. Consequently, it allows the poor fit (null hypothesis) to be accurately tested (Maydeu-Olivares et al., 2018). If an RMSEA value range from 0.05 and below, it indicates a good fit. If it ranges from 0.6 to 0.10, it is considered a proper fit, and if the value is above 0.10, it indicates poor fit (Chen et al., 2008).

3.17.3 The Goodness of Fit Index (GFI) and Adjusted Goodness of Fit Index (AGFI)

This was developed as an alternative to the x2 test by Sorbom and Joreskog in 1993 (Xia and Yang, 2019). It calculates the proportion of the variance in the model accounted for by the calculated population covariance. It helps to show how closely the model comes to replicating the observed covariance matrix (Steiger, 2007). The recommended cut-off point for GFI is 0.9. However, when sample sizes or factor loadings are low, a higher cut-off point of 0.95 is more appropriate (Marcoulides and Yuan, 2017). Nevertheless, this index has become less popular in recent years due to its sensitivity, and a recommendation for it not to be used has also been made by (Sharma et al., 2005). The AGFI is an index related to the GFI; it adjusts the GFI based on the degree of freedom, allowing a more saturated model reducing fit (Xia and Yang, 2019). The AGFI index also tends to increase with sample size, and the value of 9.0 or more is generally accepted to indicate a well-fitted model. Due to the impact of sample size on both the GFI and AGFI and their reliability as a stand-alone index for fit indices was ascertained. Hence, the need to also examine other fit indices (Hooper et al., 2008).

3.17.4 Incremental Fit Indices

The incremental fit indices are also referred to as the relative or comparative fit indices (Walker and Smith, 2017). This group of indices does not use the chi-square in its raw form but only compares its value to a baseline model. These models assume that the null hypothesis means that all variables are uncorrelated (Cangur and Ercan, 2015). The different main types of incremental fit indices, according to (Singh, 2009; Hooper et al., 2008), are the Normed-fit index (NFI), the tucker Lewis index (TLI), and the comparative fit index (CFI).

3.17.5 Normed-fit index (NFI) and Tucker Lewis Index (TLI)

This type of statistics examines the model by comparing the value of the model's x2 to that of the null model, specifying that all variables measured are uncorrelated (Brosseau-Liard and Savalei, 2014). Under the NFI, the value greater than 9.0 is considered a good fit, and recently, its cut-off criteria are shifting to be equal or greater than 0.95 (Hu and Bentler, 1999). However, a low sample size (e.g., less than 200) can be sensitive to this index and should not be relied on solely (Brosseau-Liard and Savalei, 2014). This issue is usually rectified by Tucker-Lewis index (TLI) assessment, which works well with smaller samples and can indicate poor fit regardless of other statistics pointing towards good fit (Sharif et al., 2018). Nonetheless, because TLI is not normed, values can easily go over 1.0, which can be hard to interpret (Sharif et al., 2018). The value of 8.0 is recommended as a cut-off of TLI. However, Hu and Bentler (1999) recommended values equal to or more than 0.95 as the threshold.

3.17.6 Comparative fit index (CFI)

Peter Bentler first established the CFI in 1990, and it is referred to as the revised form of the NFI (Hu and Bentler, 1999). The CFI considers the sample size and can perform well with even a small sample size (Sharif et al., 2018). Like the NFI, this index presumes that latent variables are uncorrelated and evaluate the sample's covariance matrix with the null hypothesis (Cangur and

Ercan, 2015). A CFI value of 0.9 initially indicated a good fit, until recently where a cut-off criterion of CFI value greater than or equal to 0.95 is recognised presently to indicate a good fit (Hooper et al., 2008). The CFI has gained popularity, and its one of the most reported indexes in the SEM program because it is the least affected by sample size.

3.17.7 Parsimony Fit Indices (PFI)

The Parsimonious Normed Fit Index (PNFI) and Parsimonious Goodness of Fit Index (PGFI) are the two main types of the index under the PFI and are both based on the adjustment of the degree of freedom (Nunkoo and Ramkissoon, 2012). The only difference is that the PGIF is related to the GFI, while the PNFI is related to the NFI (Tarka, 2017). Both statistics are penalized seriously for the complexity of the model, leading to why the values for parsimony fit index are very much lower than other GFI indices (Barrett, 2007). There is no specific threshold level suggested for these indices. Thus, PFI is recommended for use with other GFI when assessing a model fit. Because no threshold value is recommended, this statistic is made more difficult to interpret (Hooper et al., 2008).

3.18 Reporting fit indices

About the indices that should be reported during a model fit, (Schreiber et al., 2006; Hooper et al., 2008) stated that it is not realistic or necessary to include every index the program output produces can burden the reviewer or the reader. Reporting a collective combination of some importance index under the three different types of fit indices discussed in this study is essential because different indices reflect a different aspect of model fit. According to (Steiger, 2007; Hooper et al., 2008), only the essential fit indices should be considered, and the most reported ones are the GFI, AGFI, NFI, CFI, TLI, RMSEA. These indices are most sensitive to model misspecification, sample size, and parameter estimation; hence, they are chosen over other indices (Hooper et al., 2008). Studies of (Singh, 2009; Cangur and Ercan, 2015) also stated that

even though the chi-square is known to have many issues associated with it, it is still vital to be reported alongside its degree of freedom and related probability (p) value.

3.19 Model modification and re-specification

Model modifications are carried out to establish a good-fitting model from a poorly fitted model. This process is being assisted using the "Modification indices" computed for each fixed parameter by the SEM software (Schonberger et al., 2011). The value of a certain modification index is the lowest amount that the x2 statistics is expected to reduce if the equivalent parameter is freed. This information enables researchers to carry out a sequence of model modifications (Guo et al., 2009). At each step of the model modification, a parameter is released that creates the highest fit. This process is usually continued until an adequate model fit is achieved (Nunkoo and Ramkissoon, 2012). The Lagrange Multiplier (LM) and the Wald test are the statistical tests conducted during model modification indices. This test can compare nested models but require calculating one model only (Roxas et al., 2009). The LM suggests improving a model by asking for one or more parameters of the model to be fixed or added to improve the overall fit. Unlike the LM test, the Wald test asks which unnecessary parameter is deleted from the model (Roxas et al., 2009). Both tests do this by identifying the specific parameter that would lead to the largest drop in model x2 and calculate the expected change in the x2. Such parameters could be the addition or removal of covariance among variables and the addition or removal of a path in a mis-specified model or has a low loading factor (Grace et al., 2010). This procedure can be replicated until the model is satisfactory. However, it has been proposed that the fewer the amendments, the better the model would work (Nunkoo and Ramkissoon, 2012).

3.20 Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis is a special case in SEM. It is a flexible and powerful statistical technique used to verify a set of variables (Marsh et al., 2014). CFA has become one of the most popular statistical tools in psychology and educational research (Jackson et al., 2009). In CFA, the

researcher uses knowledge of the empirical research, the theory, or both, to propose the connection pattern and then investigates the hypothesis statistically (Schmitt, 2011). According to Jackson et al. (2009), the approach to CFA progress through the following procedure: a review of significant theory or literature to sustain model specification, establish model identification, carry out introductory descriptive statistics, estimate model parameters, examine model fit and result in interpretation. In this study, CFA was conducted to confirm the relationship between exogenous variables and endogenous variables to know if it is significant or not after the model modification and reassessment of model fit. To carry out CFA, in the Amos graphics software, under analysis properties, the output tap was being opened. The standardized estimation box and the minimization history box were both activated. In calculate estimates, covariance was applied to all exogenous variables in the model, and the data was analysed using regression weight, covariance, and correlation.

3.21 Data Analysis-Study Three

3.21.1 Interview Transcription Process

Upon completing data collection, the researcher transcribed the interview data (self) into written forms in a word document to simplify analysis (Clark et al., 2017). According to Azevedo et al. (2017), self-transcription is essential because it makes researchers much closer to their data and easier to identify trends and themes. The transcription protocol used in this study was adapted from (Braun and Clarke, 2013). In support of this rationale, Trippas et al. (2017) affirmed earlier that the development or adoption of validated transcription protocol is an important aspect of data analysis because it helps avoid data inconsistencies or weaknesses during transcription. Inconsistencies in the transcription of the data set can produce biases in data analysis that will be difficult to understand later in Trippas et al. (2017). During transcription, audiotapes were transcribed word for word (i.e., verbatim). The sentences and phrases of the interviewee were being transcribed verbatim to the best of the researcher's knowledge. Sounds that are not verbal, background sounds, or overlapping speech were not included in the transcript (e.g., sighs, laughter, or coughs). Participants' misspelt words were being transcribed verbatim as they said

it. Including slangs, misuse of words, and grammatical errors. Exclamations like mhm, ahh, ermm, ohhh, naah were also included in the transcript. In addition, all abbreviations were written as said, and all numbers were spelt out in words (e.g., 100% is written as one hundred per cent). The initial capital was used to write place and brand names. "Inaudible word" was used to identify every word in the audiotape that was difficult to understand. An ellipsis was being used to denote pauses in a speech that were longer than ten seconds (brief pause). At the end of the transcription process, the transcribed data were further subjected to qualitative analysis through thematic analysis.

3.21.2 Thematic analysis

Thematic analysis is one of the most common forms of analysis within qualitative research (Braun et al., 2019). It is vitally a method of recognising and studying patterns in qualitative data (Clarke and Braun, 2013). This approach was successfully adopted by Biggs et al. (2013) to analyse their qualitative data around the perception of safety leaders on safety culture in an Australasian organisation. Thematic analysis was first named an approach in the 1970s, and ever since, several versions of thematic analysis have been planned within psychology, including that of (Braun and Clarke, 2006).

The phases (discussed in sub-sections below) used to accomplish the thematic analysis in this study were based on the work of psychologists (Braun and Clarke, 2006). Although the procedures associated with other thematic analyses are different, Braun and Clarke (2013) emphasised the theoretical flexibility of thematic analysis by recognising it as an analytical method instead of a methodology, which mainly other types of qualitative approaches are. The study of Braun and Clarke (2014) further argued that the examination or search for a pattern across language does not require devotion to any language theory or a descriptive framework of human beings, practices, or experiences. Hence, they refer to thematic analysis as a theoretical flexible analytic method. It means that thematic analysis can be practical in a different theoretical framework, e.g., from essentialist to constructionist. This (theoretical independence) also means that any individual can learn thematic analysis without necessarily having the theoretical

knowledge important to other qualitative approaches. Thematic analysis has also been used as a basic method because it is suitable for a wide range of research questions, theoretical perspectives, and research interests. It also works with a small or large data set, which can be useful to produce theory-driven or data-driven analyses. The thematic analysis allows for categories or themes to emerge from the following: repeating ideas; indigenous terms, metaphors, and analogies; shifts in the topic; and similarities and differences of participants' linguistic expression. Thematic analysis was carried out using the NVivo software for this study. These were achieved using the software to upload all twelve transcribed files (one from each participant).

Phase 1: Familiarity with the data set

In the NVivo software, the data was organised or cleaned up to make it easy for analysis. For this to be done, all interview questions were grouped under the same heading. Sub-questions were grouped under a separate heading, and participant identification codes and responses were grouped under different headings; followed by running of “query” on the data, which allowed the researcher to know the data in terms of patterns on how participants responded to the questions, the kind of word or phrase participants used in describing or responding to questions and the frequencies of words they used. Before reading the interview transcript, the keywords used frequently by participants were determined. These keywords were established from the interviewee’s terminology during the interview process and served as a reference point for their experiences. Next, a pictorial display using the word cloud was viewed to learn more about the meaning of each of the phrases used by each participant. Each of these keywords was also viewed under “word search” in query and viewing the word tree enabled the researcher to find out about the information that comes before or after the word and the context of each word used. Finally, before reading the transcripts to identify possible initial codes, auto coding was carried out in paragraph style to help organise all participant responses together according to the research question for easy reading. All these preliminary analyses allowed the researcher to familiarise themself with the data set by actively engaging with the data and thinking analytically with the

data. There was continuous reading and re-reading of the transcript until it was sure that the researcher was comfortable with this phase before proceeding to code generation.

Phase 2: Initial code generation

After the researcher familiarised himself with the data set, an initial coding process was carried out, based on information gathered from the research question. Coding provides a systemic way of achieving useful parts of data as it links to the research question (Braun and Clarke, 2006). It also includes data reduction and simplification but not losing meaning (Braun et al., 2019). The importance of condensing large data set to smaller units in this stage is to understand the phenomenon of focus to develop a construct (Clarke and Braun, 2013). Coding helps in data re-conceptualisation including, finding more possibilities for analysis (Braun et al., 2019).

In this analysis, the coding process was of a sematic focus, whereby the meaning and ideas of a statement are explicitly stated. This process was achieved by reading through the transcribed data. Any statement or sentence of meaning is identified and labelled by assigning it to a word that best describes it. As data reading continued, further identified relevant statements were labelled or sorted, assigning a chunk of a relevant statement under an existing label. The initial codes generated during this phase help set the stage for more detailed analysis by enabling the researcher to identify the data according to the ideas that have been obtained throughout the process. The approach for code development was data-driven in an inductive way, where the content of the data drives the emerging analysis. These codes facilitated the researcher's ability to locate data pieces and the analysis, including identifying why they were included. Alongside the code generation, data were also grouped into categories or classes, which enabled the researcher to access the descriptive characteristics of participants and allow for further coding where possible.

Second coding round: After the initial code generation, it becomes obvious to conduct a second coding to ensure a systematic, coherent, and robust set of codes generated. These were achieved by reviewing all data coded under their mark to see if it reflected the meaning with which it had

been coded originally. As a result, some existing codes were tweaked and, in some instances, merged. It resulted in the development of some latent codes, together with the systematic codes initially developed. On the other hand, rarely was the coding process completed the first time because it was optimized by adding or subtracting possible codes.

Phase 3: Themes Searching

In this phase, focus was placed on how to syndicate codes into candidate theme to identify a higher-level pattern, which has a broader meaning and capture multiple ideas. Another important aspect of this higher-level identification is that it takes the analytic research narrative more than simply describing or summarising themes and explaining their importance or implication (Braun et al., 2016). There was a combination of coded data with the same highlighted colour/meaning under the proposed themes they reflect, and all through the process, several themes have been developed. The distinction between themes and code is that themes are sentences or phrases that recognise what the data means Braun and Clarke (2006). Themes explain coding outcome for analytic reflection. In this analysis, the themes were being developed in a latent manner, where ideas or concepts underpinning developed codes are implicitly expressed and adopted a "deductive focus" where the process of analysis is driven beyond the data in a theoretical concept. Themes comprise descriptions and ideas in a culture that can explain statements, causal events, and morals derived from the participant's interview (Braun and Clarke, 2012). However, during the process of theme searching in this phase, where any coded data is identified that were not appropriate for the label they were assigned and are again recorded where appropriate before continuing the theme search; thus, the coding process continued in this phase. Following the development of the themes, the data under each team was read and re-read to capture the data's potential strength and observations of missing information.

Phase 4: Reviewing themes

The next phase of the task conducted was theme review. The existing themes were subdivided into smaller units referred to as sub or child themes and a parent name covering its associated sub-theme later allocated. Information that contradicts or supports previous studies were further examined; this allowed for theme revision. Reviewing the theme was considered important because it allowed the researcher to know the discernible pattern of themes. The validity of distinct themes was considered, including their connections to a data set. It was achieved by further reading and re-reading the data set to know if the current sub-themes are assigned to link back to the data set. Some information found not to fit under a particular sub-theme was once again recoded or un-coded, thereby interfering with assigned files and references. Some sub-themes were again renamed, if necessary, merged with existing sub-themes, or omitted until there was an achievement on the idea of themes and how to portray the data set.

Phase 5: Defining and naming themes

In this phase, names of existing themes were refined or defined to present them in the final analysis, where each piece of information will be scrutinized from a theme. Therefore, this is achieved by proofreading the data set further to know if all theme names have accurately explained the context to which they are being used. Whereby chance it was not discovered, re-coding and un-coding occurred. In addition to this, there was the identification of the importance of each theme and how the data's entire story was documented., why themes are of interest, and what is fascinating about the themes.

Phase 6: Producing the report

All grammatical errors in the information derived from the transcribed data were being corrected during this phase. The themes that are meaningful and contribute to the study research questions were decided. These themes were further refined again to be reported as final themes

for the study to enable the researcher to convey a clear story about the current state of organisational safety culture in Nigeria oil and gas companies by assessing the different elements that comprise a positive safety culture.

3.22 Validation of qualitative findings

Qualitative research is often characterized by uncertainty and flexibility, by a tension between rigour and creativity, by the need for necessary compromises (Burnard et al., 2008). Validation of qualitative findings can include checking the research method, analysis, and interpretation not only with the academic literature and academia but also with the researched population, either by working collaboratively or by having a "critical reference group" which should include a range of stakeholders critical to the study (Kihn and Ihantola, 2015). Access to the different oil and gas companies that participated in this study was by invitation. The researcher had already earned the trust of the oil and gas workers when seeking their consent on participation and explaining the importance of the research to their safety performance. In ensuring that qualitative data has internal validity, a critical reference group was usually established within each of the companies visited, usually comprised of two to three individuals. These individuals are sometimes employees (secretary, either male or female) from the administrative buildings and, most times, including an individual with an association with the oil and gas industry (community member from a department that provides a permit to access the oil company). Their involvement in the research process was important in guarding against interviewer bias and acknowledging any one type of information from participant's response. The members of the critical reference group were also involved in the coordination and development of the recruitment strategy and sampling framework. The randomization process conducted during the respondents' selection helped improve the external validity of the research results. The oil and gas companies chosen for this research were also randomly chosen from a list of oil and gas companies in the Niger Delta region of Nigeria to improve the generalisability of the results.

Recourse to member checks was limited because the researcher had promised the participants complete anonymity, and follow-up would have been almost impossible. However, two

participants were contacted by the researcher due to the initial relationship established. First, the participants were sent a plain-language report of the interview analysis and interpretation with enough detail and reflexivity to ascertain whether the results were correct. Then an acknowledgement letter of validation confirmation was sent to the researcher by mail (see Appendix IX and XI). At every stage of the initial data analysis process, and interpretation of the qualitative data was also guided, monitored by senior academic staff (my supervisors) to ensure credibility and validity of the findings.

After explaining the methodological methodology, methodological choices, data collection methods, and data analysis process in this chapter, the next chapter will discuss results obtained from the various data collection methods used in this review.

4.0 CHAPTER FOUR: DATA ANALYSIS

4.1 Overview

The study aimed to identify the factors that impact workers' safety behaviour in the Nigerian oil and gas industry. A detailed literature review revealed that safety culture is a major factor influencing workers' safety behaviour and that strengthening such a culture requires considering the elements that constitute it. To examine these relationships, the study adopted quantitative methods (i.e., questionnaire survey for study one and study two); thus, qualitative data was being collected in study three, where selected participants from previous studies took part in face-to-face interviews. Data obtained through the quantitative method from study one is presented, followed by study two outcome, and later the qualitative method (study three).

4.1.1 Descriptive statistics

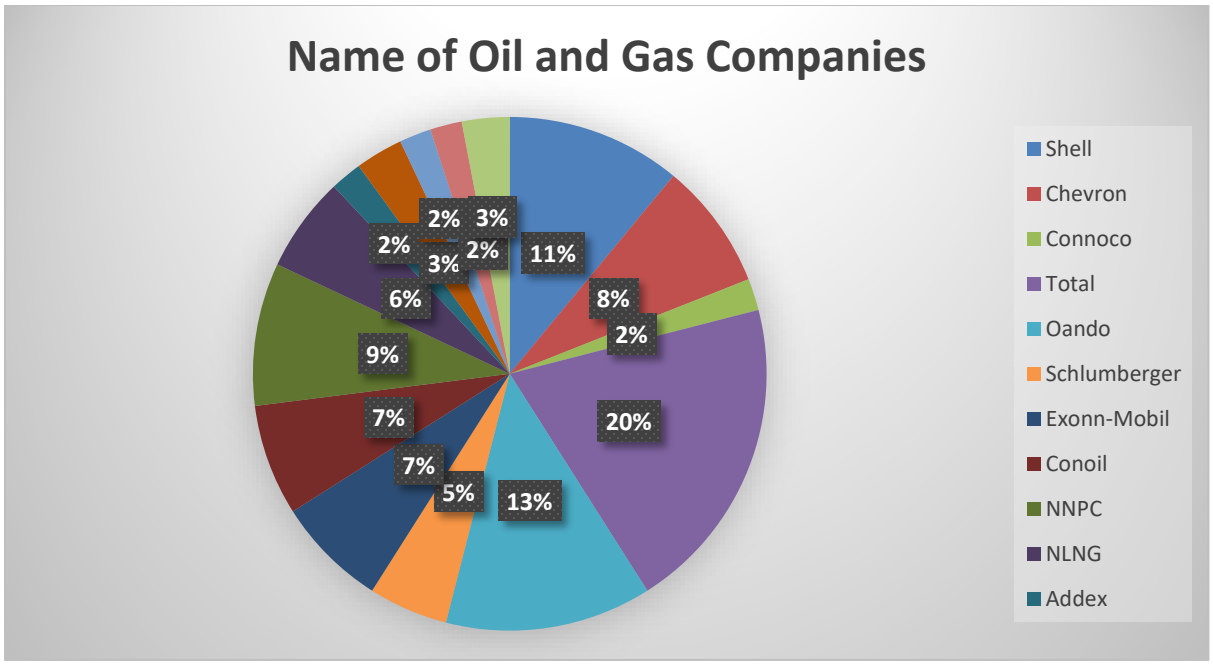

Figure 11: Participants percentage distribution across the oil and gas organisations that took part in the survey.

From figure 11; Total oil Company have the highest frequency (20%), followed by Oando (13%), Shell (11%), NNPC (9%), Chevron (8%), Exxon-Mobil (7%), Conoil (7%), Schlumberger (5%), NLNG (6%), Petrobras (3%). While Statoil, NexenInc, Connoco, and Addex have the least frequency (2% each), others who did not specify the name of oil and gas made up to (3%) of the total participants.

Table 4: Descriptive statistics of gender, age, employment type, work experience and job category.

	Frequency (%)
GENDER	
-Male	58.9
-Female	40.9
-Other	0.2%
AGE	
-18-25	18.4%
-26-35	28.8%
-36-45	27.5%
-46-55	22.9%
-56-65	2.2%
-66-75	0.2%
EMPLOYMENT TYPE	
-Contract	19.7%
-Part-time	11.9%
-Full-time	68.4%
WORK EXPERIENCE	
-0-5	30.7%
-6-10	35.1%

-11-15	22.7%
-16-20	10.0%
-25-30	1.3%
-Others	0.2%
JOB CATEGORY	
-Production	5.8%
-Engineering	33.6%
-Drilling	13.2%
-Maintenance	19.3%
-Crane Operator	5.2%
Admin/management	18.6%
-Construction	2.4%
-Others	1.9%

Table 4 presents survey participant's general characteristics that include gender, age, employment type, work experience, and job category. Based on the sample population, 58.9% of the participants identified their gender as male. Participants that identified their age range between 26-35 accounts for 28.8% of responses received across the sampled group. Most of the participants identified themselves as working in a full-time role (68.4%), followed by those in a contract role (19.7%). Participants with 6-10 years' work experience represent 35.1% of the study group while analysis of job role, 33.6% had engineering role followed by those who identified themselves as working in maintenance role (19.3%).

4.1.2 Percentage of participant responses

The table in *appendix XII* presents the percentage of responses for each item used to measure safety management practices is summarised. Over 50% of all participants agree or strongly agree

to Q13 "*My supervisor puts pressure on me to get the job done on time*." In addition, over 60% of all participants agree or strongly agree to Q16 "*My supervisor has difficulty motivating the team to work safely*." However, over 90% of all participants agree or strongly agree to Q24 "*I am satisfied with the mode of safety communication in my workplace*".

The table in *appendix XIII* summarises the percentage of responses for each item used to measure safety compliance. Over 60% of all participants agree or strongly agree to Q4 "*I ignore safety regulations to get the job done on time*," and again, over 60% of all participants agree or strongly agree to Q5 "*In some instance, I feel pressured to put production before safety in this installation*." However, over 90% of all participants agree or strongly agree to Q7 "I understand what my responsibilities are rights are for safety".

The table in appendix XIV summarises the percentage of responses for each item used to measure safety participation. Over 60% of all participants agree or strongly agree to Q8 "*I feel if I say too much about safety, I might get fired*." However, over 90% of all participants agree or strongly agree to Q6, "Co-worker often help and remind each other to work safely," and Q11, "*My workplace makes sure I comprehend what my responsibilities are for safety*''.

4.2 Reliability Test

Table 5 presents results from items used to measure safety management practices and safety participation for their reliability and were higher than $\alpha > 0.7$, whereas measured items for safety compliance reliability scores measured below the $\alpha < 0.7$. Thus, the total Cronbach's Alpha score for all 45 items ranges from moderate to high (Taber, 2018).

Table 5: Reliability test result of all items measured

Variables	No of items	Cronbach's Alpha (α)	Mean	Standard Deviation
Safety Management Practices	26	0.863	107.58	9.215
Safety Compliance	8	0.681	33.78	2.946
Safety Participation	11	0.767	44.98	4.810

4.3 Identification of the path model using Structural Equation Modelling (SEM)

Table 6: Parameter summary for model identification

	Weight	Covariances	Variances	Means	Intercepts	Total Number of distinct to be estimated
Fixed	2	0	0	2	0	4
Labelled	0	0	0	0	0	0
Unlabelled	8	3	6	4	2	23
Total Number of estimated sample moment	10	3	6	6	2	27
Degree of freedom (*df*)						4

In table 6, the total number of estimated sample moment parameters (27) was more than the total number of distinct parameters (23). The degree of freedom (*df*) is greater than zero (*df* =>0); as a result, the model is over-identified.

4.4 Parameter Estimation

Table 7: Estimation of parameters among variables and model fitness

	Estimate	*P*-Value	Result
SMP →SC	0.23	0.000*	Significant
SMP → SP	0.37	0.000*	Significant
WE → SC	-0.20	0.037	Not significant
WE → SP	-0.43	0.000*	Significant
AG → SC	-0.30	0.000*	Significant
AG → SP	0.11	0.308	Not significant
GE → SC	0.22	0.226	Not significant
GE→SP	0.05	0.825	Not significant

Model fitness parameters								
Chi-square (x^2)	*Df*	*df*/ x^2	RMSEA	GFI	AGFI	CF1	TLI	NF1
359.491	7	51.356	0.331	0.822	0.467	0.707	0.371	7.704

Abbreviations: *p<0.005 = significant SMP = Safety management practices, SC = Safety compliance, SP= safety participation, WE = Work experience, AG= age, GE = gender, *df/ x^2* = degree of freedom/ chi square, RMSEA=Root Mean square error of Approximation, Goodness fit index =GFI, Adjusted Goodness of Fit index=AGFI, Comparative fit index = CFI, Normal fit index=NFI, Tucker Lewis index =TLI.

The maximum likelihood estimation was applied in the Amos graphics software to yield optimal parameters of all studied variables to assess the distributional properties (Table 7). Although there was a significant direct estimated impact of safety management practices on safety participation and safety compliance, safety management practices had a higher direct estimated impact on safety participation than safety compliance. The significance of work experience has been discovered to have a direct estimated impact on safety participation (p<.001) and a non-

significant direct estimated impact on safety compliance (p= 0.037). From the result, age has a significant estimated impact on safety compliance and not significant on safety participation (p<.001). However, gender equality was found not to significantly impact both safety compliance (p = 0.226) and participation (p = .825), respectively. The values of parameters under model fitness were found not to be in the acceptable value, according to Hu and Bentler, (1998) i.e. (*df/ x*2 <5.0; RMSEA < 0.08; GFI > 0.9; AGFI > 0.9; CFI > 0.9; TLI> 0.9; NF1> 0.9), and model was considered not fit. The model was then modified using modification indices for it to be fit (figure 12 below).

4.5 Modification of Model

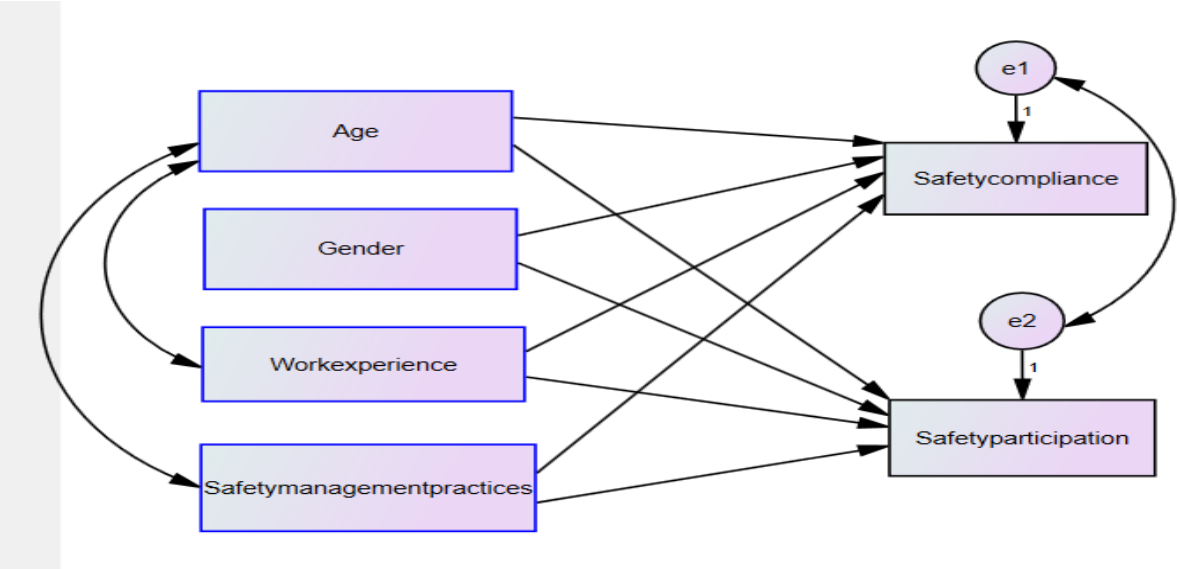

Figure 12: A modified model for the relationship between age, gender, work experience, safety management practices to safety compliance, and safety participation.

The model was modified and improved through modification indices by placing a covariance between age and work experience and safety management practices. Also, there was the addition of covariance between error variables 1 and 2 to increase the values of the fitness measures to the acceptable value for a fit model. The overall fitness improvement of the model was confirmed by carrying out a Confirmatory Factor Analysis (CFA) in table 8 below.

4.6 Confirmatory Factor Analysis (CFA)

4.6.1 Model fitness

Table 8: Summarises the parameters and values for Model fitness

Different types of model fit	**Values**
Absolute model fit	
Chi-square value	12.833,
Probability value p =< 0.05	p< 0.05
Root Mean square error of Approximation (RMSEA) =< 0.08	0.069
Goodness fit index (GFI) = > 0.9	0.990
Adjusted Goodness of Fit index (AGFI)= >0.9	0.989
Incremental model fit	0.956
Comparative fit index (CFI) >0.9	0.956
Normal fit index (NFI)	0.955
Tucker Lewis index (TLI)	0.901
Parsimonious model fit	12.833/4 = 3.208
Chi square/degree of freedom (minimum discrepancy) = <5.0	

The model fit was being used after model modification to determine how well the proposed model captured the co-variances of all the model's measures or items. The values used to assess the fitness of a model under the different types of model fit such as Absolute model fit,

Incremental model fit, and Parsimonious model fit were being investigated to check the fitness of the study model. According to this study, the range of values for the various forms of model fit is within the correct range. While only the RMSEA was greater than 0.08, the overall model was deemed fit (Table 8).

4.6.2 Test for relationship among variables using CFA

Table 9: The relationship among variables from Confirmatory factor analysis test

Measured Variables	Estimate	*P* =Value
Safety participation ← Work experience	-0.427	0.003*
Safety compliance ← Work experience	-0.201	0.109
Safety participation ← Safety management practices	0.369	0.000*
Safety compliance ← Safety management practices	0.229	0.000*
Safety participation ← Age	0.106	0.467
Safety compliance ← Age	-0.299	0.018
Safety participation ← Gender	0.222	0.266
Safety compliance ← Gender	0.051	0.825

($p < 0.005$ is significant) ($p > 0.005$ is not significant)

Table 9 presents the result of the confirmatory factor analysis that helps to explain the relationship between variables. There was a significant association between and safety participation and work experience ($p = 0.003$). However, no significant relationship between work experience and safety compliance was observed.

In addition, safety management practices showed a significant relationship with safety compliance and safety participation. Age and gender did not significantly correlate to safety compliance and Safety participation (Table 9).

4.7 Study two: Data Analysis

For study two, participant's questionnaire responses after three months totalled 1203. They were exported to SPSS version 25, and uncompleted questionnaire removed, leaving a total of 1004 (83.5%) completed questionnaires subjected to further analysis, which will be reported in the next sections below.

4.7.1 Participants demographic characteristic

From figure 13; Total Oil Company have the highest frequency (16.6%), followed by Chevron (14.7%), Shell (11.4%), Exonn-Mobil (11.1%), Schlumberger (9.9%), NNPC (9.0%), Seplat (7.0%), Oando (6.8%), NPDC (5.7%), Viv Limited (3.2%), Conoil (0.2%), NLNG (0.1%). Others who did not specify the name of oil and gas made up to (4.3%) of the total participants.

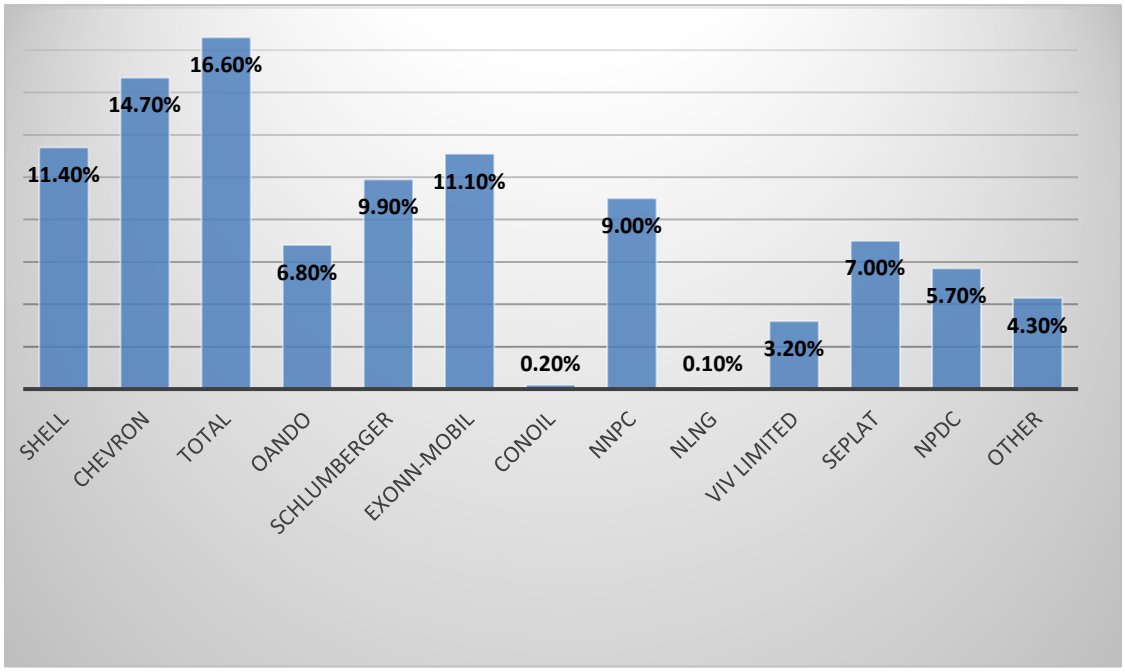

Figure 13: Bar chart illustrating participants' distribution based on workplace they are drawn.

Table 10: Descriptive statistics of age, work experience, and job category

	Frequency (%)
GENDER	
Male	91. 4
Female	8.6
AGE	
18-25	3.1
26-35	42.3
36-45	49
46-55	5.4
56-65	0.2
WORK EXPERIENCE	
0-5	11.8
6-10	46.6
11-15	38.7
16-20	2.7
25-30	0.2
JOB CATEGORY	
Production	26.4
Engineering	42.1
Drilling	22.9
Maintenance	1.6
Crane Operator	0.7
Admin/management	1..8
Construction	2.6
Others	2.0

Table 10 presents participant's general characteristics that include gender, age, work experience, and job category. It revealed that male participants made up 91.4% of participants. In

comparison, 8.6% of the participants are female Participants between the age range of 36-45 have the highest response rate of 49% and followed by the 42.3% representing those that identified themselves as falling within the 26-35 age band. Participants with 6-10 years' work experience have the highest percentage (46.6%), and in Job category, the engineering department has the highest percentage (42. 1%).

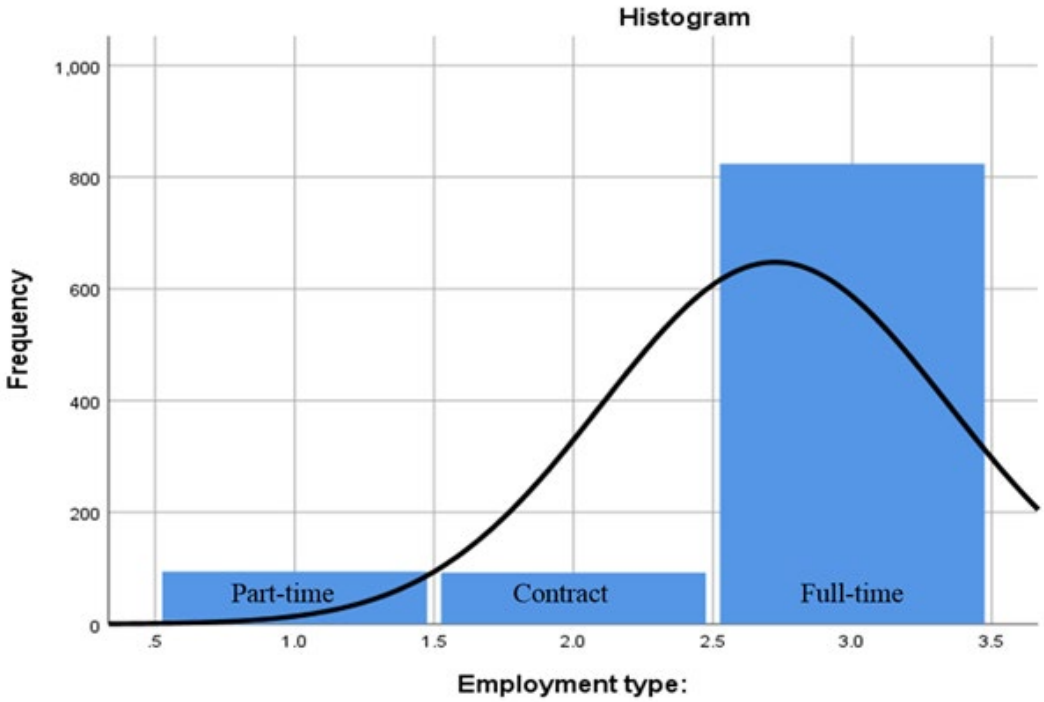

Figure 14: Histogram distribution of participants' employment type.

Figure 14 shows that full-time employees have the highest frequency (81.6%), followed by contract workers (9.3%), and then part-time workers (9.3%).

4.8 Cross tabulation test

Table 11: The relationship between workers' demographics and safety participation, safety compliance and Mindful safety practices.

Demographics	Safety behaviour components	*P* = Value
Gender	Safety-compliance	0.185
	Safety-participation	0.294
	Mindful safety practices	0.143
Age	Safety-compliance	0.000*
	Safety-participation	0.000*
	Mindful safety practices	0.000*
Work-experience	Safety-compliance	0.007
	Safety-participation	0.000*
	Mindful safety practices	0.000*
Job category	Safety-compliance	0.000*
	Safety-participation	0.000*
	Mindful safety practices	0.000*
Employment type	Safety-compliance	0.000*
	Safety-participation	0.000*
	Mindful safety practices	0.000*

($p < 0.005$ is significant) ($p > 0.005$ is not significant)

Findings from the cross-tabulation test between worker's demographic information and the additional safety behavioural components are summarised in table 11. There was no significant relationship between gender and safety behavioural components (Safety-compliance = 0.185; Safety-participation= 0.294; Mindful safety practices = 0.143). Work experience showed a significant relationship with safety participation (0.000*) and mindful safety practices (0.000*) but not with safety compliance (0.007). While age, job category, and employment type show a significant relationship with all behavioural safety components (0.000*).

4.9 Reliability Test

Table 12 presents items used to measure the different elements of both safety culture and safety behaviour tested for their reliability. Table 3 shows that neither of the things examined was identified to have a reliability score greater than 0.7, regarded as generally good. For safety culture elements, only items used to measure safety communication had Cronbach's Alpha score greater than 0.6 but not up to 0.7. Other items that measured management commitment, safety leadership style, safety motivation, employee involvement, and safety training were all below Cronbach's Alpha reliability score of 0.5.

Table 12: Test for the reliability of items used to measure safety culture elements and safety behaviour component before adjusting the Inter-correlation Matrix.

Reliability test for safety culture items before Inter-correlation Matrix adjustment				
Different safety culture elements	**Number of items**	**Cronbach's Alpha score**	**Means**	**Standard Deviation**
Management commitment	6	0.041	19.80	2.102
Safety leadership style	6	-.074	18.69	1.881
Safety communication	5	0.686	18.47	2.420
Safety Motivation	4	0.229	13.87	1.748
Employee Involvement	5	0.061	15.82	1.933
Safety training	5	0.470	15.64	2.467
Reliability test for safety behaviour items before Inter-correlation Matrix adjustment				
Different safety behaviour component	**Number of items**	**Cronbach's Alpha score**	**Means**	**Standard Deviation**
Safety Compliance	4	0.612	15.34	2.094
Safety Participation	5	0.555	19.64	1.875

Mindful safety practices	4	0.331	16.16	1.541

For the elements of safety behaviour, only items used to measure safety compliance had Cronbach's Alpha reliability score above 0.6 but not up to 0.7. While items used to measure safety participation and mindful safety practices had Cronbach's Alpha reliability score below 0.6. Overall, the Cronbach's Alpha reliability scores for these items were considered poor and not accepted. The low alpha score was discovered due to weak item correlation while looking at the inter-correlation matrix (the values were approaching zero), which needed to be improved by adjusting the Inter-correlation Matrix.

Table 13 below presents the inter-correlation matrix outcome for all tested items after it was adjusted and used to measure different elements under safety culture.

***Safety culture elements*:** For the different safety culture elements, after the inter-correlation adjustment, the Cronbach's Alpha reliability score of items measuring management commitment improved from 0.049 to 0.709. However, items measuring safety leadership did not show improvement and remained the same score -0.074. This score was considered weak and, as such, not acceptable (Taber, 2018). For safety communication, all items measured after the inter-correlation adjustment, the Cronbach's Alpha reliability score (0.686) remained the same. For safety motivation, the Cronbach's Alpha reliability score of all items improved from 0.049 to 0.730 after the deletion of two items. The Cronbach's Alpha reliability score for all items increased from 0.061 to 0.849 under employee involvement. For the safety training element, the Cronbach's Alpha reliability score of all items improved from 0.470 to 0.717.

***Safety behaviour component*:** All items used to measure the different components, safety behaviour, were also subjected to Inter-correlation adjustment to improve their Cronbach's Alpha reliability score. They all had close correlation values, and there was no deletion of items. After the inter-correlation adjustment, the Cronbach's Alpha reliability scores remained the same

when compared to table 12, i.e., safety compliance (0.612), safety participation (0.555), and Mindful safety practices (0.331).

Due to the poor reliability score of the items that measured mindful safety practices, all the items measuring were deleted and removed from the study variables before further analysis (figure 21 below). In total, items measuring safety behaviour element amounted to 4 deleted items (out of 13 items) and not included in further analysis. The variable "Mindful safety practices" was made up of four (4) items. This variable was also deleted (figure 21 below) from the analysis due to its impact on the model fit and reliability of the result. In this study, all items used to measure safety culture and safety behaviour subjected to further analysis in this study have Cronbach's Alpha reliability scores ranging from poor 0.5 to high 0.8 (Taber, 2018).

Table 13: Reliability test of items used to measure safety culture elements and safety behaviour component after adjusting the Inter-correlation Matrix.

Reliability test for safety culture items after Inter-correlation Matrix adjustment				
Different safety culture elements	**Number of items**	**Cronbach's Alpha score**	**Means**	**Standard Deviation**
Management commitment	4 items	0.709	13.96	2.309
Safety leadership style	0 item	-.074	-	-
Safety communication	5 items	0.686	18.47	2.420
Safety Motivation	2 items	0.730	7.29	1.434
Employee Involvement	2 items	0.849	6.09	1.093
Safety training	4 items	0.717	13.30	2.474
Reliability test for safety behaviour items after Inter-correlation Matrix adjustment				
Different safety behaviour component	**Number of items**	**Cronbach's Alpha score**	**Means**	**Standard Deviation**
Safety Compliance	4 items	0.612	15.34	2.094

Safety Participation	5 items	0.555	19.64	1.875
Mindful safety practices	4 items	0.331	16.16	1.541

4.10 Percentage of participant responses

The percentage of responses for each of the remaining 18 items measuring safety culture after the deletion of 12 items with poor reliability score is presented in figure 15. It was found that over 60% of all participants agree or strongly agreed to Q21 "*Workers who act safely receive positive feedback*" and Q23, "*Lesson learnt from accident and injuries are communicated to employees*." However, only 38.9% of all participants agree or strongly agree to Q34"*My organisation invests a lot of time in safety training of workers*," and only 46.2% agree or strongly agree to Q8 "*Safety rules and procedures are strictly followed by the management"* (figure 15).

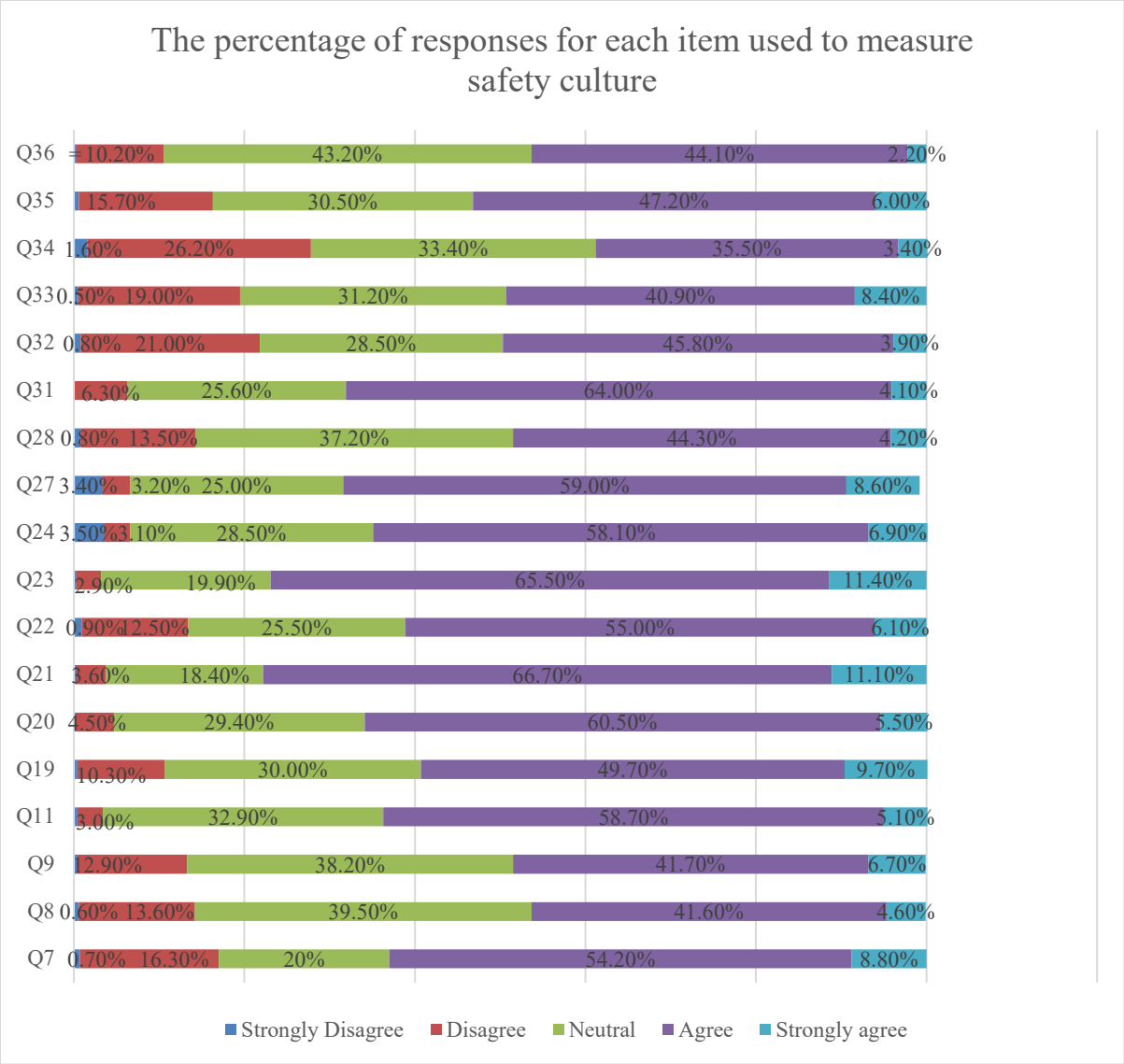

Figure 15: Responses for each item used to measure safety culture

The percentage of responses for each of the remaining 13 items measuring safety behaviour after deleting four items with poor reliability scores was summarized in figure 15. It was found that over 80% of all participants agree or strongly agreed to Q43 "*I put extra effort to improve safety in the workplace*" and Q44, "*I encourage my co-workers to work safely.*"

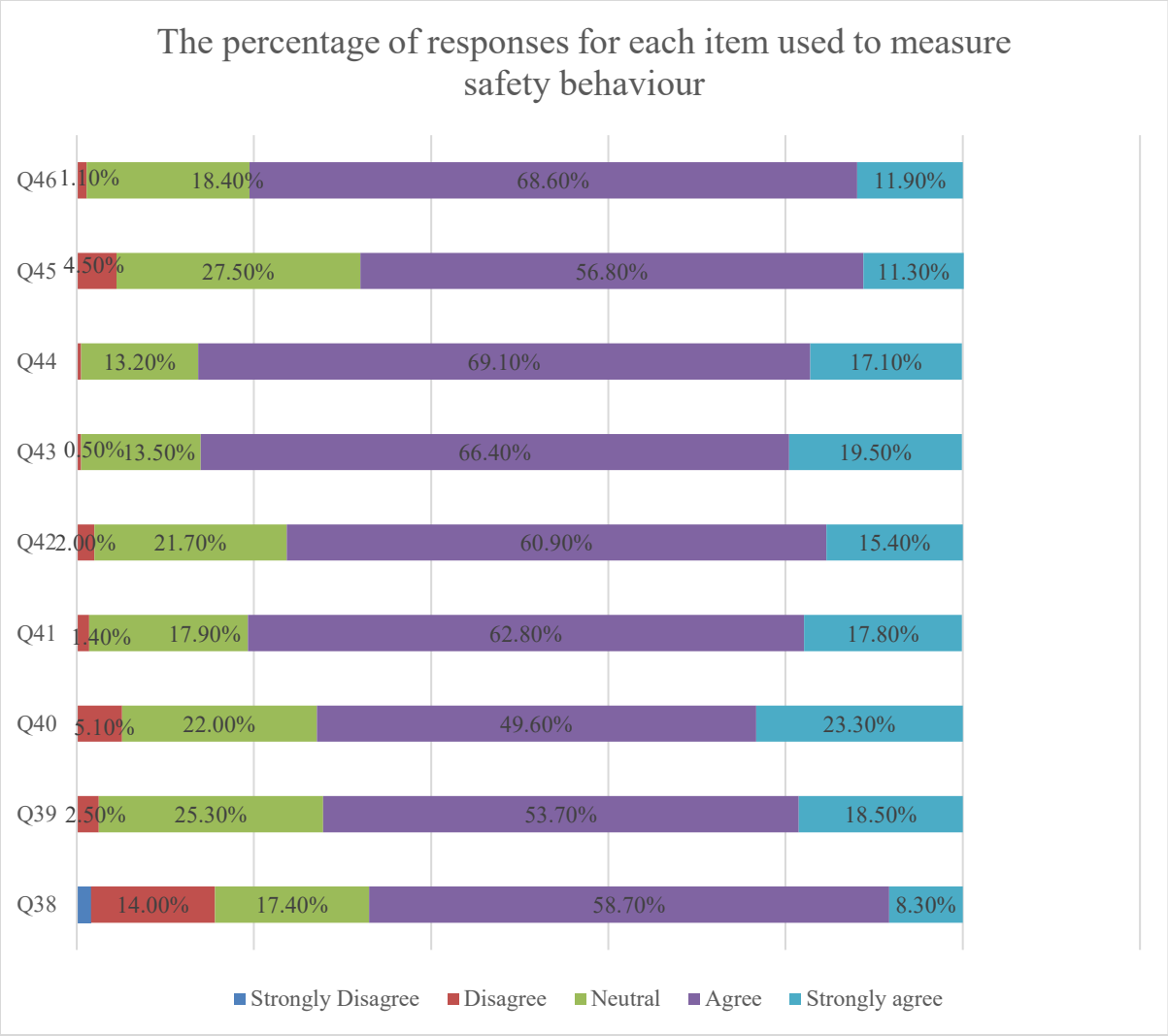

Figure 16: The percentage of responses for each item used to measure safety behaviour

4.11 Final variables subjected for further analysis

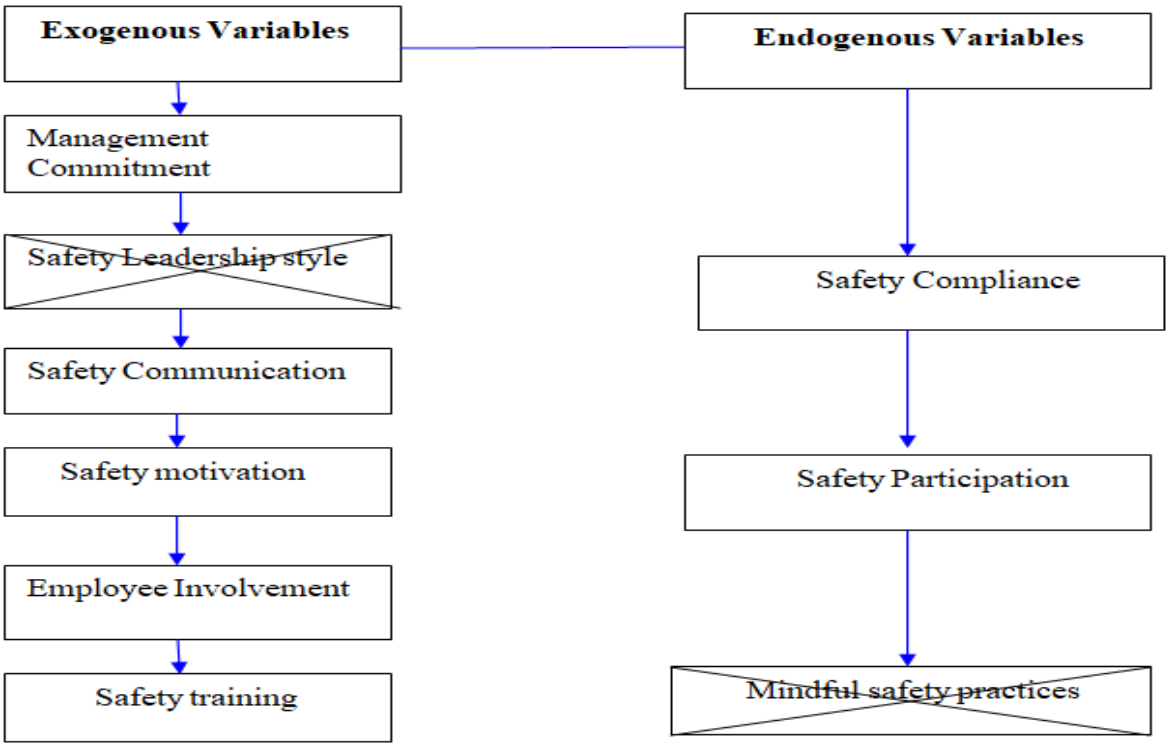

Figure 17: Presenting the list of final variables of the study to be subjected to further analysis.

In figure 17, Safety leadership and Mindful safety practices variables were not considered as it does not present an acceptable Cronbach's Alpha reliability score for each item measured in table 13 above.

4.12 Structural Equation Modelling

4.12.1 Model specification of variables

Figure 18 shows the intrinsic or causal relationship between endogenous variables (management commitment, safety communication, safety motivation, employee engagement, and safety training) and exogenous variables (management commitment, safety communication, safety motivation, employee involvement, and safety training) (Safety compliance and safety participation).

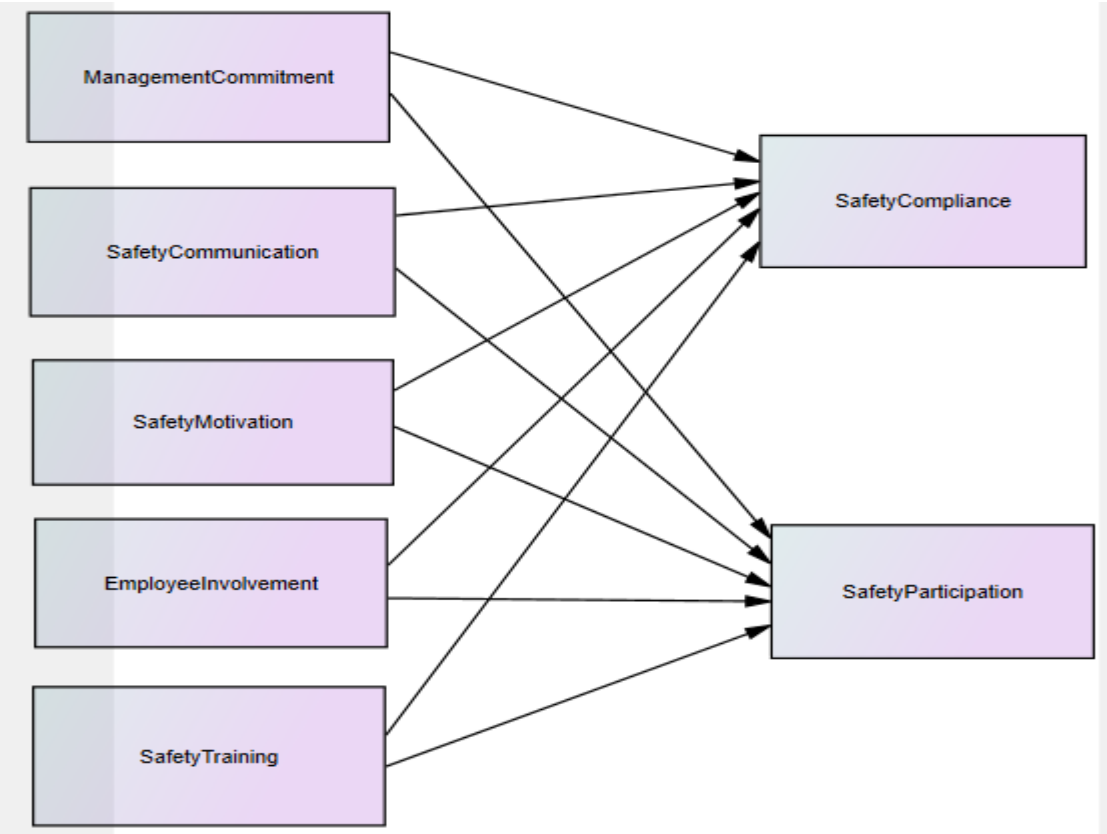

Figure 18: The hypothesised path analysis model.

4.12.2 Model Identification

From table 14, in the model identification, the total number of estimated sample moment parameters (35) was more than the total number of distinct parameters (30). The degree of freedom (*df*) is the difference between both parameters (35-30= 5) and is greater than zero (*df* =>0); as a result, the model is over-identified.

Table 14: Parameter summary for model identification

	Weight	Covariances	Variances	Means	Intercepts	Total Number of distinct to be estimated
Fixed	2	0	0	2	0	4
Labelled	0	0	0	0	0	0
Unlabelled	10	6	7	5	2	30
Total Number of estimated sample moment	12	6	7	7	2	35
Degree of freedom (*df*)						5

4.12.3 Estimation of parameters

Figure 19 presents means and variances values for the exogenous variables considered in the study. Safety communication had the highest mean (*m* =18.47), indicating that data are more spread out under this construct. Management commitment had the highest value of variance (σ2= 5.32) to safety compliance and safety participation. While safety motivation has the lowest value of mean and variance (*m*=7.29, σ2= 2.05) to both safety compliance and safety participation. For endogenous variables, the intercept value of safety participation (α = 11.05) is higher than that of safety complianceα = 3.49. The covariance values for exogenous variables were evaluated using standardized estimates. Management engagement and safety coordination had the highest covariance value (= 3.09). The least covariance value (=0.03) was being found between safety preparation and safety motivation.

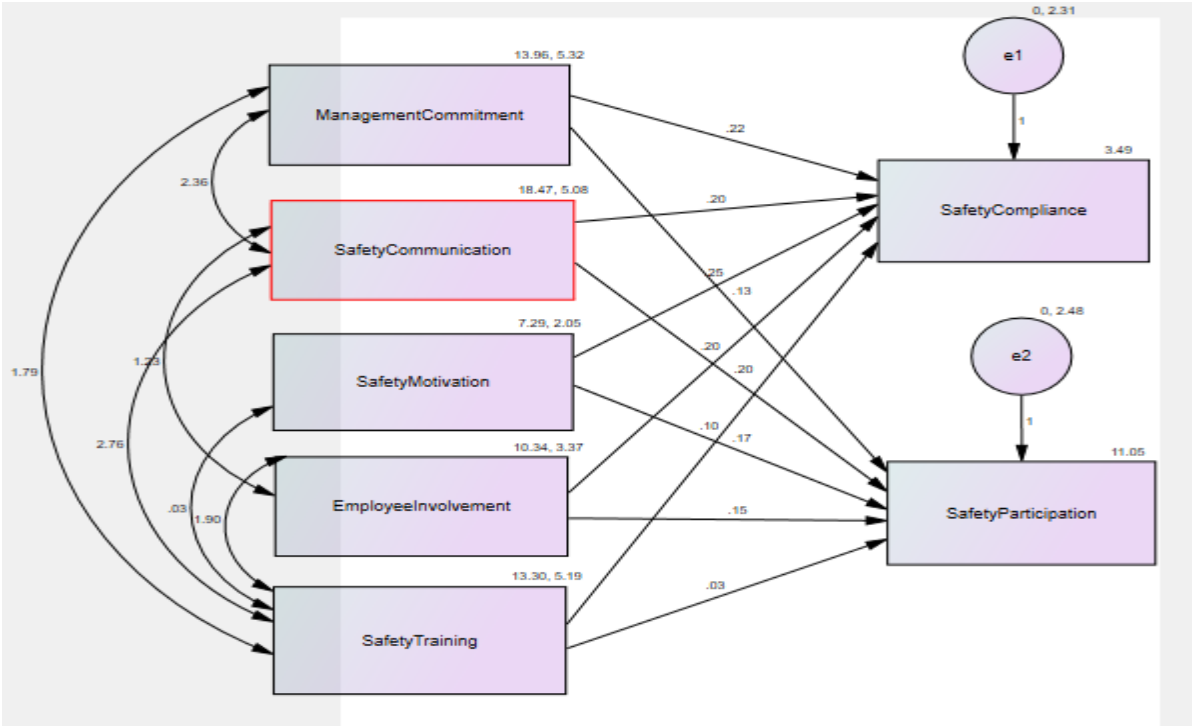

Figure 19: Illustrates the distributional properties of all studied variables.

Safety communication had the highest estimated loading factor of (0.20) concerning safety participation measured, which means that respondents show more interest in the significance of safety communication and safety participation than the other exogenous variables. It was discovered that safety training has the lowest estimated loading factor of (0.03) to safety participation, revealing that respondents are giving the least preference to the significance of safety training to safety participation compared to other exogenous variables. Because the value of the loading factor was below 0.05, it can impact the model fit. The model needs re-specification by deleting the one-directional arrow linking safety training to safety participation.

A higher approximate loading factor of (0.25) was discovered between safety incentive and safety compliance regarding safety compliance. It implies that respondents showed more interest in the significance of safety motivation over safety compliance when compared to the other exogenous variables. While the estimated lowest loading factor of (0.10) between safety training and safety compliance shows that respondents are showing the least interest in the significance of the

relationship between safety training and safety compliance compared to the other exogenous variables.

Table 15: The relationship among variables in parameters estimation

Variables	Estimate	S. E	C.R	P-Value
Management commitment→SC	0.217	0.024	8.964	0.000*
Management commitment→ SP	0.126	0.025	5.036	0.000*
Safety Communication→ SC	0.195	0.027	7.181	0.000*
Safety communication→ SP	0.199	0.028	7.060	0.000*
Safety Motivation→ SC	0.248	0.034	7.411	0.000*
Safety Motivation→ SP	0.168	0.035	4.845	0.000*
Employee Involvement→ SC	0.196	0.030	6.484	0.000*
Employee Involvement →SP	0.147	0.031	4.711	0.000*
Safety Training → SC	0.104	0.027	3.800	0.000*
Safety Training → SP	0.031	0.028	1.084	0.278

*Abbrevations:*SC= Safety compliance; SP= Safety participation; SE= Standard error; CR= Critical ratio, (*p = <0.005) is significant and (p = >0.005) is not significant

The direct estimated impact of the significant and non-significant relationship of an individual exogenous variable to endogenous variables is summarised and presented in table 15. From the result, all exogenous variables such as management commitment, safety communication, safety motivation, employee involvement had a significant relationship (p = <0.005) to both safety compliance and safety participation, except for safety training that had a significant relationship to safety compliance (p = <0.005) but not with safety participation (p = >0.005 not significant). The values of the critical ratio of tested variables were greater than ±1.96, resulting in a significant relationship, except for safety training and safety participation had a critical ratio value below ±1.96.

Although most of the exogenous variables had a significant relationship to an individual component of safety behaviour, the estimated impact on each of the endogenous variables

differs. The direct estimated effect of management engagement on safety enforcement (0.217) was being found to be higher than that of safety participation (0.126). Safety communication had a higher direct estimated impact on safety participation (0.199) than safety compliance (0.195). Safety motivation had a higher direct estimated impact on safety compliance (0.248) than safety participation (0.168). Employee Involvement had a higher direct estimated impact on safety compliance (0.196) than safety participation (0.147). Safety training had a higher estimated impact on safety compliance (0.104) than safety participation (0.031).

4.12.4 Model fitness

Model fit was used to see how well it captured the co-variances between all the model's measures or items (Table 16). The values used to calculate the fitness of the study model under different types of model fit, such as Absolute model fit and Incremental model fit, were investigated to verify its fitness. The values were being discovered to be outside the acceptable range.

Table 16: Summarises the parameters and values for Model fitness

Different types of model fit	**Values**
Absolute model fit	
Chi square value/ Degree of freedom	654.304/5
Probability value *p* =< 0.05	*p*<0.001
Root Mean square error of Approximation (RMSEA) =< 0.05	0.360
Goodness fit index (GFI) = > 0.9	0.717
Adjusted Goodness of Fit index (AGFI)= >0.9	0.728
Incremental model fit	
Comparative fit index (CFI) >0.9	0.769
Normal fit index (NFI)>0.9	0.769
Tucker Lewis index (TLI)>0.9	-.029
Different types of model fit	Values

Absolute model fit	
Chi square value/ Degree of freedom	654.304/5
Probability value p =< 0.05	p<0.001
Root Mean square error of Approximation (RMSEA) =< 0.05	0.360
Goodness fit index (GFI) = > 0.9	0.717
Adjusted Goodness of Fit index (AGFI)= >0.9	0.728
Incremental model fit	
Comparative fit index (CFI) >0.9	0.769
Normal fit index (NFI)>0.9	0.769
Tucker Lewis index (TLI)>0.9	-.029

Abbreviations: RMSEA=Root Mean square error of Approximation, Goodness fit index =GFI, Adjusted Goodness of Fit index=AGFI, Comparative fit index = CFI, Normal fit index=NFI, Tucker Lewis index =TLI. (p = <0.005) is significant and (p = >0.005) is not significant

For absolute model fit, the *df /x*2 *was* above 5.0; the values for Goodness of fitness such as GFI, AGFI were below < 0.9, and the RMSEA was above 0.05. For incremental model fit, the CFI, TLI, and NF1 values were below 0.9. The overall model was considered not fit. The model was then subjected to model modification and re-specification (figure 20).

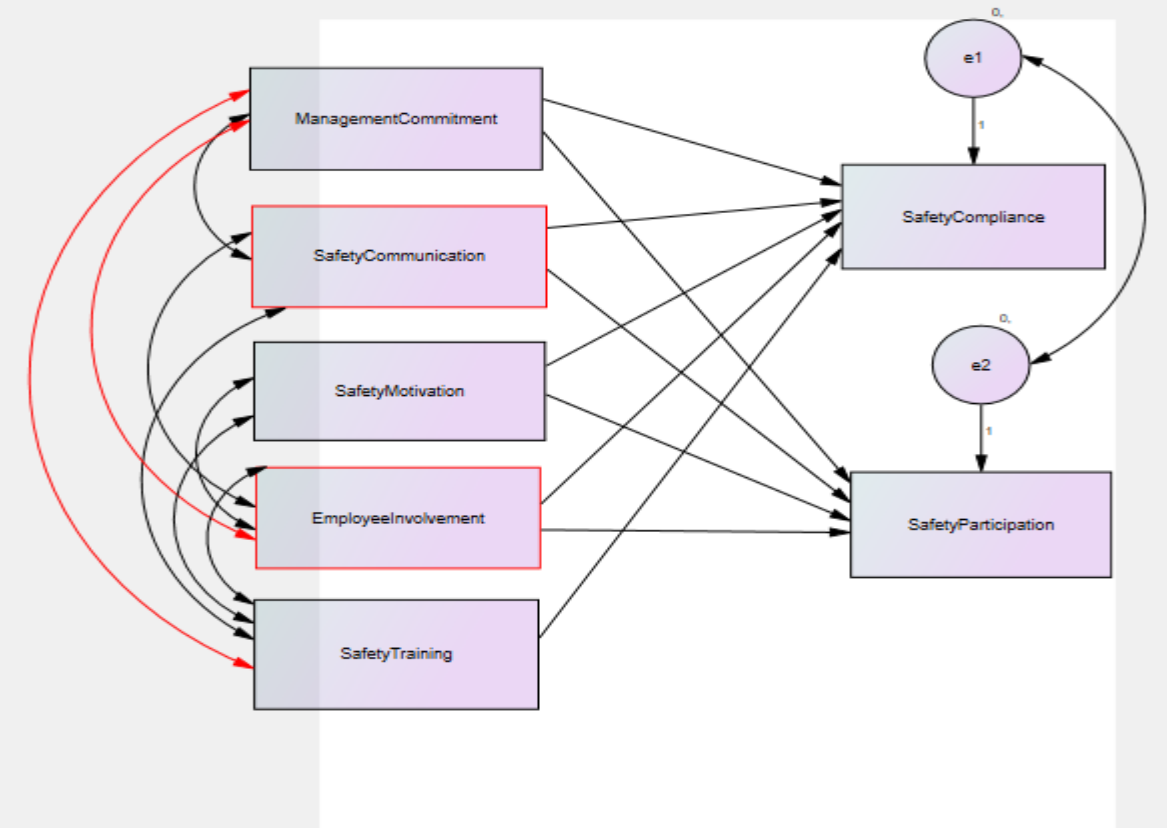

Figure 20: Illustrating the modified or re-specified model

In figure 20, the model was modified to become fit by using the modification indices in the Amos software. Three more covariances were applied to the model to get it to fit. The first covariance was added between the management commitment and employee involvement variables, and the second between the safety and employee involvement variables. The last covariance was added to error variable one (e1) and error variable two (e2). Because of the low loading factor (0.05), the one-directional arrow linking safety training to safety participation was removed and deemed inappropriate (figure 20), as it was found to affect model fitness. The model's fit was then re-tested after these changes were made (see table 17 below).

Table 17 below shows the results of the model's modification. The fitness was re-assessed to know how well the proposed model captured the covariances among all measures or items of the model. The values used to evaluate a model's fitness using various fit indices were

investigated. For absolute model fit, the values for Goodness of fitness such as (GFI, AGFI were above>0.9) and the (RMSEA was below < 0.05). For incremental model fit, the CFI, TLI, and NF1 values were below 0.9. Most of the values for classifying a fit model were discovered under the types of model fit to be within the acceptable range according to Hu and Bentler (1998), except for the probability value *p* = <0.005 is significant, which was supposed to indicate that the model does not relate to the data. The overall model was considered not fit and acceptable.

Table 17: Summary of the parameters used to measure the Model fit after modification

Different types of model fit	**Values**
Absolute model fit	
Chi square value	16.244/3
Probability value *p* => 0.05	*P*<0.001
Root Mean square error of Approximation (RMSEA) =< 0.08	0.066
Goodness fit index (GFI) = > 0.9	0.996
Adjusted Goodness of Fit index (AGFI)= >0.9	0.941
Incremental model fit	
Comparative fit index (CFI) >0.9	0.995
Normal fit index (NFI) >0.9	0.994
Tucker Lewis index (TLI) >0.9	0.967

Abbreviations: RMSEA=Root Mean square error of Approximation, Goodness fit index =GFI, Adjusted Goodness of Fit index=AGFI, Comparative fit index = CFI, Normal fit index=NFI, Tucker Lewis index =TLI. (p = <0.005) is significant and (p = >0.005) is not significant

4.12.5 Confirmatory factor analysis (CFA)

Table 18 confirms the relationship between variables in the CFA test after model modification. All exogenous variables such as management commitment, safety communication, safety motivation, employee involvement had a significant relationship (p = <0.005) to both safety compliance and safety participation, except for only safety training and safety participation where no relationship was tested. Management commitment had a higher direct estimated impact on safety compliance (0.217, p = .001) than safety participation (0.131, p = .001). Safety communication had a higher direct estimated impact on safety participation (0.210, p = .001) than safety compliance (0.197, p = .001). Safety motivation had a higher direct estimated impact on safety compliance (0.248, p = .001) than safety participation (0.169, p = .001). Employee Involvement had a higher direct estimated impact on safety compliance (0.198) than safety participation (0.161). Safety training had an estimated impact of (0.099), but no estimated impact resulted in safety participation.

Table 18: Summarises the relationship among variables from CFA

Variables	Estimate	P-Value (p< 0.005 is significant) (p>0.005 is not significant)	Results
Management commitment → SC	0.217	0.000	Significant
Management commitment → SP	0.131	0.000	Significant
Safety Communication→ SC	0.197	0.000	Significant
Safety communication→ SP	0.210	0.000	Significant
Safety Motivation→ SC	0.248	0.000	Significant

Safety Motivation→ SP	0.169	0.000	Significant
Employee Involvement→ SC	0.198	0.000	Significant
Employee Involvement →SP	0.161	0.000	Significant
Safety Training → SC	0.099	0.000	Significant
Safety Training → SP	Nil	Nil	No Result

4.13 Qualitative Data Analysis (study three)

For the qualitative method, a face-to-face interview was conducted with twelve workers from different local and multinational oil and gas companies located in the Niger Delta region of Nigeria. This was used to obtain information about employees' perceptions of the current state of organisational safety culture and its safety behaviour. The items covered several elements that constitute a positive safety culture, such as management commitment, safety leadership style, safety communication, employee involvement, training and information, motivation, and learning organisation (see chapter two for detail). The transcribed data from interviews were subjected to thematic analysis to find a pattern to help draw a conclusion and the result presented in subsequent sections.

4.13.1 Descriptive statistics from qualitative analysis

In table 19, there were 12 interview participants in total. In terms of participants' position, 67% (8) of the participants are managers. However, 25% (3) are managers with Health and safety duties. 16.8% (2) of the participants are supervisors, and 16.8% are frontline employees. For gender, 95% (11) of the participants were male. For organisation, 35% (4) of the participants are from NPDC, 25% from Seplat, 25% from LEE engineering, while 17% from Viv Limited. In terms of

work experience, participants had work experience ranging from 6 to 50 years. For organisation type, 65% (8) are local while 35% (4) are multinational.

Table 19: Characteristics of interviewees

Position	**Work experience**	**Gender**	**Organisation**	**Type of organisation**
1) Manager	40 years	Male	NPDC	Multi-national
2) HSE manager	>10 years	Female	NPDC	Multi-national
3) Supervisor	15 years	Male	NPDC	Multinational
4) Frontline employee	50 years	Male	NPDC	Multi-national
5) Manager	30 years	Male	Seplat	Local
6) HSE manager	>12 years	Male	Seplat	Local
7) Frontline employee	6 years	Male	Seplat	Local
8) HSE manager	23 years	Male	Lee Engineering	Local
9) Manager	25 years	Male	Lee Engineering	Local

10) Manager	30 years	Male	Lee Engineering	Local
11) Manager	7 years	Male	VIV limited	Local
12) Supervisor	10 years	Male	VIV Limited	Local

4.13.2 Thematic analysis findings from study three

4.13.2.1 Preliminary qualitative data analysis

Table 20 summarises the frequencies of words generated from the Preliminary analysis of "Query run" on the transcribed data. Words frequently mentioned and discussed by participants in the transcribed data generated during the query run were examined. The word "Safety" had the highest frequency, followed by management issues and unsafe. These keywords were also related to the research question and served as a reference point to participants' experiences in their workplace.

Table 20: Frequencies of words in "Query run"

Keywords	Frequency (*n*)
Safety	729
Management	250
Issues	1503
Unsafe	146
Training	137
Employees	135

Figure 21 below illustrates the use of word cloud to confirm the frequency of words used by participants viewed in the query run. In the word cloud, bigness and boldness of the word mean that word was frequently mentioned among the interviewees. Like in the query run, the word “safety” was more conspicuous than other words' frequency. These preliminary analyses helped the researcher think critically about the data set and how these participant responses can answer the research question.

Figure 21: Pictorial display of the keywords from all participant interview responses.

4.13.2.2 Initial generated codes

Table 21: Summarises the outcome of the initial codes generated in NVivo software. During the coding process, a chunk of text is read, and a word/ label that explains the meaning of the text is allocated to the text (code label) in the left column of the table. The middle column of the table explains the participant’s transcript (uploaded as files, one file per participant). The references explain the number of texts extracted and coded from the files. Information in table two also revealed that over 83% (10) of participants said something about a visit, employee and communication, safety, management, motivation, training, and relationships.

Table 21: List of codes generated with the number of files and references

Initial codes generated	Files	References
Challenges	2	2
Communication	12	27
Confidence	9	9
Culture	2	2
Employees	12	32
Fatalities	4	6
Feedback	7	9
Incident	3	3
Information	4	4
Learning	6	7
Management	11	45
Meetings	7	11
Relationship	10	10
Motivation	11	30
Visit	12	13
Niger Delta	1	1
Performance	2	3
PPE	3	3
Production	6	7
Punishment	1	2
Report	4	4
Reporting medium	10	11
Responsibility	9	11
Safety	11	26
Supervision	1	1
Training	10	34

Unsafe	9	14
Workplace	7	7

4.13.2.3 Second coding phase

Table 22: Summarises the adjustment made on the number of files and references after the second coding phase.

Codes generated	Files	References
Challenges	2	2
Communication	12	27
Confidence	9	9
Culture	2	2
Employees	12	32
Fatalities	4	6
Feedback	7	9
Incident	3	3
Information	4	4
Learning	6	7
Management	11	45
Meetings	7	11
Relationship	10	10
Motivation	11	30
Visit	12	13
Niger Delta	1	1
Performance	2	3
PPE	3	3
Production	6	7

Punishment	1	2
Report	4	4
Reporting medium	10	11
Responsibility	9	11
Safety	11	26
Training	10	34
Unsafe	9	14
Workplace	7	7

In this table 22, after the second round of coding, some codes were found not to fit the assigned labels, the number of files and references was then readjusted.

4.13.2.4 Initial themes developed from the aggregation of codes

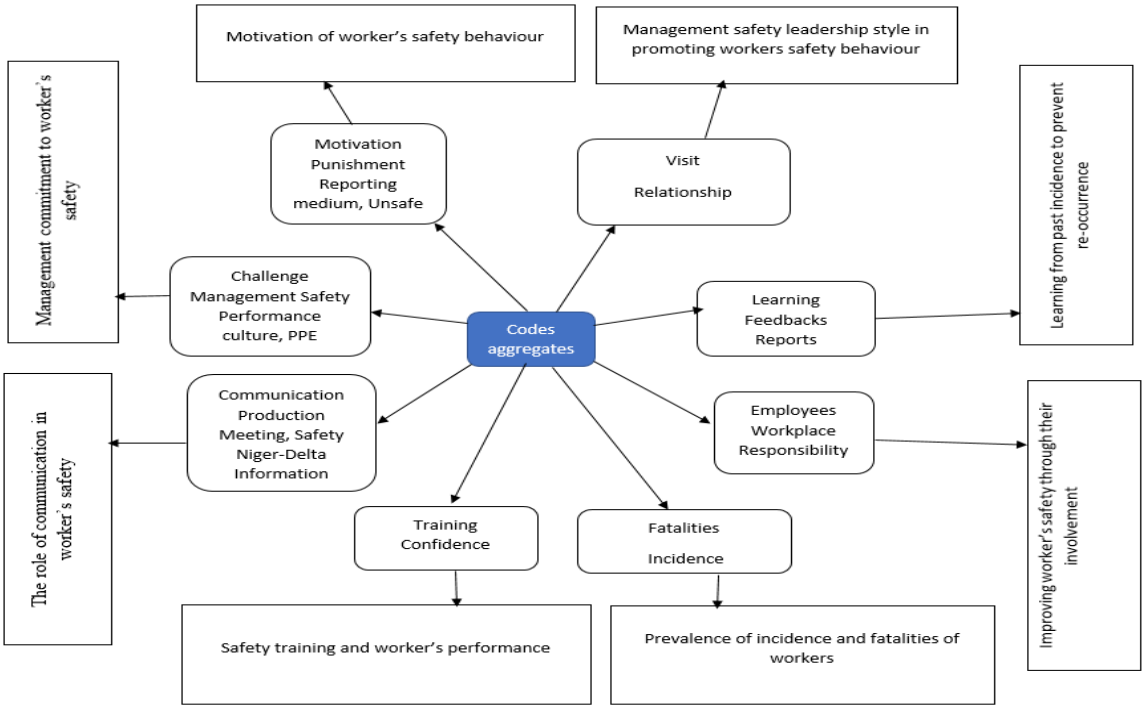

Figure 22**:** Clusters of codes that led to the emergency of the final eight themes.

Aggregates of related codes were grouped to develop a theme that captures a broad range of ideas of clustered codes (figure 22). These different themes cover different aspects of safety culture elements that constitute a positive safety culture measured in the interview questions of this study.

Table 23**:** List of different initial themes developed from code aggregation

Themes	Files	References
1.Management commitment to worker's safety	12	14
2.Management safety leadership style in promoting workers safety behaviour	10	13
3.The role of communication in workers safety	12	57
4. Safety training and workers performance	10	31

5. Improving workers safety through their involvement	12	35
6. Motivation of workers safety behaviour	12	43
7.Learning from past incidence to prevent re-occurrence	10	14
8. Prevalence of incidence and fatalities of workers	6	9

Table 23 above lists the themes developed with respect to figure 23 (see appendix XV). The number of files (one file per participant) that contributed information used to develop the themes was also listed in the table, including the number of times relevant information (references) was retrieved or coded from the participant. It was found that 100% (12) of the participants contributed information to theme numbers 1, 3, 5, and 6. Over 83% (10) of participants contributed to themes 2, 4, and 7, while only 6 (50%) interviewees contributed to theme number 8.

Table 24: Themes reviewed to generate sub-themes

Themes and sub-themes	**Files**	**References**
Parent Theme 1: **Management commitment to workers safety**		
Sub-themes		
1.Difficulties to management safety commitment	2	2
2.How management show commitment to safety	5	10
3.Importance of management commitment to safety to safety at work	6	6
4.Level of safety commitment by management	8	1
5.Management emphasis on safety		
6.Ways management encourage employees on safety behaviour	5	5

Parent theme 2		
-Management safety leadership style in promoting workers safety behaviour at work		
Sub-themes		
1.Management site visit to ensure workers compliance with safety procedures	4	4
2.The quality of the relationship between management and employees	9	9
Parent Theme 3		
The role of communication in workers safety		
Sub-themes		
1.Channels for safety dissemination	10	14
2.Concerns for safety	1	1
2.Prioritising safety and production	8	9
3.Safety information and time duration	11	21
4.Value for safety	7	12
Parent theme 4		
Safety training and workers' performance		
Sub-themes		
1.Different types of training	3	3
2.Importance, usefulness and effectiveness of training and information	8	13
3. Management perception on employee's safety training	5	8
4.Time or duration of safety training	4	4
5.Worker's safety training performance or output	3	3

Parent Theme 5		
Improving worker's safety through their involvement		
Sub-themes		
1.Employee's perception about their workplace	5	5
2.Employee's perception of safety responsibilities	6	10
3.Management commitment and perception to employee's safety involvement	8	9
4.Reasons for engaging workers on safety	4	4
5.Ways to engage employees and the importance of their safety	6	8
Parent Theme 6		
Motivation of workers' safety behaviour		
Sub-themes		
1.Importance of reward and its impact on workers motivation	5	6
2.Mediums used to report unsafe behaviour to motivate safety behaviour	8	9
3.The usefulness of reporting medium	7	7
4.Types of safety motivation strategies	12	21
Parent theme 7		
Learning from past incidence to prevent re-occurrence		
Sub-themes		
1.Channels of receiving feedbacks	4	4
2.Importance of feedbacks and reports in preventing incidence reoccurrence	3	3
3.Ways of preventing incidence re-occurrence	6	7

Parent theme 8		
Prevalence of incidence and fatalities of workers		
Sub-themes		
1.Degree of incidence	4	4
2.Fatality rates and occurrence	4	5

Data in table 24 contains all themes reviewed (parent theme), and its associated sub-themes were summarised. Of all the themes reviewed, the first theme on "Management commitment to workers safety," was found to have more sub-themes (six) compared to other themes. While the second theme, "Management safety leadership style in promoting workers safety behaviour at work," and the eighth theme, "Prevalence of incidence and fatalities of workers," had the least associated (two each) sub-themes. The number of files and references that contributed to the development of the sub-theme was also presented in the table.

4.13.2.5 Refining theme names

Table 25: Refined names of themes and sub-themes

Themes and sub-themes	**Files**	**References**
Parent Theme 1: Management obligations to the safety performance of workers and challenges to commitment		
Sub-themes		
1.Difficulties to management safety commitment	1	1
2. Management interventions to worker unsafe behaviour	6	5
3.Importance of management commitment to safety to safety at work	4	4

4.Rating the level of safety commitment by management	6	8
5.Management emphasis on safety	5	5
6.Ways management encourage employees on safety behaviour	3	3
Parent theme 2		
-Management safety leadership style in promoting workers safety behaviour at work		
Sub-themes		
1.Management site visit	4	4
2.The relationship between management and employees	8	8
Parent Theme 3		
-Communicating the vitality of safety towards improving workers safety behaviour		
Sub-themes		
1.Channels for safety dissemination	6	7
3. Prioritising safety or production	8	7
4.Access and availability to safety information	8	8
5.Importance and value for safety	5	5
Parent theme 4		
Management provision of safety training and its impact on workers' safety performance:		
Sub-themes		
1.Different types of training	**2**	**2**
2.Importance and effectiveness of training and information	9	14
3.Management commitment to employee's safety training	2	2
4.Time or duration of safety training	4	4

Parent Theme 5		
Improving worker's safety behaviour in the workplace through their involvement		
Sub-themes		
1.Employee's perception about their workplace	4	4
2.Employee's perception of safety responsibilities	6	7
3.Management perception of employee's safety involvement	4	3
4.Reasons for engaging workers on safety	4	4
5.Ways to engage employees and the importance of their safety	5	5
Parent Theme 6		
-Motivating workers safety behaviour, using the reward system and reporting medium:		
Sub-themes		
1.Importance of reward and its impact on workers' motivation	5	5
2.Mediums used to report unsafe behaviour to motivate safety behaviour	5	5
3.The usefulness of reporting medium	7	7
4. Safety motivation strategies by management	9	10
Parent theme 7		
-Learning from past incidence to prevent re-occurrence		
Sub-themes		
1.Channels for receiving feedbacks	3	3
2.Importance of feedback and reports in preventing incidence reoccurrence	3	3
3.Ways of preventing incidence re-occurrence	6	8

Parent theme 8		
Prevalence of incidence and fatalities of workers in the Nigeria oil and gas companies:		
Sub-themes		
1.Degree of incidence	4	4
2.Fatality rates and occurrence	4	5

Table 25 presents themes (parent theme) and associated sub-themes refined or adjusted to give a comprehendible meaning of the coded information it portrays. All final files and references that contributed or make up the sub-theme development are also summarised in the table.

4.13.2.6 Final themes and their sub-themes

After the revision and redefinition of all existing initial themes and their sub-themes (Table 24 and 25), the names of final themes and their associated sub-themes are presented in figure 23 (see appendix XV), which was used to convey a clear story about the qualitative findings of this study, as it relates to the research question. From the information presented in figure 23, the final eight different Parent themes and their sub-themes emerged retrieved from the qualitative data emerged.

The first seven parent themes were found to correlate and covered seven elements around positive safety culture measured in the interview questions (see table 26 below). This reflects a major strength of the data; information sourced from participants is considered robust and useful in providing documentary evidence on the current state of safety culture in the oil and gas companies and how their safety behaviour is impacted.

Table 26**:** List of final parent themes and the associated safety culture element they explored

Different parent themes developed after the thematic analysis	**The interview question covered seven (7) safety culture elements**
1)Management obligations to the safety performance of workers and challenges to commitment →	1)Management commitment
2)Management safety leadership style in promoting worker's safety behaviour →	2)Safety leadership style
3)Management provision of safety training and its impact on worker's safety performance →	3)Training and information
4)Motivating workers safety behaviour, using the reward system →	4)Motivation
5)Communicating the vitality of safety towards improving workers safety behaviour →	5)Safety communication
6)Enhancing worker's safety behaviour in the workplace through their involvement →	6)Employee involvement
7)Learning from past incidence to prevent re-occurrence →	7)Learning organisations
8)Prevalence of incidence and fatalities of workers in the Nigeria oil and gas companies	

4.13.3 Final themes/sub-themes and how they relate with different the seven elements of organisational safety culture.

4.13.3.1 Management Commitment

Parent Theme 1: Management obligations to the safety performance of workers and challenges to their commitment:

This parent theme covers how management shows commitment to safety and how employees perceived their commitment level. It also describes how management motivates or enhances employees' safety performance and how much emphasis is made on safety, and the difficulties management faces towards their commitment to safety. The parent theme has six sub-themes that capture information about "management commitment" to safety, a key element of safety culture. Information gathered helped explore management safety practices in the organisations, as management commitment is the backbone to improving the safety culture at work. With this information, an analysis of the current management commitment to safety in the Nigeria oil and gas industry was achieved.

a) Sub-themes 1: Difficulties to management safety commitment

This sub-theme discussed what could challenge management towards their commitment to safety. It concluded that although management sometimes may be willing to commit to safety, lack of proactive knowledge on safety issues among management was identified as a barrier that can make it difficult to commit commitment. To expand on this, participant LEEHseMaOO1 concludes,

> *"With regards to management commitment" to overall safety issues at work, I will tell you it's not easy! It's not easy to have proactive knowledge to make workers understand. Giving them reasons why commitment to safety should be key is very difficult".*

This position also forms part of the early views made by vivMa001 during the interview process where the interviewee concluded that,

> *"It can also be difficult to show management commitment when you have employees that believe that safety is in the hands of God and do think you have to be too careful or act in a certain way to remain safe. Some will even tell you that they have traditional powers that before any explosion like this, they will disappear…… so these are the challenges we face every time trying to you know and make them understand".*

These statements revealed that management in the Nigeria oil and gas industry might have a good orientation on the importance of safety at work. Still, involving employees may be one of the major challenges they face in implementing a good safety system in the industry.

b) Sub-theme 2: Management's interventions to workers unsafe behaviour

The outcome from this subtheme described management response when employees are involved in an unsafe act. This theme further highlights management commitment, their practice, and their efforts that are visible to the employees and are acknowledged. In line with this, participant SEPFEOO2 explained that "*when unsafe acts or conditions are reported, immediately management sets up a committee to investigate. So, I think, even in industry standard that is the best approach to every near miss, every unsafe act or unsafe conditions, incidents or accidents should be investigated, the root cause analysed, and recommendation so that such things should not occur again. So, management show commitment when it comes to that".*

Further intervention actions taken by management in response to employee's unsafe behaviour revealed several issues among the interviewees to which Participant NPDCFEOO4 concluded that such measures,

> *"revealed that the first and foremost action management take if employees are found involved in any unsafe act is, first to call you to let you know what you are doing and then they let you know the implication and the way it can be of serious pain to other people around you. Then they will give you a little coaching in case you do not understand what is going on or you do not understand the gravity or the consequence of your actions. After that, you will be placed under serious watch by the supervisor. If such a thing repeats itself once or twice, you will be withdrawn from the team because you will be considered a danger to the rest of the team. You will be subject to another process of reformation in terms of further training and recertification until they are sure that you are fit for purpose to be part of the team before allowing you to join the team again."*

In furtherance, another interviewee, NPDCHSEOFOO2, explained that *"if there is any issue reported, management will try to investigate what happened and close the gap so that there will be no reoccurrence, no incident or potential incident."*

Participant SEPHSEOFFOO3 *"revealed that when an unsafe act is reported, management wants to look at the root cause of such an unsafe act, to prevent a reoccurrence, and it is not to witch hunt, neither is it to discipline or punish, rather it is to put a corrective measure in place. So, that kind of creates a good atmosphere in the workplace and this approach is very motivational, because it makes people free, personnel and even contractors, they are free to air their mind".*

These statements imply that management measures have been put in place to prevent future incidents from occurring and subsequently keep workers safe at work.

c) Sub-theme 3: Importance of management commitment to safety at work

This sub-theme describes why management feels they should be committed to or indulge workers in safety. The essence of this theme is that it will help understand management's intentions to their safety commitment. Do they show commitment for personal interest or to the interest of everyone involved? Do workers perceive their commitment to being important? To ascertain this, information retrieved from data disclosed under this theme that management commitment is important for several reasons. Participant LEEHseMaOO1 was among the interviewee who expressed their view on the importance of management commitment at work. In his words, he stated that *when the management is committed to safety, the whole process work, and in my organisation, we are, the process to which we are, is in a progressive process. We are not static.*

Participant LEEMaOO2 stated that "*yes, managers encourage and motivate employees on safety because of the impact the poor record has on the manager's template or the manager's scorecard, also on the company reputation and the life of the employees, so it's easier for us to manage it when it's still at the preventive stage than when an accident*

occurs." Then, LEEMaOO3 further stated, "*when it comes to safety issues that is one of the key issues that management do not joke with because the organisations, we work with also don't play with their safety matters because for any safety incident that occurs, work will stop and investigations will have to take place, and you know that cost a lot of money, so it is better you prevent before it happens."* Finally, NPDCSUPOO3 a supervisor, mentioned that "*management show commitment to safety because the culture of industrial safety permeates from management and cascades down to people on the frontline or the people, we can call foot soldiers."*

These statements show that the importance of management's commitment to safety is visible to the workforce, and management understands the need and benefits of their commitment to safety.

d) Sub-theme 4: Rating the level of safety commitment by management

This theme is all about rating management level of safety commitment regarding rating management safety performance. This theme is important to know if the management knows why it is obligatory for them to commit to safety. It is not enough to say they are committed. To what degree or extent do employees perceive their commitment? To conclude this,

NPDCFEOO4 stated, "*I think management commitment is quite excellent as regards this company because we take safety issues very seriously, and they always give feedback and motivation to staff that have demonstrated additional effort to responsibility, knowledge, and understanding and who have put the extra mile in promoting the safety culture of the company. Similarly, opinion from other participants on the level of management commitment in their organisations was also acknowledged."*

According to LEEMaOO2 and LEEMaOO3, *"management commitment to overall safety issues is good, that's why you see all safety gadgets are provided."*

Another participant, NPDCFEOO4, also stated they *"are highly committed because, even in the ministry, you know that if your workers are not healthy, obviously, you are not likely going to achieve what you are set out to achieve, everybody wants a good healthy worker, and not that when you are working, instead of you attending to the work, you end up carrying casualties to the various health centres or whatever."*

In addition, NPDCSUPOO3 revealed that "t*hey are very committed because yearly we get safety equipment, and there are different upgrades of different aspects. We look at general safety, general plan safety, and its impact on the personnel, the asset, and the environment. So, of all these issues are being reviewed going forward".*

Furthermore, NPDCSUPOO3 stated, "*Well, I will rate them high, above average in their response to safety.* Finally, SEPHSEOFFOO3, a health and safety officer, stated that it is good, and I can say very well, because of how *they handle safety issues. We have very proactive management when it comes to safety, and so, I can see that they are very good".*

Although management commitment was acknowledged to be generally good, however, a need for improvement has been admitted by participant VivMaOO1, who stated in his words that "*I think it's generally positive, but is there a need for improvement? Of course, there is. Now, I will score them above average, because first and foremost, they show commitment by providing the fundamental safety requirement needed. You know, the safety boot, the safety hat, the kit itself. However, do we need to do more? Of course, we do".* Their improvement is critical to the improvement of safety culture at work.

e) Sub-theme 5: Management emphasis on safety

This theme explains how paramount safety is talked about in the organisation. This theme is important because it will reveal if safety is something of a mere say by management or culture. Information gathered from the data revealed that safety is given a lot of emphases. This conclusion was drawn from five different participants during the interview process.

According to participant LEEMaOO2*, "management talk about safety as often as the need arises, especially when we are carrying out tasks that involve safety operations like lifting and hoisting and other things that we do regularly, and we make sure that the staff is aware of the risk involved in that activity."*

In the explanation of participant NPDCFEOO4, *management view safety as a very critical issue. They even let people know that at no point should safety be compromised anywhere, at any level, because you could be the only man standing that will save the life of all the other crew in the facility, or even the whole plant, because the work we are doing is safety-oriented such that any error or mistake can result in total burn down of the facility so, we give zero margins to compromise on safety.*

Participant NPDCHSEOFOO2 opined that "*yes, at all times, management talks about safety, vis a vis production."*

According to participant SEPFEOO2, "m*anagement always lays emphasis on the importance of safety, so if I may rate their frequency, they always do it, they regularly do it. They roll out safety procedure; they roll out new safety guidance as it rolls out in the industry, so they are very committed to safety".*

Participant SEPMAOO1 stated that "*management talk safety moment by moment, like our last time all meeting, our CEO made it clear to our HSE that if anything goes wrong, he will hold him responsible."*

These revelations denote that management demonstrates exemplary actions towards the improvement of safety in the workplace. This shows they are concerned about the safety and welfare of the workforce, which is part of their obligatory responsibility.

f) Sub-theme 6: Ways management encourage employee's safety behaviour

This theme describes avenues worker's safety behaviour is being motivated by management. This theme will help throw more light on the different ways management promotes workers' safety

behaviour since unsafe behaviour is the major cause of injury and accident in the organisation. To ascertain this, information on the different ways management use to motivate safety behaviour was mentioned by participant LEEHseMaOO1 during the interview process, who stated,

> *"The way we encourage workers is by celebrating milestones. We celebrate the end of the year, and when you report an incident that is an unsafe act or unsafe condition, it is rewarded. When you are a safe worker, it is rewarded, that is what they call safety champion, so with this, workers are encouraged".*

This information was also retrieved from part of participant SEPMAOO1 interview responses who revealed,

> *"Management give out personal protective equipment. That is standard. I think overall, safety shoe, safety cap. The same to our contractors. Even now, we have taken it upon ourselves that we make it available because if you ask a contractor to provide a PPE, he may not because most contractors want to cut corners. So, management commitment is that they give you all it takes to encourage and make sure you work safely".* Finally, participant VivSUPOO2 opined that *"it's been encouraging as I said before because we have not had reason to cry out to management to fulfil their part because when it comes to safety, they provide equipment, they provide these things and not only provision of these things, they attend our meetings, they encourage workers. We have safety reward, award, and other stuff, so, is a way of encouraging workers to work safely."*

It is noteworthy that management derives different ways to keep workers motivated in safety. This will not only make them feel empowered, but it will also increase their commitment to safety, as this will bring multiple benefits to the organisation.

4.13.3.2 Safety leadership style

Parent Theme 2: Management safety leadership style in promoting workers safety behaviour at work: This theme describes the management leadership style in promoting safety behaviour by visiting the site to ensure that workers are working safely and enabling a cordial relationship between management and employees at work. According to past studies, creating an exemplary action, positive relationship with workers by management at different levels can help improve workers' safety behaviour in the workplace, and this theme will help explore such.

a) Sub-themes 1: Management site visit

This sub-theme discussed how often management visits the site to check on employee's safety compliance and wellbeing, to know if there are working in compliance with organisation safety policy. This was made possible due to the information sourced from four different participants during the interview process, whose statements are as follows,

> Participant NPDCSUPOO3 stated that "*management has a schedule where they plan a visit. I think there is one monthly. There is also a quarter visit, a six-monthly visit, and all that. They have a schedule they follow. But they do come to the field to see that some of all these safety issues are being enforced".* In the same vein, participant SEPFEOO2 explained that "*in their organisation **(**Seplat**)** there are managements in different levels. 'Ennh,' for their commitment generally, if I talk of the frequency, they visit the field to see how we are compliant with safety, I can say every month. Then for the top leadership team, every quarter, i.e., once in four months, they must come for management facility inspection. Then the other level of management comes once a month. So, they show a form of commitment. However, for supervisors, it is daily".*
>
> Participant SEPHSEOFFOO3 also revealed that "*management visits periodically, sometimes monthly, sometimes quarterly by various site visits. It could be the management from the base; it could be the management from the headquarters like the GM coming in for what we call MFI (management field inspections), monthly especially.*

And it could be through other mediums, you know, by just a stop-check on the field activities. As for supervisors, they do it together with the managers when the managers come to the field. Yeah, they do it together with the manager". While participant VivSUPOO2 further explained that "*management do visit sites in their organisation, they go to see our workers working in our various locations to make sure they keep to the culture because to us, safety is a culture."*

It is a good practice that management in the Nigerian oil and gas industry regularly visits the site, as this can help them verify the progress in workers' safety performance and determine if any safety concerns need to be addressed.

b) Sub-theme 2: The relationship between management and employees

This sub-theme discussed employee's perceptions about the quality and nature of relationships among workers from all levels of the organisation.

The relationship between management and workers was expressed by participant NPDCFEOO4 *to be cordial. At no point in time would we allow any form of friction*. In the same notion, participant NPDCMANOO1 described it as *powerful, and it's perfect because we both need to work together to achieve the common goal.* Participant SEPFEOO2 stated *that it's very cordial because the workforce is very critical to the operations, so they care about our welfare; they care about our behavioural activities and so on, even our families. So, we have a very cordial relationship apart from the operations, and participant* VivSUPOO2 views it to *be very robust and very sound.*

Other participants who also made vital contributions to understanding the existing relationship between management and employees were participant LEEMaOO2, who narrated his point of view stating,

"Em, the quality of the relationship between managers and workers on-site is such that the workers can express themselves. I exchange information and communication with my

workers on-site often, and I don't shout them down; I listen to what they have to say as much as I can take and implement. I do that. They are not stifled; even in my team, they are not stiff. They can feel free and talk, so nobody would say they are not allowed to express themselves. We give them free expression, and by so doing, we can pick up the severe points and the areas that can become a show-stop our safety.

Furthermore, participant NPDCSUPOO3 revealed that it's a professional relationship we have, and it's business-like because our sole purpose here is to safely produce oil and gas, as I have mentioned before, so it's very professional. It's a professional relationship. Finally, participant VivMaOO1 describes it *as professional. There is this level of trust you will want from management, and management will also want that from workers to get the very best. Em, while we want discipline to exist, it is also important that this place works without unnecessary pressure. So, it's a delicate balance that we try to find, but overall, the relationship has been very professional. Everybody knows their job, and they do it regardless of relationship or personal differences.*

Although the above participants claimed a positive relationship exist between employees and management in their organisation, however, a contradictory statement was made by participant LEEHseMaOO1, who complained that *some of my colleagues see themselves as bosses and can never do a proper coaching and mentoring process because workers cannot open, and workers can never be free working with them"*.

Sound and cordial relationship between management and workforce are essential in the Nigeria oil and gas industry to encourage the willingness to offer safety support and perform well in their duties.

4.13.3.3 Safety Communication

Parent theme 3: Communicating the vitality of safety towards improving workers' safety behaviour: This theme discussed how different Nigerian oil and gas companies emphasise safety importance or prioritise it. The different medium for safety communication or information as

they found appropriate or effective was also covered. They showed concern for safety issues, values, and the time duration they found appropriate to disseminate safety information. The important aspect of this theme is because it captures everything about safety communication systems in the oil and gas industry. Safety communication is another key element of effective safety culture. With this theme, analysis of the perception of workers on the organisation about safety can be explored in terms of its communication.

a) Sub-themes 1: Channels for safety dissemination

This sub-theme is important because it discussed the different methods or ways employees use in exchanging or receiving safety information and where and when it has been communicated to them. Different ways for communicating safety in different oil and companies were revealed by participants who expressed their different thoughts during the interview process.

> According to participant LEEHseMaOO1, "*Safety communication. In our organisation, there are several ways we communicate safety. If you go to our project site, you see safety signages, billboards and see the notice board. We also have them for rules and regulations like the do's, and the don'ts".* This same participant LEEHseMaOO1 further explained that *"safety communication on-site may not be too active because people have a different safety culture different belief. But for us in this organisation, we engage worker through pep talks, through toolbox talks, through HSE meetings, through induction, through several programs, and in all these workers are communicated to adequately, you see signages everywhere. So even though you cannot speak, you can see a picture, which is a good way of safety communication. A notice board is here for you to see, and I think that is an effective way we have been using".* In the same view, participant LEEMaOO2 stated, "*they do toolbox meetings, we talk about the task before it goes on. We have email correspondences where reports are sent on safety. We can analyse the report and see what the trends are and how we can address the trends. We have other means of communication, phone calls and we can be in contact, we use all that to express and manage the safety as well as site work that is concerned". This opinion was also shared*

by participant LEEMaOO3 who stated that "yes, em mostly the communication mode is through discussions, toolbox meetings, monthly safety meetings where minutes of meetings are recorded, and issues raised are cascaded to top management for them to resolve. Then UAC forms for that of unsafe act and unsafe condition."

Different safety dissemination channels were also shared by participant NPDCHSEOFOO2 who described "*the mode can be oral; the mode can be maybe through email or signs within or facility, and of course it is very effective."*

It was further explained by participant SEPHSEOFFOO3 that "*the mode of communication is usually from errrh, it can be through the managers to supervisors and then to their subordinates down the line. Then, if there are any problems, mails are sent, and of course, it goes with feedbacks. So, I can say, it's cordial and effective enough".*

Finally, participant VivMaOO1 stated, "*there is a toolbox talk, a daily toolbox talks where people get to share their everyday experiences about safety, so it's a no hold conversation, so everybody is free to say whatever they want to say regardless of the way and manner you put it, so I think that helps a lot. The mode of safety communication is through conversation in the form of a meeting, in a daily briefing where we share the experiences about anything safety that affects you and your daily lives, so the mode of communication is through conversations in meetings and daily safety briefings".*

It was noteworthy to know participants revealed that most Nigerian oil and gas companies adopted multiple dissemination channels to safety information. This is essential to increase the efficiency of safety information in the workplace.

b) Sub-Theme 2: Prioritizing safety or production

The difficulty for Production Company to prioritise safety overproduction acknowledged in different studies, and this challenge faced by the organisation is one of the leading causes of

serious injuries and accidents. This theme enables the researcher to know to what extent is safety prioritised in the organisation. Is there any time it is disregarded due to the high volume of demand or production? What is the employee's perception about safety versus production in the organisation? To gain insight, information was gathered from different participants who expressed their point of views relating to the management prioritisation of safety to production during the interview process,

> In the view of participant LEEMaOO3, "*safety is what drives production, so I will put them at fifty/fifty because, without the safety aspect, production must not start. We must really define what we want to do, identify the hazards, and cascade it down to the workforce before we go into production. So, I will say safety drives production in the organisation here".*
>
> In the same vein, participant NPDCFEOO4 stated that "*in as much as production is essential in the pursuit of profit, at the end of the day, once safety is compromised like I said it's a question of running into a serious hazard and everything that you have worked for goes to zero. So, safety is the driving factor for production because once you compromise safety, invariably, you are not sure of getting to that production target that you are aiming at for that day. So virtually, the equipment will be at risk, and the staff will be at risk; once the staffs are no longer in good health and the equipment are no longer available, you're already back to zero. So, Safety comes first before even work performance because the assessment here in terms of when you are judging personnel performance, safety is about sixty per cent, and the actual work is just forty per cent".*
>
> The balance between safety and production was also explained by Participant NPDCHSEOFOO2, who stated that in their organisation*, "management will like us to produce as planned. In addition, he wouldn't allow anybody to get hurt or compromise to safety while we are producing the oil and gas" and* participant NPDCMANOO1 mentioned that *"every day we review the activities we need to do ensuring that all safety aspect has not been compromised."*

The opinion of Participant SEPHSEOFFOO3 was further shared, who admitted that "*they know that there are times when production seems to be the major thing, but the organisation takes safety so seriously, and the balance is usually when we have issues that will make us want to ensure that production is on the high side. At the same time, there is a need for us to do the job safely,"* and finally, participant SEPMAOO1 opined that *"safety takes proceeds to production. Production is secondary. Okay, otherwise, it becomes the issue of penny-wise pan foolish. If you want to produce everything today and in the next ten years you can't come up, or the facility is totally ruined, it doesn't make sense, so safety is a priority; production is secondary. Yes".*

However, a different perception on the prioritisation of safety overproduction was shared by participant SEPFEOO2 who stated, "*well, to be honest, you know this is a production company, if we don't produce, there will be no income and, if we keep on doing that, if there is no production over a long time, I mean we may run out of business. So, there are sometimes, not all the time, that they might compromise some safety procedures just to get us to produce the oil and gas and so, the balance tilts towards production more than safety in some cases".*

If safety can remain a priority in an organisation, safety programs and safety culture improvement will be successful.

c) Sub-theme 3: Access and availability of Safety information

This theme discussed how safety information is assessed in the organisation to create awareness or reminder of possible hazard associated with the workplace, different ways by which employees access safety information was retrieved from participants during the interview process, and some of their contributions are as follows.

According to participant LEEHseMaOO1, *we have a safety handbook, and that our safety handbook is very robust. It's very good information, and we have a website, a notice board, and safety signs everywhere, and this safety information you are talking about has been available to the workforce. The information is here because every day you do a*

toolbox talk, you do a pep talk, you do a toolbox talk, every week you do meetings, every month you do meetings, and people go for training with respect to their jobs. Regarding this, participant LEEMaOO2 also made contributions by mentioning that "*em safety information is already quite available from the reports that we receive, most of us receive the reports by email, in fact, you can see this board outside there, everybody walking into this company can see our statistics for the various sites, we have weekly meetings where we also share safety information already, so information is always available".*

Ways by which participants access safety information was also stated by participant LEEMaOO3 who maintained that *"safety issues like I told you earlier, we have what we call weekly safety meetings where each section has their safety talk where issues are raised and resolved and then whatever is challenging in the system is cascaded to the management. Then the monthly safety meetings where all staff gather and have a safety talk, where issues raised in the weekly safety meetings are brought into the monthly safety issues and meetings and those things resolved too.* Following this, participant NPDCFEOO4 stated that *"right there before you even enter any plant, there is a lot of em sign and signages letting you know the do's and don'ts and all the available area of major hazard, and what you can do to avoid them and then they also have what they call this memory jogger safety pamphlet that they will give to you such that you know what exactly is expected of you at every location of the worksite you find yourself."*

According to participant NPDCHSEOFOO2 contribution, *"our information here is not confidential, information is communicated to everyone, we have posters, we have the email that we communicate with everyone. We have signages here and there within the facility. All these are to communicate with the people, so information is not hidden"* and in the opinion of participant NPDCMANOO1, "safety information is described to be *"always very available. We have it in audio, we have it in visual, and we have clips on fliers. We have all over the facilities in the form of signages to create awareness, safety awareness."*

In furtherance to this, Participant SEPFEOO2 explained that *"well, everywhere you go to in this station, you see a notification, one safety notification or the other. So safely, I mean safety information is readily available anywhere in any area. You can get to the station and see hazardous area zone zero, you see a noise map, you see mustering point, and they will tell you that you cannot go beyond this point without your personal (safety) protective equipment. So even in our system, there is what they call Seplat Information Management System, and so we have access to different information as far as safety is concerned. And we also have the safety policy displayed in our notice board signed by the managing director. So, safety information is readily available to everyone." Participant* SEPHSEOFFOO3 stated that *"Safety information is more or less at the fingertips of every person, whether the safety officer, the operators in the various stations because of the communication that management has put in place and the means of communication, it has helped a great deal."*

It is important to note that workers in the Nigeria oil and gas industry have access and availability to safety information in the workplace. Such practice is vital to developing a positive safety culture, which can reduce the number of injuries and accidents of workers at work.

d) Sub-theme 4: Importance and value for safety

This theme examined the value of safety in the organisation. This theme is relevant because it clarified whether safety is perceived by management as something that requires prompt responses or commitment? Information was gathered from participant responses during the interview process, where several participants maintained positive responses on how safety is valued in the organisation. They concluded that,

According to participant LEEHseMaOO1, "s*afety is discussed in the organisation in all activities. Whatever thing you do, we consider safety, and the reason is that if safety is not involved, anything can go wrong, and so we are trying as much as possible to communicate safety every day, every time. There are several areas and things you do to communicate safety, so when you see it, you take ownership".*

In the statement of Participant NPDCFEOO4, *"Safety is our core, key-value in this organisation, and then as you walk in, you can see that everybody is on their PPE."*

As mentioned by participant NPDCFEOO4, *"when it comes to safety element, there is no lowest staff, there is no highest staff. The lowest personnel can raise an eyebrow on safety, and the highest personnel will be at attention, ready to listen to him to know what he is talking about. Because, if you compromise safety here, even everybody's em life could be in danger, just in a matter of a second. So, issues of safety are something that we do not cross over, neither do we allow it to sleep under the carpet".*

It was also explained by participant NPDCMANOO1 that *"safety is needed to survive, the risk level on this job or the risk level in producing oil and gas is very high. So, we can't afford to compromise safety. Every time we spot anything that looks like an unsafe condition or unsafe act, it is usually brought forth, and then we discuss it".*

Furthermore, participant SEPHSEOFFOO3 admitted that "*they don't cut corners, and in the documentation, safety procedures are well followed" and* finally participant SEPMAOO1 described *"safety as a life wire, why because one little mistake can bring the whole of this facility down, and that is something we do not want to happen because we want to save lives."*

Effective safety communication engages employees from all levels of the organisation to participate in safety-related activities. Employees perceiving safety to be valued in their organisation are vital in developing a positive safety culture in the organisation.

4.13.3.4 Safety training and information

Parent Theme 4: Management provision of safety training and its impact on workers' safety performance: Safety training is another key element of positive safety culture and requires significant attention to improve workers' safety behaviour. This theme describes the safety training management provides and how effective employees find it, including the time and duration of the training and its impact on their safety performance. Training is vital in creating safety awareness, which in turn reduces unsafe workplace behaviour. This theme will help to know about safety training and information, including its importance in the Nigeria oil and gas companies.

a) Sub-theme 1: Different types of training programs

Training programs may also lead the oil and gas industry to experience a reduction in the number of absenteeism of employees caused on account of health problems and compensation claims. The theme is essential because it was supposed to provide information about the kinds of sufficient safety training programs employees are involved in improving their hazard awareness about safety. This information was possible because the data retrieved from participant LEEMaOO2 disclosed that *"many of their workers who are on-site have been trained for the activities that they are doing including technical training and safety training. The client trains according to the work system that we are using, and the client is also involved in the ongoing training."*

> This view was also contributed to by participant SEPFEOO2 who maintained that "*yes, I can say Seplat is doing well in that area because we are scheduled for training as it is due, we have different forms of training when it comes to safety, and as long, there are some that the validity period is for two years, and when the expiration date is approaching, they try to do a refresher training. So, Seplat is committed to training in that area".*

Operations in the Nigeria oil and gas industry can be most often dangerous. Therefore, employees undergoing different suitable training in all aspects of their job can help reduce incidents and accidents and, consequently, have a happier workforce and better productivity.

b) Sub-theme 2: The importance and effectiveness of training and information

Safety training and information are crucial in the oil and gas industries to experience a dramatic enhancement in the motivation and confidence level of employees and staff members in terms of hazard and risk awareness. This theme is vital because it discussed the usefulness or importance of the safety training provided by the management and how effective it is for workers' safety behaviour. This information was obtained from data gathered from participants during the interview process.

These participants described the significance and efficiency of training and information in their different perception, such as,

> Participant LEEMaOO2 opined that *"safety training has sharpened their minds and makes them more sensitive to hazards and risks. So, even when they become complacent by regularly seeing those risks, safety training helps to bring it up again as a risk and not just something that is normalized. So, it's kind of reminding them that this thing should not be taken as part of the work. They should know that it is a risk and needs to be addressed".*
>
> In the statement of participant NPDCFEOO4*," safety training is very effective. Before you are even allowed to go near the plant, you must have passed through not less than three satisfied safety courses, and you must pass it not less than the excellent mark of seventy per cent."*
>
> In the description of Participant NPDCFEOO4*, "safety training is the cornerstone of all our safety programs, training comes first, you will first of all be exposed to the various hazards, and then you go through towards the various training and then you must pass it at higher standard level."*

According to participant NPDCSUPOO3, *"when an employee is scheduled for a safety course or a safety training, he is being refreshed, new ideas are coming up, so he has to be aware of what is going on, so it's very effective." In addition, participant LEEHseMaOO1 maintained that workers are trained to report unsafe act and unsafe condition. So, we also train them not only to report it but to take ownership when they see it, and then when they report it, you reward them".*

In the opinion of participant LEEMaOO2, *"safety training programs are effective, of course, they are not only in-house training, but many of them are also done by established organisations, and training organisations with the same global standards."*

Participant SEPFEOO2 explained that from those training, they know how to report these incidents, they know exactly what to do when the incident occurs. The knowledge and competencies they have gotten from those training help them in their job, and that reflects in our safety records because we have done so well that in the whole of last year on our facility, there were no critical or serious safety issues that were raised and that employees are competent in that area.

In the view of participant SEPHSEOFFOO3, *"the training they have been through is good enough, and like I said one of the best ways to measure the effectiveness, one of the tools that you can use is to look at the safety culture of the place, if the culture is okay, of course, is the training. Is it effective? If it's effective, I think it's okay".*

Participant VivMaOO1 further made contributions by explaining that *"one can only judge the effectiveness of safety training programs by your safety records and I feel that for us here because we have little or no major incidents - we just having minor bruise, minor slips here and there - I think that judging by our safety records we could see that the training that we carry out for staff is effective, I think that is the only way, that's the most important way, there is a difference between what you get in the class and when you put it into use. If you use that as a yardstick, I think we are doing great".*

It was also acknowledged by participant VivMaOO1 that *"there is nothing like education, there is nothing like information, there is nothing like when people are enlightened, I generally think because of the so many training and safety briefings that we do, it has opened their eyes to the awareness of safety, and they know what it means to put yourself in the situation that cost you, you know, I think it has helped quite a lot."*

It was admitted by participant VivSUPOO2*, "that safety training is very effective, very effective; some training is done locally within this facility. Some are done outside this facility. Training is properly done to make sure workers are ready for duty."*

Other participants who further narrated the importance of safety training are participant NPDCHSEOFOO2, who stated that *"safety training has done a lot if you check our incidents and accidents in this organisation. It has been low, and the training has been a major factor for it to below."* Participant SEPHSEOFFOO3 explained that *"the fact is that over the years we have had different kinds of training for hazard identification, and if you look at our records and the culture comparing the present with the past, it's a good way of knowing that there has been a great improvement in that area, so I can say that it has improved everyone."* Finally, participant VivSUPOO2 stated that *"when employees are properly trained, they don't feel this inferiority complex when you have external bodies coming to check their work, because they know the right thing to do, they know how to be prepared for their work and how to work safely."*

Participants widely acknowledged the impact of safety training on safety behaviour. Effectively training workers in the Nigeria oil and gas industry contributes towards competence in the health and safety of employees and reduces financial distress related to the cost of occupational ill-health.

c) Sub-theme 3: Management commitment to employee's safety training

The importance of this theme is that it describes management's willingness and commitment to safety training through organising refresher safety courses and setting out a budget for training.

However, only participant NPDCMANOO1 contributed to this information and stated that "*management is ever willing to train people and give refresher courses."*

An effective management commitment is to demonstrate value and commitment to safety training management commitment to safety, which is one of the most important dimensions towards establishing a positive safety climate.

d) Sub-theme 4: Time or duration of safety training programs

This theme is essential because it describes the length or the period allocated to safety training and the time interval, as it has been said that no amount of safety training is too much for workers. However, insufficient training and time allocated for training can create a more dangerous workplace for employees. To expand on this, conclusions were drawn from participants who expressed their different views during the interview process.

> In the view of participant SEPHSEOFFOO3, "*so much, good time, some people have different schedules for meetings and training both within and abroad. So, time and money, manpower is spent on training".* In the same vein, participant SEPFEOO2 explained that "the time and duration of safety training depend on the training *we are talking about. The management tries to ensure that industry standard is maintained for the duration of those training. So, enough time is committed to training".*
>
> Furthermore, participant VivMaOO1 mentioned that *"it is difficult to gauge that right now, we do fifteen, twenty minutes daily for toolbox talk on a daily basis, we spend two hours for HSE meetings once a month and then the training we do, there are established accredited bodies that do these training, so we book one for a week, two weeks, three weeks as the case maybe you know it's difficult to say the time but what we do quite a lot."* Ultimately, participant VivSUPOO2 disclosed that, *"safety trainings are done every three months, and we encourage our workers to improve themselves too, but not to only rely on the trainings they get from the company and see how they can also improve on themselves, so in terms of training we are doing very well."*

Dedicating quality time for workers in the Nigeria oil and gas industry to undergo safety training at the different phases of their work will enable them to work safely without any risks to their health.

4.13.3.5 Employee involvement

Parent Theme 5: Enhancing workers' safety behaviour in the workplace through their involvement: Effective employee participation is a key component of the safety culture assessment process and successful follow-up actions. It is empowering for employees to be involved in their work processes and associated safety processes. This theme will help describe how management shows commitment to workers' safety involvement, employee's perception about the workplace, safety responsibilities, and the different ways they are being engaged in the workplace.

a) Sub-themes 1: Employees perception about their workplace

This theme describes employees' thoughts about the organisation they work if they think it's a good place to work or not, with reasons for their decisions. This was possible due to the data sourced from some participants during the interview process. In this regard, information retrieved from participant LEEMaOO3 disclosed, ***"****they are very much happy, that is why they are still hanging out in the work. They come to work early, stay, those in the field go to the field to work if they are not happy, we will have an incidence of unsafe and unsafe conditions".*

> Similar input was also made by participant SEPHSEOFFOO3 who stated, "*we have seen many that are even leaving other companies or other organisations rather, they feel like working here. One of the things that I mentioned earlier is that you will notice that the atmosphere within this company is cordial. You don't want to work in a place where you have anonymous grudges and are afraid. The management of this company has deemed it fit to put certain things in place to ensure the workers' welfare and even their career*

progression. So, it's a bribe for many, and many seem to be coming in, or rather they will love to come in."

A further contribution was made by Participant VivSUPOO2, who explained, *"of course yes and I think they feel it's good, if it's not a good place to work they won't be with us, we've had some of them for a very long time. We have people who have been in the company for ten, twelve, fifteen years or so, and the more they grow, the more they acquire more training and expertise. They keep improving themselves, the opportunities are broader, they have opportunities to go somewhere that is big, the fact that they are still here tells that there is a reason they are here. So, to me, I can say they feel it's a good place to work".*

However, participant VivMaOO1 was only confident to state his perception about the workplace but was unsure about his colleagues. He stated that "*safety-wise I think they do, financial wise I'm not too sure, I'm in a higher position and I could say I'm comfortable as I hold a managerial position and my salary may be okay for me, but I mean it's difficult for me to speak for others."*

It is good that employees feel that their workplace is a good place to work; such a sense of satisfaction or feeling motivates workers' interest towards complying with safety rules and procedures in place at their workplaces.

b) Sub-theme 2: Employee's perception of safety responsibilities

This theme describes workers' thoughts on who they think should be responsible for safety in the workplace. This theme is important because it will help understand how well-informed workers are regarding safety responsibilities. It was interesting to find that most participants understand that safety is everybody's responsibility in the workplace. According to their responses during the interview process, participant NPDCFEOO4 mentioned: *"that everybody is responsible for safety, especially your own personal safety, the safety of your colleague, the safety of the business the safety of the managers, so we are all responsible for the safety of everything here."*

In the statement of participant NPDCMANOO1 on safety responsibility, *"everyone is responsible, even though we have a departmental head but the safety of your environment, your activity, even your life, lies in your hands. So, you are expected to manage your safety and the safety of others and individuals".*

When the opinion of participant NPDCSUPOO3 was requested, he stated that *"safety is a business of everybody, like I said before it starts from the management and it trickles down the line. So, people are very responsive; people show their commitment to it because it's a commitment".*

On participant NPDCSUPOO3's explanation, "the responsible person for safety is the management team, it starts from them, then we have safety officers and individuals. We are all responsible at different levels by being conscious of different situations as it concerns safety".

In the same vein, participant SEPFEOO2 mentioned that *"everyone is responsible for safety, that is one of our slogans, and we will always use that every day. So, safety is everyone's responsibility".*

Similarly, participant SEPHSEOFFOO3 stated that *"every worker is responsible, every worker from top to bottom,"* just as participant VivSUPOO2 understands that *"everyone is responsible for safety, but we have a safety department and safety officers. Still, safety is everybody's responsibility".*

Understanding the need to take ownership of safety responsibility by workers is a great step towards developing the right culture in the Nigeria oil and gas industry.

c) Sub-theme 3: Management perception to employee's safety involvement

This theme described management insight about employees' safety involvement. It helps understand if management thinks employees are given equal opportunity to contribute to safety

issues, thereby involving them in decision making. Conclusions drawn from some participants during the interview process made it possible to gain insight into the perception of management to workers' involvement in safety. On this note, participant LEEMaOO2 testified, *"I don't think employees are constrained to discuss safety, they are free, just like the other questions, they are free to discuss safety concerns, you know they send emails on safety issues that they want us to address, and we empower them to highlight the safety concerns, and it is not awkward for them to talk about safety, they are empowered to discuss it."*

> In alliance, participant NPDCFEOO4 mentioned that *"management has given everybody, every staff that singular privilege, that anything that has to do with safety, their safety, the organisational safety, or workplace safety, is paramount. Nobody hinders you when you are talking about safety, or peradventure you refuse to do anything on account of safety. It will be seriously respected, and nothing will ever stop anybody from allowing you to air your mind as regards your fear of certain aspect of work or the job that you feel it's not safe or any activity that is ongoing that you perceive as an unsafe".*
>
> An additional contribution was made by Participant NPDCSUPOO3 in this regard, who thinks *"workers are always free, given that everybody has an equal opportunity to speak out about your concern, how it affects you as a person, the team, and the facility. So, people speak out about their concern. For instance, if it's raining and you ask somebody to go out, they will politely tell you the risk of lightning or the risk of flooding and that the work should be put off. So, supervisors listen, people can convey their differences or their reservations when it comes to working in a very dangerous situation."*

Engaging employees in safety-related processes makes them more confident when carrying out their work processes, leading to positive organisational results such as reduced work-related injuries and accidents.

d) Sub-theme 4: Reasons for engaging workers on safety

This theme explains why management engages workers in safety behaviour due to the numerous advantages of involving employees in safety. Some participants disclosed different reasons for engaging employees on safety during the interview process.

> In the view of participant SEPFEOO2, *"workers across all levels are involved, even those who are not regular staff are all involved. Even the contractors working with us are stakeholders; if they are on the field at that time, they are involved in the safety meeting because it concerns everyone".*
>
> To make an additional contribution, participant LEEHseMaOO1 explained that, "you see for you to ensure this process works, you must engage the workers, and management will also regularly *make a schedule ensuring that they are visible on-site."*
>
> *In the reasoning of SEPMAOO1," engaging workers is important because you should be your brother's keeper. You know, like now I could be making a mistake, and this young man will say, ah Sir, this thing can lead to problems, and that is the time for me to take a second look, and if it is true, I stop. We communicate to that extent". Following this reasoning,*
>
> Participant VivMaOO1 stated, *"obviously, you cannot be safety compliant if it's not a joint effort. So, there must be a joint effort for you to be able to observe and get a one hundred per cent or near one hundred per cent safety or non-incident situation, so yes".*

Employees need to have a sense of involvement, ownership, and commitment because it encourages them to have feelings such as self-worth, belonging, and value.

e) Sub-theme 5: Ways to engage employees and the importance of their safety

This theme describes different avenues management use in engaging workers on the right safety behaviour and their impact on their safety performance. Information sourced from participant's qualitative data helped to understand different ways of involving Nigeria oil and gas workers in safety operations. These different means were disclosed by participants where participant

LEEMaOO2 stated, *"it depends on their roles. Some of them are more involved than others, but everybody is involved in the safety even if it is the office here; they are encouraged to attend the weekly safety meetings, and occasionally, they do the work about in the yard here to assess any safety issues that they can see. Then they make a report for them to be closed out. Of course, those who are on-site are more involved than those who are in the office, and then it's a day-to-day thing".*

Following this view, participant NPDCFEOO4 contributed by explaining that *"virtually everybody is encouraged to be involved in day-the to-day management of our organisation. First and foremost, every weekly basis, we normally have what they call HSE safety meetings, where everybody will assemble in our auditorium and various learning from incidents the one within our plant. The one within the country and the international will be discussed, and then the key learning from it will be heard from everybody and how people can avoid such as pitfall in the future will be cascaded down".*

Participant NPDCHSEOFOO2 also opined that in their organisation, *"everyone is involved. Once you enter as an employee, we do what we call induction, safety induction, which made everybody know what to do and what not to do, and therefore, everyone is carried along. We also go for training and take refresher courses to remind us of what we should know".*

Explanations regarding ways workers are engaged in safety was further made by participant SEPHSEOFFOO3 who stated that *"the first place from the very beginning they are given the induction, and they have the idea that safety issues are not left to the safety man, so every worker is a potential safety officer across the organisation they have the power like I said earlier to intervene, using the unsafe act and unsafe condition program. They are well equipped with the necessary knowledge basically to intervene.*

It was concluded by participant SEPMAOO1 that *"one hundred per cent, everybody is involved. How they are involved in safety is that you are empowered to intervene, you are empowered to report near miss, unsafe condition, unsafe act, in fact, it's one hundred per*

cent that is why I say it's one hundred per cent. If this facility goes down, you go home and stay hungry. So, you wouldn't even want that to happen".

Everyone from all levels in the organisation must be given an avenue to contribute or have freedom of speech. This makes them feel obliged to getting involved in the safety program, thereby improving their safety performance.

4.13.3.6 Safety motivation

Parent Theme 6: Motivating workers' safety behaviour, using the reward system and reporting medium: This theme describes how management encourages and motivates employee's safety behaviour by rewarding them. Motivation has been said to have a strong role to play in the improvement of organisational safety culture. Therefore, exploring the theme will allow the researcher to know if motivation is important in Nigerian oil and gas companies to improve workers' safety behaviour.

a) Sub-themes 1: Importance of reward and its impact on workers motivation

This theme described employee's perception of the reward system. The theme is also important because it explained the impact of the reward on workers' safety motivation and its effect on safety behaviour. To ascertain this, some participants made some vital contributions to how the reward system adopted in their organisation has impacted and motivated their safety performance.

According to workers contribution on the importance of reward on safety motivation, participant LEEHseMaOO1 stated that *"if for instance, we are three working today and at the end of the day, I was rewarded, you will be motivated and want to report, and when you report they will reward you, it goes around. So, I think it's a very good strategy."*

In the same view, participant LEEMaOO2 explained*, "we may have HSE meetings where we reward those who are doing very well in recording unsafe acts, so, you know in that*

way, that you are motivating them to record more to bring out more of those issues so that they can be addressed."

It was also mentioned by participant NPDCFEOO4 that *"any staff that can achieve goal zero at the end of the year in any of their work performance set target is usually well rewarded and, because of the rewarding system and the recognition given to goal zero target staff, many people actually try to fall in line to ensure that they emulate such a wonderful performance and then by and by, all together in an aggregate level, many of the staff tend to exhibit excellent performance when it comes to safety compliance."*

Some inclusions were also made by participant VivSUPOO2 who stated, *"we discover that sometimes, whenever they get this award, it's more like a little competition, everybody, each department wants to outdo the other department, you start seeing people improving in safety aspect, you see people reporting unsafe act and trying to do the best."*

Finally, participant SEPMAOO1 disclosed that *"yes, we do punish employees. If you goof around, you are punished, and management consequences occur, yes, this is also a form of reward for employees".*

Rewards and incentives for employees are some of the main ways in which an organisation can encourage good health and safety at work.

b) Sub-theme 2: Mediums used to report unsafe behaviour to motivate safety behaviour. This theme explores ways of reporting unsafe acts in the industry and how it encourages their reporting system. To comprehend these ways, information was retrieved from some participants' qualitative data, where they revealed diverse ways workers report incidence at work.

To understand these ways, participant LEEMaOO3 concludes that *"unsafe act and unsafe condition are reported through the UAC form which is an unsafe act and unsafe condition form, which is submitted to the safety department through the box, and then the issues*

rose through the unsafe act, and unsafe conditions are analysed through the issues raised and proffer solutions to the issues."

A similar revelation was made by participant NPDCHSEOFOO2 who disclosed, *"we have unsafe act or unsafe condition form, which everybody can use to report at any time they observe an unsafe act or unsafe condition. Then if the form is not available, we can also do an email, or you can walk to your supervisor to report that."*

Other means for reporting unsafe behaviour were described by participant NPDCMANOO1 as *"oral and written, so any medium, we apply any available medium. If it's something that you want to send further away, you need to take pictures, you need to write, and you need to possibly take video clips, so, all means, all available media is what we use".*

It was further disclosed by participant SEPHSEOFFOO3 that *"they have about three different channels of reporting. You can report by mail, or directly by making a call, you can report by a dropbox, we have boxes in different places, and then somebody goes there pick an item on the box, you know to communicate to management the ideas".*

Finally, a revelation was made by participant VivMaOO1 who stated; *we have a card that we use, there is a behavioural base (BBS) card, there is a design template that we use to monitor activities, we will just tell them that any unsafe act that has been noticed should be put down so that we can now subsequently discuss it when we are together in our safety meetings or safety briefings or toolbox talk, and then we will see how we will improve that. There are designed templates for that.*

Mediums used in reporting unsafe behaviour should be convenient and fit for their purpose.

c) Sub-theme 3: The usefulness of reporting medium

This theme describes employees' views on the reporting system. Do they find it useful, effective or do they think there is a need for a review? Information obtained during the interview process

from most participants is that the reporting system is fit for purpose, but there is a need for review. For example, in their statement, participant NPDCFEOO4 believed that *"what they have is measuring up to standard, but that does not mean that we are hundred per cent there or we are that perfect, there is always room for improvement because as new equipment is coming, new technologies are coming, it also comes with its own new set of hazards, a new set of threats. And so, we will always encourage the management to ensure that anytime that there is the need for a change of technology, change of equipment, change of processes or procedure, the staff needs to, first, be carried along ahead of time for effective training, and not just after it has been introduced before you begin to discuss them, that's like placing the cart before the horse."*

In a similar opinion, participant LEEMaOO2 thinks *"it is fit for purpose, but it can also be reviewed to have an electronic element."*

Contributions made by participant NPDCSUPOO3 stated that *"it's fit for purpose, we've been using the same system, and you know the result shows for it, so it's a very good system for reporting, but there may be a need for review."*

In the same vein, participant SEPFEOO2 admitted that *"there is always need for improvement in any area, but for now so far, it is effective in the sense that, while you are with your system in the office you can report online, but in the event where you are not anywhere near where a computer system is, or there is no network, you can just look around the manual form and report, anyone that is filled will be taken seriously, so but sometimes you may have network issues, and sometimes your manual form may be misplaced so, there is always need for improvement in every process. So far, it's also very effective."*

The statement of participant SEPHSEOFFOO3 was also found to be in alliance with others who mentioned that "*there is always room for improvement, right, if you are doing something today, tomorrow it may be outdated but, what we are doing now seems to be working for us and I think that is what matters the most."*

Finally, the inclusion of Participant VivMaOO1 was that *"at the moment I think it is a very effective means of reporting things, see life itself is dynamic, I'm pretty sure that you know things get stale over time, that's why people need a review of their life itself, companies need a review of their policy. We will say categorically that what we are doing is good, but I think there is always room for improvement in everything that we do, so yes."*

Although most participants saw a need to review their reporting even though it is found effective now, however, participant *LEEMaOO3* admitted there was no need for review by stating that *"their existing mediums are very good means for reporting accidents, so there is no need for review".*

Encouraging reporting culture of workers by management in the workplace is essential because, in this way, safety concerns can be addressed, and any related problems can be fixed to avoid accidents and learn from past incidents.

d) Sub-theme 4: Safety motivation strategies by management

Transformational or transactional motivation is the motivation strategies management adopts when encouraging workers' safety behaviour. This theme is important because it explored the different motivation strategies put in place by management to motivate workers' safety in the Nigeria oil and gas industry. When participants were asked about different motivation strategies in their workplaces, some disclosed different strategies during their interview responses.

Regarding this, participant LEEMaOO2 stated, *yes safety performance is rewarded typically in some of the monthly meetings, we try to reward those who have done well, maybe the best driver for the month, the worker who has done well safety-wise, those who recorded in the AUC's, we try to give them some token, some form of appreciation so that to encourage them to take safety as important as the main performance of the work.*

According to Participant LEEMaOO2's opinion, *goal zero is a major motivation for us because it affects us. If we don't maintain goal zero, it affects the work progress, the client*

we work for. It could result in a shutdown for up to a week or two a month when investigations are ongoing. So, we make sure that we try to maintain a goal zero culture across the board.

It was explained by participant LEEMaOO3 that *"when a milestone is reached, those who perform are well motivated by giving them incentives, sometimes hardware like electric kettles, cash and so on."*

The revelation made by participant NPDCHSEOFOO2 showed that *they encourage safe working practices by giving them gifts, souvenirs, and there is a punishment for those that compromise safety rules and regulations.*

It was described by participant NPDCMANOO1 that, *"what motivates workers to the awareness to work safely, to work and achieve what the policy says, no impact to the environment because of your activities, no wasteful damage, no injury because of your activities because all of these have bearings on you as an individual."*

According to participant NPDCSUPOO3's statement, *"we have the HSE manager and an HSE team, so sometimes they come up with gifts and incentives just to encourage people to be aware and take ownership of what is happening in their work environment."*

It was noted by participant SEPFEOO2 that "*there are different ways they encourage safe working practices. For example, there is a reward they give for the best facility in terms of good housekeeping, and when you can stop some hazards or accidents from happening, you will be recognised and rewarded. So, they try to encourage that by reward and recognition".*

During the contribution of participant SEPHSEOFFOO3, he explained that *"they motivate workers by setting examples and I believe so much in that. Somebody said examples are better than precepts, so they set examples and, what they usually do is, one, they intervene, I have seen management staff intervene on issues that are unsafe, and that is a good example".*

During the discussion on different strategies for safety motivation, participant VivMaOO1 thinks that *workers do not need a whole lot to be motivated. Everybody wants to be safe at all times; everybody wants to be healthy at all times, so that's enough motivation, here we love life quite a lot, so you don't need air in motivation to be safe, so I think they are already self-motivated, so whatever we do are just additional things that come with it."*

The final contribution was made by Participant VivSUPOO2, who explained that *"there are many ways we motivate. I talked about awards, we have awards when they meet HSE targets, and we have awards for outstanding workers in safety practice and other stuff. So, in terms of motivation, we are doing well. There are other ways of motivating workers too, and if we go very long without accidents, we motivate the entire crew in such projects so, in terms of motivation we are doing well, I think there is no end to motivation, we can also improve on how to motivate our staffs".*

Workers' engagement or involvement in safety programs largely depends on the motivation and support they receive from the management team. Therefore, management should strive to lead by example and abide by the same safety policies they expect of their workers.

4.13.3.7 Learning Organisation

Parent Theme 7: Learning from past incidence to prevent re-occurrence

Efficient safety management systems include collecting safety information from the operational production system to learn from accidents and incidents and thus provide a basis for continuous safety improvement. In relation to this, this theme is important because it describes ways management learn from past incidents to prevent reoccurrence, how feedbacks are useful in incident prevention, and the avenues of receiving feedback as a "learning organisation," another strong element of safety culture that management should imbibe when trying to create the right culture.

a) Sub-themes 1: Channels of receiving feedbacks

This theme described how workers receive feedback after raising complaints on any safety-related issues. This information is important because it will give insight into if workers' complaints are taken seriously by management or if decisions made or lessons learned from incidents are communicated to workers, which is a vital practice towards improving workplace safety culture. Data retrieved from some participants through qualitative findings make it possible to understand the different channel feedback is received in their workplaces. In relation to this, participant NPDCFEOO4 explained that *"anytime there are issues and then a report of an incident is generated to top management, there is usually corresponding feedback. There are different ways management gives us the feedback, either cascading feedback from higher authority to the concerned personnel via their supervisors or the departmental head or eventually monthly when they normally have their forum where they cascade the feedback directly to the employee or the staff concerned via emails. The group managing director can communicate all the observations back and the line of thought and action that the top management has taken back to the various staff via email or via all these telecommunication conferences they interact with us".*

In the same light, participant NPDCSUPOO3 disclosed that *"when workers raise safety concerns, reports are being acted upon, though relatively slow as what we have expected but, it's been acted upon, and feedback is being given to the team during the general HSE meeting which is done bi-weekly."*

Further inclusions of participant SEPHSEOFFOO3 stated*, "feedbacks are usually sent through meetings and if it requires urgent feedback that day, give it 24hours, the following day you get feedback. However, there are times when some issues after been reported will take a little time because of what it requires. It may require some contractive process, and it may require some management, you know, sitting and making decisions about it."*

Having an effective channel for sending or receiving feedback can help improve safety communications. This can help understand what safety topics workers are not clear about.

b) Sub-theme 2: Importance of feedbacks and reports in preventing incidence reoccurrence

This theme discussed the essence of feedbacks or reports analysis from past incidence in preventing incidence reoccurrence. Information sourced from participants during the interview process disclosed the different reasons why feedback and reports are essential. In the statement of participant LEEMaOO2, *"feedback is given almost immediately, so those who are doing well are encouraged to continue while those who are defaulting are immediately corrected, so they don't endanger the workplace."*

> Related opinion from participant NPDCMANOO1 revealed that *"workers have to receive feedback anyhow. The essence of the feedback is for you to be enlightened, for you to know what went wrong, and then for you to know how to guide against it".*
>
> Further input made by participant SEPMAOO1 stated that *"the reports help them work out modalities and mitigate re-occurrence. So, it's something that you know helps to build robust safety measures in every organisation".*

Providing feedback to employees is one of the main ways they know if they are exhibiting the wrong or right safety behaviour. A well-built feedback culture welcomes feedback and uses it to improve organisation, teams, and individuals.

c) Sub-theme 3: Ways of preventing incidence re-occurrence

This theme describes employee's perception of the procedures put in place that management use to prevent the re-occurrence of incidence, and these ways were revealed during the interview process. In relation to this, it was concluded by participant LEEHseMaOO1 that *"incidents are usually investigated, having investigated it to prevent reoccurrence, then you disseminate the information, we do what they call learning from incidence, we cascade to workers. I think with this, it will prevent reoccurrence, and it will not happen again."*

> In the same vein, information sourced from Participant NPDCHSEOFOO2 disclosed that *"they do a lot of safety communication, in which we now review some of the incidents in*

other company. Why are we doing so? To prevent reoccurrence in our own company and also to create awareness, by so doing the incident level here has been reduced, and also the worker are aware or conscious that if I do this, this will be the result."

On the explanation of participant LEEMaOO2 on incident prevention, he disclosed, *"we are maintaining a good safety record over time, but it takes a lot of effort to maintain it. So, to keep on, we learn from incidence, we see what has happened to others, and we prevent such from happening here".*

According to participant LEEMaOO2 view on the ways incidence are prevented, he stated that *"LFI (learning from incidence) is taken seriously to make sure we don't repeat, we don't want to learn through our own experience, we learn through other people experiences, so we try to learn from those things and put things in place that can help us to avoid ending up with the same incidence in our own organisation, and so far we have been fortunate and avoided such."*

Inclusions made by participant NPDCMANOO1 noted that *"for every incident that happened, people are competent in that area and set up to investigate, to find out why it happened, and possibly what can be done to prevent re-occurrence."*

It was also explained by participant VivMaOO1 that, *"I'm told that they had a major safety breach many years ago and that opened their eyes to the all of the problems that could arise from an act of carelessness arising from the non-use of safety-related rules and kits, so I think it's more economical for the company to do the right thing now which is to be safety conscious."*

Further contributions made by participant VivSUPOO2 revealed that *"when an accident happens, the first thing to do is find out the root cause of the accident and try to find every course to learn from that accident because if you don't learn, it will happen again and again. So, one of the ways to avoid reoccurrence of an accident or incident is to try and learn from it, bring everyone involved in it together, sit down and discuss it, find out the reason for the accident and try as much as possible to learn and to avoid it".*

Despite the different ways management makes efforts to prevent reoccurrence of incidences mentioned by these participants, however, barrier to why management commitment to preventing incidents may not be effective sometimes was also acknowledged by participant SEPFEOO2 that; "*Sometimes management show commitment in preventing re-occurrence but it still happens. It is not necessarily because management did not act promptly to prevent a reoccurrence; sometimes, it may be due to the employees themselves. You can take a horse to the river, but you cannot force it to drink water. So, sometimes behavioural actions take place. You might be taught what to do, you might know what to do, you might be given the right things to do, but an employee might just choose not to do it, and if that accident occurs again, it doesn't necessarily mean management did not show commitment for it not to happen again, it's just because maybe the employee involved, or the contractor involved failed to comply with the set down rules. In our industry, we call that attitude issues or human errors."*

A well-designed and implemented incident control plan can help prevent accidents and control hazards in the workplace.

4.13.3.8 The Prevalence of Incidence and Accidents

Parent Theme 8: Prevalence of incidence and fatalities of workers in the Nigeria oil and gas companies: This theme covers information on how often fatality of workers occurs and the degree of incidence recorded in the organisation. Due to the high records of statistics on injuries and fatalities of workers in the oil and gas sector, this theme is important in comparing the findings of this study with the existing published information.

a) Sub-themes 1: Degree of incidence

This sub-theme discusses how often incidents occur and if it leads to death, major or minor injuries. With the help of qualitative data gathered from participants during the interview process, the degree of incidents in Nigeria oil and gas industry was ascertained, where participant

NPDCFEOO4 stated that *"yes, we have had so many incidents of pipe-burst, fire incident and the rest but mainly due to third parties or communities or unknown persons trying to do some illegal bunkering and in the process of doing that illegal bunker, they may experience fire outburst or gas release."*

> In alliance with this view, Participant NPDCHSEOFOO2 confidently explained that *"in short, since we started, we have not gotten any major accident in this operation, our accident or incident is mostly on vandals cutting off the line, that's third-party interference."*
>
> This position also forms part of participant NPDCSUPOO3 view, who expressed that, *"fortunately for us, we've not had any major incidence, I think, but some of the critical incidents we've had has just been equipment failure or third-party sabotage."*
>
> In conclusion, participant LEEMaOO3 disclosed, *"we've really had not had any incident on site. Apart from the safety standard we maintain, the international oil companies we work with have very high standards, and nobody wants to have downtime or loss of manual, so based on that, all safety issues are handled well, workers are well educated and given the implication of incidence and accidents".*

The continuous monitoring of organisational safety performance by management in terms of records of incidence is critical to maintaining safety cultural elements in the workplace.

b) Sub-theme 2: Fatality rates and occurrence

This theme describes the number of fatalities recorded in the organisation. This theme is important because it will give an insight into how often fatalities occur in the Nigeria oil and gas industry. However, when participants were interviewed regarding fatality rates and occurrence in the industry, those who made meaningful contributions to the question denied work-related fatalities have occurred. According to *participant LEEHseMaOO1, "we have not had a fatality; we have not had a very critical or high potential incident. Yes, there could be an incident, I cannot*

rule out the fact that there has not been an incident, but there has not been any fatality". In relation to this contribution, participant LEEMaOO3 opined*, "hmm, we've really had no fatality here, so we've not had an incident that will lead to work stop, except for maybe minor or first aid issues."*

Further contributions were also made by participant NPDCSUPOO3 who explained that *"so far, we've not recorded any mishap that may have claimed somebody's limb or claimed somebody's life."* And following this, participant NPDCSUPOO3 noted, *"we have not had any RTA, that is, road transport accident that has claimed lives or claimed limbs, or we've not had any accident that has taken somebody's life, so it shows that people are really aware of the safety hazard or the concerns around jobs."*

In comparison with other organisations, participant VivMaOO1 explained that, if you want to compare viz a viz you know the reported incident and accident with the industry, I think we are doing great because we almost always have zero per cent fatality, you know, on a yearly basis, even when we have unsafe acts and conditions, they are very minimal so, I think if you compare it to the ratio – national ratio – I think we are doing exceedingly well

Goal zero fatality vision in an organisation offers a foundation for learning from accidents and improving safety processes.

Having presented the result analysis for studies one, two, and three in this chapter, the next chapter will discuss the key findings of this study.

5.0 CHAPTER FIVE: DISCUSSION

5.1 INTRODUCTION

The study aims to evaluate safety behaviour and its impact on safety performance among oil and gas workers in the Niger Delta region of Nigeria using both quantitative and qualitative methods of data collection. To achieve the study's aim, two sets of quantitative surveys carried out the first measured safety management practices within the region's oil and gas sector and how they impacted employees' safety behaviour. The second explored the relationship between individual elements of organisational safety culture and workers' (frontline) safety behavioural response. To explore further safety issues as raised in the earlier quantitative studies done, face to face qualitative interview was undertaken where it investigated the perceptions of workers (both management and frontline staff) on the existing safety culture in the Nigeria oil and gas industry and its impact on their safety behaviour at work. These investigations were informed by the conclusion drawn in earlier studies where poor safety culture has been found as a major precursor that is likely to influence workplace safety behaviours among employees in workplaces, consequently leading to workplace accidents. In addition, limited empirical studies that considered safety behaviour among workers in the Niger delta further expand on the study rationale (Lu and Tsai, 2010, Edwards et al., 2013, Nordlof et al., 2015; Ehiaguina and Moda, 2020). Strengthening a safety culture can improve safety performance among workers (Osman et al., 2019; Kalteh et al., 2019; Rubin et al., 2020). The findings from both quantitative and qualitative studies will be discussed in the subsequent sections below.

5.2 Quantitative findings from study one: Assessment of participant's demographic information and safety behavioural components

5.2.1 The impact of demographic factors on workers safety behaviour

The association between participant's demographic information and safety behavioural components was assessed as part of the data analysis, due to the acknowledgement across safety culture studies, role of demographic factors considered for effective assessment and

management of organisational safety culture (Marinaccio et al., 2013). The outcome from the present study found demographic factors that include work experience, age, etc., having a direct impact on safety participation. This further demonstrates the relationship between workers and work experience as an important factor toward occupational safety improvement in Nigerian oil and gas workers (Maleki et al., 2018). In contrast, Nævestad (2017) found only age, work sector, and activities of workers to be significant in improving occupational safety culture. Previous studies on safety culture that focused on employees in the oil and gas industry and other high-risk industries affirmed these variables; gender, age, and work experience as essential elements required during safety culture measurement (Ibrahim et al., 2012; Nævestad, 2017). These factors are found to affect safety culture, thereby influencing workers' safety behaviour (Ismail et al., 2012). To expand on the implication of the present study's finding, a look at a previous study on nuclear power stations in the UK by Lee and Harrison (2000) that examined the risk perceptions on workers safety, observed significant differences when gender, shift, age, workdays, and work areas of the respondents are considered.

Similarly, Gyekye and Salminen (2010) found work experience as having a significant impact on workplace occupational safety culture improvement. In contrast, Nævestad (2017) research did not find work experience to be important in the enhancement of occupational safety culture. Despite the dissimilarities of findings shown across safety culture studies on the impact of demographic factors on workers safety behaviour, work of (Ismail et al., 2012; Nævestad, 2017; Saedi et al., 2019) concluded that overall, demographic factors as influencing elements on safety behaviour of workers should be considered as vital parts of safety culture assessment.

5.2.2 Safety management practices and workers safety behaviour

Based on the outcome from the safety management practices measured, it was obvious there is the need for safety policy realignment and practice improvement within the country oil and gas industry as it relates to safety management commitment, safety communication, safety leadership, employee involvement, safety communication, safety training and their impact on worker's safety behaviour respectively. Overall, safety management practices had a significant

role in safety participation (*p=0.000*) and safety compliance (*p=0.000*), suggesting more emphasis need to be placed on workplace safety culture, as it positively influences workers' safety behaviour in the industry.

This finding has beneficial implications for safety management because it re-affirms safety participation and safety compliance of employees' role in influencing change, especially where effort and the right climate are encouraged. Similarly, Vinodkumar and Bhasi (2010) affirmed safety management practices as a measure of organisational safety culture with a direct significant relationship on employees' safety behaviour in eight different high-risk industries observed in India. In addition, safety management practices do not just enhance working conditions but also positively impact employee's behaviour in respect to safety, thereby decreasing workplace accidents. Other previous studies also affirmed that enhanced safety culture and safety behaviour could serve as a precursor to minimising accidents among employees in the oil and gas industry (Means and Yule, 2009; Olsen, 2010; Nielsen, 2014).

5.2.3 Role of senior management and their commitment to positive safety culture

The involvement of senior management and their commitment to positive safety culture is fundamental to the endorsement of related policies, procedures, and practices (Mearns and Yule, 2009; Ek et al., 2014; Skeepers and Mbohwa, 2015). Effective leadership is viewed as a necessary factor needed to drive the workforce towards safety-associated mechanisms and procedures (Kilaparthi, 2014). The percentage of participants' responses in the present study when safety management practices were measured was significant. The result shows over 50% of the participants agree or strongly agree that their supervisors pressure them to meet up with work demands, which makes it more than likely for the employees to ignore safety regulations to get their job done on time. It is evident that a poor safety climate within an organisation could lead to inadequate job design and increased work pressure of workers. For instance, high levels of work pressure may prevail because of the absence of procedures, policies, and practices intended at maintaining work demands at controllable levels (Dollard and Bakker, 2010). Again, over 60% of participants agreed that management has difficulty motivating them on safety-related issues,

as found in the pilot study of this research. Where lack of motivation prevails, this can create a scenario for employees' non-participation or compliance to safety rules and regulations in the workplace, resulting in increased accidents and incidence at work. Fernandez-Muniz et al. (2007) explained that, as part of effective safety culture and policy improvement at work, management must motivate or encourage employees to report accidents, injuries, as well as near misses. This approach is viewed as beneficial to organisations, as it helps with learning and improvement of existing safety measures based on incidents recorded and mitigates future re-occurrence (Wu et al., 2010).

Participant's responses on safety compliance showed over 60% either agree or strongly agree that in some instance, they feel pressured by management to put production before safety in their installation. However, over 60% of participants hold a similar opinion about ignoring safety regulations to get the work done on time. This finding highlights a trade-off of productivity over safety within these organisations, where production pressure and targets seem to have significance over safety actions. Previously Boughaba et al. (2014) concluded that safety commitment by the employee might be low where management neglects safety processes whenever production falls behind plan. As a result, Parker et al. (2006) concluded that to achieve an effective safety culture in the oil and gas industry, the workers must see that managers have the attitudes and endorse the behaviours that upkeep safety.

According to Dollard and Bakker (2010), poor safety culture in an organisation could increase employees' pressure to hide emotions rather than convey them. This may happen where workers' contributions to positive safety promotion are not being prioritised and may give rise to less motivation and intensified fear of expression. The outcome from the present study further reaffirms this position where over 60% of the respondents admitted not having the confidence to report safety concerns and fear of being fired when they continuously raise safety concerns to their management. This position, if not checked, may lead to a poor starting point to successfully prevent workplace accidents, limit the flow of safety information, and expose employees further to possible workplace accidents. Considering this, Lu and Yang (2010) conclude where safety

concerns and safety motivation are neglected, it may negatively affect safety behaviour, which may affect workers reporting culture.

While the strength of the study rest in the magnitude of the respondents, range of the organisations, its sectors, and workgroups, including the data analysis, the provision of evidence that establishes the link between safety culture and safety behaviour of workers in the Nigeria oil and gas industry is seen as a major gap that the study has advanced, however, some limitations were acknowledged in the study. For example, not every piece of information available around mechanisms linking safety culture and safety behaviour was measured. Another limitation was on how the questionnaire was designed, which led to failure to analyse the individual effect of each element of safety culture on the safety behaviour of workers. Nevertheless, this analysis is important because it will provide an in-depth understanding of the elements the Nigeria oil and gas industry should focus on to create a culture that values safety and takes care of each other to prevent workplace injuries and accidents. Hence, further study is needed to achieve this goal and compensate for this limitation.

5.3 Quantitative findings from study two

5.3.1 The relationship between workers demographic factors and safety behaviour

Previous studies on safety culture carried out in the oil and gas industry, and other high-risk industries have confirmed both gender, age, education background, job category, work experience and employment type as essential elements in safety culture measurement (Ibrahim et al., 2012; Ammouri et al., 2015; Nævestad, 2017; Saedi et al., 2019). The relationship among different demographic factors such as age, gender, work experience, job category, employment type, and different components of safety behaviour (safety participation, safety compliance and mindful safety practices) was examined. Findings from this association showed that work experience has a significant relationship with safety participation and mindful safety practices but not with safety compliance, where work experience has no significant impact. (Ehiaguina and Moda, 2020). Demographic factors such as age, job category, and employment type were all

found to have a significant relationship to safety behavioural components measured in the study. According to the present findings, Gyekye and Salminen (2010) established work experience as an effective panacea to improve the occupational safety culture. In furtherance, Marinaccio et al. (2013) viewed age, gender, work experience, and work department as important factors towards advancing the right policy to improve workplace safety performance. In addition, a significant association was found between age, education qualification, work experience and job category and workplace safety climate in the study of Vinodkumar and Bhasi (2010) survey involving 2,536 workers from diverse chemical industries in India.

In contrast, Ammouri et al. (2015) found no significant relationship between age, gender, job category and work sector to workers safety behaviour and concluded that such factors might not be important in the enhancement of occupational safety culture. In contrast, Cooper and Phillips (2004) argued that demographic variables of workers do have a partial influence on safety climate factors in the workplace environment in their safety climate study among production plant workers in the United States. Significant differences between demographic information and workers safety performance have also been found in Lee and Harrison (2000) study on nuclear power stations in the UK, where the risk perceptions of workers safety were examined. The impact of age, attitude and tenure was evaluated by Siu et al. (2003) among workers in 27 different construction companies in Hong Kong and found that older employees do engage in more positive safety attitude and concluded that age and attitude are predictors of workers safety performance. Though the results obtained from different studies differ, demographic information has vital roles to play when assessing workplace safety culture for sufficient or effective management of workers' safety behaviour (Lee and Harrison, 2000; Marinccio et al., 2015). Evaluating workers' demographic factors makes the process feasible to comprehend their effect on organisational behaviour and safety culture (Han et al., 2019; Saedi et al., 2019). In addition, the process helps to offer a tangible explanation to incidents trends, identification of behaviours that leads to safety and health hazards and their connections with workers perceptions towards the job risk, comfort, and responsiveness to safety regulations.

5.3.2 Safety culture and safety behaviour relationship

The relationship between different elements of safety culture and safety behaviour components (safety compliance and safety participation only) measured in the study formed the discussion section. All elements of safety culture measured were found to have a significant relationship with workers safety to which promotion of positive safety culture within the Nigeria oil and gas industry will help improve workers safety performance thereby decreasing the number of accidents and injuries to workers. According to Ehiaguina and Moda (2020), understanding this relationship is important in developing knowledge on the relationship between individual elements of safety culture and their impact on workers' safety behaviour in Nigeria's oil and gas industry. However, these elements were not tested against the safety behavioural component (mindful safety practices) because items measured under the variables were considered very weak (<0.3) and not acceptable under the Cronbach's Alpha reliability score (Taber, 2018). Such weak scores can impact the result's reliability or introduce biases in the finding (Barbaranelli et al., 2015).

Another study found that a similar association was found where safety management practices considered a channel used to promote a well-built safety culture were directly significant to workers' safety behaviour. In alliance with these findings, (Anwar et al., 2019; Gao et al., 2019; Ehiaguina and Moda, 2020) affirmed the significance of safety management practices on workers safety behaviour within different high-risk industries, including Nigeria oil and gas sector, and concluded that promotion of good safety management practices does enhance working condition. In addition, a similar scenario encouraged by the management does impact positively on employee's safety behaviour in respect to safety, thereby decreasing workplace accidents and injuries. Previous studies have established that enhanced safety culture and safety behaviour could serve as a precursor to minimising accidents among employees in the oil and gas industry (Behari, 2019; Osman et al., 2019; Mearns, 2020).

5.3.3 Importance of management commitment in enhancing workers safety behaviour

Management commitment from the study was found to have a significant association with safety participation (p=<0.005) and safety compliance (p=<0.005). These findings further emphasise the role of management commitment on promoting positive safety outcomes within the Nigerian oil and gas industry, as their commitment forms the culture that determines what will and what will not work in the organisation's safety effort (Pordanjani and Ebrahimi, 2015a). Earlier studies around these subjects conducted in different high-risk industrial sectors, including the oil and gas industry, revealed that management commitment has a significant impact on safety culture establishment in the workplace (Olsen and Bjerkan, 2017; Berhan, 2020; Ehiaguina and Moda, 2020; Ye et al., 2020). These findings imply that the improvement and enforcement of adequate safety policies in the Nigeria oil and gas companies should begin with the establishment of a strong safety commitment by the management, which will serve as an active indicator for a positive safety culture that produces better safety outcome.

In addition, Ghasemi et al. (2018) opined that management commitment to safety produces higher motivation and concern for health and safety throughout the organisation. Their commitment manifests by the proportion of resources (time, money, people) and support allocated to health and safety management and the priority given to health and safety overproduction. The challenges in achieving joint safety and production goals have been analysed by previous studies (McLain and Jarrell, 2007; Jiang and Probst, 2015). According to Bryd et al. (2018), operational and safety excellence goes together. Companies that are good at managing production should also manage safety well to achieve maximum safety performance of workers. However, in this study, over 53% of participants agreed that the management does not strictly follow safety rules and procedures during production. It is obvious that maintaining a balance between production and safety is a major challenge by the management in the Nigeria oil and gas companies. Such disregard to safety procedures whenever production falls behind schedule may lead to low safety commitment by workers giving rise to serious injuries and accidents (Jiang and Probst, 2015; Guo et al., 2016).

5.3.4 The impact of safety leadership style on workers safety behaviour

Organisation safety culture has been found to be driven by effective safety leadership style, another important element of a positive safety culture, especially where the leadership team sets a vision and strategic direction while reinforcing the importance of safety to employees. The impact of the safety leadership style of an organisation on workers behaviour has previously been studied and concluded on the significant relationship between safety leadership and workers safety behaviour in different high-risk industries, including the oil and gas industry (Hoffmeister et al., 2014; Martinez-corcoles and Stephanou, 2017; Zuofa and Ocheing, 2017). Overall, efficient safety leadership is viewed as a key component of safety culture and fundamental to improving workers' safety performance through the effective relationship among the workforces. The need for the management to have sufficient safety knowledge, right attitude and behaviour that reinforce worker's optimism and enthusiasm for better safety performance is further advocated (Cooper, 2015; Muchiri et al., 2019). However, this present study failed to analyse the relationship between safety leadership style and workers safety behaviour using quantitative analysis due to the poor and non-acceptable Cronbach's Alpha reliability scores (< 0.05) of all items used to measure the safety leadership style variable, which was then removed from the list of an exogenous variable before further analysis commenced. However, with the information obtained in the qualitative interview conducted (section 5.4.2 below), it can be said that poor safety leadership style can influence workers safety behaviour in the workplace.

Works of (Cheah et al., 2012; Wu et al., 2017) concluded the importance of the leaders' collaboration with employees to establish effective safety leadership in the workplace. For example, management relies on employees to report potential or actual incidents, follow procedures, identify hazards, and work safely. Similarly, employees cannot improve safety alone but rely on management to set direction, develop supporting safety policies and procedures, allocate the necessary resources and complete corrective actions. Thus, there is a need for managers and employees to recognise safety as a social activity whereby everyone must work as a team to achieve common success. Furthermore, the need for an effective safety leadership style and practices was promoted to necessitate the management to oversee and emphasise

safety reports made by workers (Lingard et al., 2019; Schwatka et al., 2019). This should entail a follow-up of reports and feedback on report issues by communicating all lessons learned and actions taken to help prevent the reoccurrence of incidence and reduce work-related accidents and injuries.

Regarding this, it was fascinating to find in this study that over 60% of participants in the quantitative survey agreed that lesson learned from accidents are communicated to employees. This means that the reporting procedure is useful in the Nigeria oil and gas industry to obtain important information about health and safety issues in the workplace. It is also useful in identifying problems when they arise and addressing them. However, developing or maintaining a method of providing feedback for workers that is systematic can be challenging to organisations. Therefore, channels established to providing workers feedback must be fit for purpose, easy and reliable, and beneficial to both parties (management/workforce), as this will encourage employees to report incidents and take responsibility for their safety (Cheah et al., 2012; Verroen et al., 2013). The study demonstrates that over 60% of workers agreed that workers who act safely receive positive feedback from their managers, to which a well-constructed feedback and regular positive communication are found to encourage safety participation and compliance. Such practices should be reinforced within organisational safety management practices across the industry.

5.3.5 Promotion of Safety communication as a tool for safety behavioural improvement

Companies that promote structured safety communication and information are more likely to stay safe, and the Nigeria oil and gas industry should not be an exception (Kim et al., 2019; Ehiaguina and Moda, 2020). Effective communication should always be a prerequisite for good safety and health practice. Therefore, it is essential for employees to be informed, involved, and listen to workplace safety issues (Kalteh et al., 2019; Tear et al., 2020). On the contrary, inadequate safety communication at work often can lead to reluctances or an inability to identify and resolve problems in the workplace proactively. This often creates safety risks and undermines teamwork, resulting in poorer quality of workers safety performance at best and

workers' harm at worst (Kalteh et al., 2019; Tear et al., 2020). This study revealed that safety communication has a significant association with safety behaviour (safety compliance p =<0.005 and safety participation p =<0.005) of workers among the participants. This finding was consistent with that of previous studies of (Frazier et al., 2013; Amernic and Craig, 2017), who investigated the impact of safety culture on workers safety behaviour in diverse high-risk industries and geographical regions. This means that enforcement of efficient safety communication in organisational safety policies in the Nigeria oil and gas industry can give rise to informed safety culture and help improve the organisational capacity to recognise hazards at different strata within the organisation. Through this, there is an improvement in workers' safety behaviour and facilitates the creation of a safer workplace. For effective safety management practices and safety communication within an organisation to be sustained, there must be a two-way communication channel and must be passed across all levels within the organisation systematically (Nævestad et al., 2018; Yari et al., 2019). Adopting a respectful communication approach can offer employees information and inspire them to make their contributions, which in turn gives the management the opportunity to create a positive, safe, and productive working environment. Mutual workplace respect through communication that works can also result in a speedier and less confrontational resolution of conflicts or difficulties, thereby establishing a positive culture of safety (Nævestad et al., 2019; Yari et al., 2019). By creating open, two-way communication channels, both management and employees can better understand and actively address important issues and directives. The importance of encouraging open communication cannot be emphasised enough; it enables employees to buy into the organisation's safety policy practices while recognising and even suggesting areas to improve safety processes or procedures (Kalteh et al., 2019).

5.3.6 Employee involvement for safety behavioural improvement at work

Organisations who want to be successful must engage workers at all levels in diverse areas of the business and consider their safety inputs which can increase employees' motivation to assume safety responsibility and reduce potentially unsafe behaviours and injuries of workers. Based on

this, an effective safety management system in an organisation should incorporate employees' concerns and suggestions at different hierarchical levels (Gao et al., 2019; Wolniak and Olkiewicz, 2019). In this study, the SEM test was used to test the relationship between an employee's safety compliance and safety participation. The association between these variables was found to be significant (p = <0.005). This finding affirmed that, without employee involvement in safety within the nation's oil and gas industry, it is most likely that significant changes that could positively impact workers' safety performance cannot be made (Unal et al., 2019; Kim et al., 2019). In addition, Ehiaguina and Moda (2020) stated earlier that workers' involvement in improving workplace safety culture in the Nigerian oil and gas industry will enable the management to determine if the workforce accepts changes to safety rules and policies. In addition, this approach will help generate solutions considered useful during the decision-making process because employees possess local expertise that managers do not possess.

5.3.7 The importance of safety training for improvement of workers safety behaviour at work

The application of safety training in the workplace has been linked to workers safety compliance and participation, including reduced accident rates in different industrial sectors (Freitas et al., 2019; Niu et al., 2019). Considering this, safety training was found to have a significant impact on workers safety compliance (p =<0.005) but not on employees' safety participation based on the present study findings (see section 4. 4. 6). This means that in the Nigerian oil and gas industry, safety behaviour changes and compliance to safety procedures will depend on effective safety training, which must remain consistent, critical to the design, duties and responsibility employees undergo in their workplaces. However, the relationship between safety training and safety participation was not measured in the first place due to the removal of direct path linking them in the model before the analysis because poor loading factor value of 0.03, which is less than < 0.6. According to Kim et al. (2016a), such low loading factor values have the possibility to present bias analytical findings.

Nonetheless, this finding was also consistent with the work of Vinodkumar and Bhasi (2010). They did not find any significant direct path linking safety training to safety participation when the

impact of safety management practices on workers safety behaviour in the high-risk industry was investigated. However, their study concluded that the relationship between safety training and safety participation is usually mediated by safety motivation, hence, the need for management to motivate workers towards safety at work (Vinodkumar and Bhasi, 2010). To this, (Nævestad et al.,2020; Zhang et al., 2020) added, organisations that are willing to improve their safety culture must provide their workers with adequate health and safety training to ensure that they are well trained and acquire the necessary knowledge and skills required to carry out their job safely, thereby minimising risks to injury and accident.

5.3.8 Safety motivation and its impact on worker's safety behaviour

Safety motivation has been reported to influence workers safety behaviour across different industrial sectors (Neal et al., 2000; Larsson et al., 2008; Lu and Yang, 2010; Panuwatwanich et al., 2017). Considering this, the present study findings also established a significant relationship between safety motivation and safety compliance (p =<0.005) and participation (p =<0.005). This implies that employees who are encouraged and motivated to participate in safety behaviours are more likely to comply with safety policies, thereby enhancing workplace safety culture and improving workers' safety performance and subsequently reduce workers' injuries and accidents. Just as other findings conclude that the act of participating in safety activities can lead to a further increase in safety motivation and compliance (Guo et al., 2016; Panuwatwanich et al., 2017; Kim et al., 2019). According to (Weaver et al., 2013; Guo et al., 2016), workers' safety motivation is vital in every industry, and different motivation strategies should be in place for every organisation that wish to improve safety cultural practices, drive safety awareness across the organisation as this will positively influence the monitoring and learning loop of the safety management system (See more info on motivation strategy in section 5.4.6 below).

By collecting data quantitatively, it was presumed that participants (frontline employees) were open and honest when responding to the questions about the impact of the organisation's safety culture on their safety behaviour and that their responses were reflective of their reality at the time of the questionnaire completion. Although the quantitative method used in this study

allowed data to be collected from a large sample size in the Nigeria oil and gas industry in a randomised manner, which helped describes systematic relationships among studied variables in a statistical way to make a generalised finding, however, there was a need to understand individual's opinion and emotions about the existing state of safety culture across all level of the workforce (managers/supervisors/frontline employees) in the industry in order to compare for the discrepancy and obtain deeper insight, which was the main limitation of quantitative data. To achieve this purpose, a qualitative method of data collection was further adopted (interview), and the key findings from qualitative data analysis will be discussed next.

5.4 Qualitative findings of employee's safety culture and safety behaviour

To measure participant's, take around the workplace safety culture and safety behaviour, semi-structured interview findings from the study conducted gave rise to eight parent themes, and their respective sub-themes are discussed in sections 5.4.1 to 5.4.8 below. Information contained in these themes provides participants documentary evidence on the current state of safety culture in the oil and gas companies and how workers safety behaviour is impacted.

5.4.1 Management obligations to the safety performance of workers and challenges to commitment

Management is obliged by law to take responsibility for employees' safety by ensuring that their health and well-being are protected (Smith, 2011; Mullen et al., 2017). When management fulfils their workplace safety obligations and transactional responsibilities, such as willingly dedicating time to safety, providing resources, equipment, and safety training, it signals to workers that their safety and well-being is valued within the organisation and can lead to reciprocation of positive safety behaviour and performance of workers (Mullen et al., 2017). However, (Fu et al., 2018; Graves et al., 2019) noted the challenges confronting successful commitments from management towards safety. They are of the view that such challenges are often not due to unwillingness on the side of the management to commit to workplace safety because of the time

and cost required but due to lack of fundamental awareness by management on how to encourage the workforce. In most cases, the national culture of the workplaces, where employees in each country or region act and behave towards safety in a similar way or have a particular belief regarding safety, is likely to influence their approach to safety-related practices (Keiser, 2017; Yorio et al., 2019). For example, national norms on power distance may determine how junior colleagues communicate with managers on safety. In addition, religion and belief can also affect workers view of safety policies set in place by management (Keiser, 2017; Yorio et al., 2019). For employees to perform more effectively to safety practices, the safety management system and practices within an organisation need to be harmonious with the country's national culture.

Assessing these challenges confronting management safety commitment in the Nigeria oil and gas industry participants LEEHseMaOO1 and VivMaOO1 admitted that management in the oil and gas sector sometimes are willing to show commitment to safety practices; however, they are increasingly challenged by the lack of understanding on how to involve and motivate employees to participate on safety-related issues. In addition, both interviewees believe that it is difficult to show commitment to safety improvement when workforce hold believe that their safety is in the hands of God or rely on traditional powers for rescue in the event of incidents. This statement implies that safety culture in the Nigeria oil and gas industry may also be shaped by broader cultural phenomena such as national culture that can implicitly influence employee safety practices. Other studies of (Okolie and Okoye, 2012; Morrow et al., 2014) have also shown proof that organisational culture and behaviour in multinational companies vary according to the national cultural norms of the countries where operations are based. Two interviewees expanded on this notion.

Participant (LEEHseMaOO1) stated that,

> *"Management commitment" to overall safety issues at work, I will tell you it's not easy, it's not easy to have the proactive knowledge to make workers understand, giving them reasons, why commitment to safety should be key, is very difficult"* (x1).

In line with this submission, VivMaOO1, added that,

"It can also be difficult when you have employees that believe that safety is in the hands of God and do think you have to be too careful or act in a certain way to remain safe. Some will even tell you that they have traditional powers that before any explosion like this that they will disappear hmm hmm, so these are the challenges we face every time trying to, you know, make them understand" (x1).

Based on these contributions, it is obvious that management should show commitment to safety through supportive leadership to encourage their safety behaviour by treating their workers fairly, intervening respectfully during the investigation of the unsafe act and eliminating the blame culture to enhance workers positive behaviours (Fuzi et al., 2019; Lee et al., 2019). On this note, information on the different avenues' management show commitment to safety in Nigeria oil and gas companies revealed that management at times shows their commitment by intervening respectfully in the event of an unsafe act or behaviour of employees, thorough investigation of the root causes to prevent re-occurrence, training, coaching, and educating employees on the implication of an unsafe act. Accordingly, (Lee et al., 2019; Okorie and Musonda, 2020) are of the view that this type of safety management and practices is likely to cause team members to feel that their views are acknowledged and respected and can positively influence their reporting culture. Thus, such safety policies should be reinforced across the Nigeria oil and gas industry. This position was also affirmed by five different interviewees notably LEEMaOO3; NPDCFEOO4; NPDCHSEOFOO2; SEPFEOO2, and SEPHSEOFFOO3, whose statements summarised that,

"Yes, when we see an unsafe act that has been committed, we intervene respectfully, immediately management set up a committee to investigate the root cause and it is not to witch hunt, neither is it to discipline nor punish, rather it is to put a corrective measure in place, explain to the person such thing should not be done and make the person understand the implication to himself, the environment, the company himself and his family. We send on training if necessary" (x5).

To be living to their commitment, it is paramount that safety comments made by management should be seen not just as mere say but observable by employees and demonstrated in their

behaviours and actions Kim et al., 2019; Leaver and Reader, 2019). Such exemplary actions are part of the measures' management uses to show employees that they are committed to their safety and thus increase their safety motivation and safety performance (Noort et al., 2016; Nævestad et al., 2019; Tear et al., 2020). On this note, information about how participants (both managerial and frontline workers) rated the level of management commitment to safety in this study during the interview was retrieved from seven participants particularly SEPHSEOFFOO3, NPDCSUPOO3, NPDCSUPOO3, NPDCFEOO4, LEEMaOO3, LEEMaOO2, and NPDCFEOO4, described it to be beyond good. A summary of their statement expressed that,

> "*Management commitment is quite excellent in their organisation due to the ways safety issues are being handled"* (x7).

However, a concern for the need for improvement was raised by a participant (VivMaOO1) with a managerial position from one of the local oils and gas companies, revealing discrepancies in how workers perceive management commitment to safety from diverse levels in different Nigeria oil and gas companies.

> Participant VivMaOO1 submission added that *"I think it's generally positive, is there a need for improvement? Of course, there is now, I will score them above average. Because first and foremost, they show commitment by providing the entire safety requirement needed. You know, the safety boot, the safety hat, the kit itself; however, do we need to do more? Of course, we do"* (x1).

In consonance with these contributions, previous studies (Kalkavan and Katrinli, 2014; Pinion et al., 2017; Fruhen et al., 2019a) noted that employees' perception towards management commitment is very vital to understanding the extent to which management is perceived to prioritise safety, act, and communicate safety issues "successfully" within the notion of safety culture. These studies further concluded that employees of an organisation must perceive the commitment of management to be positive before they can comply with the safety rules and regulations of the workplace. In relation to this, information about workers perception of the importance of management commitment in the Nigerian oil and gas industry was retrieved from four interviewees specifically LEEHseMaOO1, LEEMaOO2 LEEMaOO3 and NPDCSUPOO3 with

managerial positions, who expressed their opinion by stating that it helps in creating the right culture within the organisation.

A summary of their inputs revealed that,

> **"***Management show commitment to safety because industrial safety culture permeates from management and cascades down to people on the frontline or the people, we can call foot soldiers". "When the management is committed to safety, the whole process work, yea in my organisation we are, the process to which we are, is in a progressive process, we are not static". The commitment of management helps prevent incidence before they occur and helps uphold the reputation of the company"* (x4).

To expand on these revelations, management commitment to safety can encourage workers safety behaviour when they portray leadership behaviours that persuade safety culture (Bian et al., 2019; Lee et al., 2019). According to (Fruhen et al., 2019b; Ye et al., 2020), such behaviours should include acting as role models to employees by always emphasising safety, recognising workers effort towards safety, rewarding achieved milestones and unsafe act, trust and respect their contributions, inspire workers to establish new interpretations, and to embolden the implementation of new techniques and safety policies to overcome problems. Regarding this study, it was disclosed by four interviewees such as SEPFEOO2; NPDCHSEOFOO2; NPDCFEOO4 and LEEMaOO2 that,

> *"Management always emphasise the importance of safety, so if I may rate their frequency, they always do it, they regularly do it, safety is not compromised anywhere. They roll out safety procedure; they roll out new safety guidance as it rolls out in the industry because it is important to saving lives, so they are very committed to safety"* (x4).

Following the above statement, the ways by which management in the Nigerian oil and gas industry encourage employee's behaviour were also revealed by three interviewees, notably LEEHseMaOO1, SEPMAOO1 and VivSUPOO2 in management positions. In a concise statement, these participants concluded that,

"So, as management, the way we encourage workers is that we celebrate a milestone, we celebrate the end of the year, when you report incidence that is an unsafe act or unsafe condition, it is rewarded, when you are a safe worker it is rewarded, there is what we call safety champion, so with these workers are encouraged. We, the management give out personal protective equipment, I think overall, safety shoe, safety cap. We also ensure that we attend safety meetings" (x3).

These encouraging behaviours by management usually indicate a positive relationship with effectual safety management practices in an organisation and should be strengthened.

5.4.2 Management safety leadership style in promoting worker's safety behaviour

Effective safety leadership style in the workplace necessitates managers and supervisors to be personally involved in health and safety events, maintain regular site visits to ensure workers are operating in safe working conditions, and contribute to incident reviews and inspections (Pokorny and Hruby, 2010; Choudhry, 2014). To ascertain this, information sourced from four interviewees which are, NPDCSUPOO3; SEPFEOO2; SEPHSEOFFOO3 and VivSUPOO2 revealed that,

"We have management in different levels. Ennh, for their commitment generally, if I talk of the frequency, they visit the field to see how we are compliant with safety, I can say every month. Then for the top leadership team, every quarter, i.e., once in four months, they must come for management facility inspection. Then the other level of management come once a month. So, they show a form of commitment. For supervisors, it's daily" (x4).

Based on these contributions, such a safety leadership style established by visiting the site on a different schedule will enable leaders to recognise and remedy any risks to the safety of employees and the workplace to achieve a goal zero. Hence it should be reinforced in organisational safety policies and practices. Early studies have drawn attention to the role of managerial leadership in shaping the organisational climate, which in turn affects employees' attitudes and behaviour (Mullen and Kelloway, 2009; Clarke, 2013). Subsequent works have

explored the relationship between leadership and climate, demonstrating that leadership acts as an antecedent of employees' climate perceptions and, therefore, concluded that a cordial and trustworthy relationship needs to exist among the workforce from different level of the organisation to foster a positive safety culture in the workplace (Mullen et al., 2011; Cooper, 2015). In this study, the nature of the relationship between management and workforce in the Nigerian oil and gas industry was explored. Seven interviewees, particularly NPDCFEOO4, NPDCMANOO1, SEPFEOO2, VivSUPOO2, LEEMaOO2, NPDCSUPOO3 and VivMaOO1 expanded on this, where a summary of their statement explained that,

> *"It's very cordial and professional because the workforce is very critical to the operations, so they care about our welfare. At no point in time would we allow any type of friction; the workers can express themselves"* (x7).

However, this position was not maintained by one of the interviewees (LEEHseMaOO1), who complained that,

> "*Some of my colleagues see themselves as a boss and can never do a proper coaching and mentoring process because workers cannot open up, and workers can never be free working with them"* (x1).

The above quotation illustrates the lack of trust existing among the workforces. This can hinder subordinate willingness to contribute to safety-related matters in the Nigerian oil and gas industry. It was further explained by (Mullen et al., 2017; Muchiri et al., 2019) that when management exhibit behaviour characterised by trust, recognition, motivation, and feedback, it can improve the well-being of workers and their involvement in safety at work. Undeniably, managers or supervisors committed to safety and encourage workers in these ways have the possibility of achieving more engagements and open communication from their subordinates regarding safe behaviours (Muchiri et al., 2019).

5.4.3 Communicating the vitality of safety towards improving workers safety behaviour

In a recent study by Kim et al. (2019), communication of safety information among the workforce was found to impact employee's safety perception and behaviour. According to (Yang et al., 2009; Nævestad et al., 2018), risk awareness can be boosted by effective safety communication through group discussion between managers and employees on workplace hazard using safety meetings, toolbox talk, emails, and phone calls. This is one of the most effective elements in all safety interventions. However, such mediums must be found very effective, easily understood, or accessed by employees to enable them to express their concerns and contribute to safety for an informed, effective decision making. In this view, information about the different channels of disseminating information was explored, and six interviewees noted to be LEEHseMaOO1, LEEHseMaOO2, LEEMaOO3, NPDCHSEOFOO2, SEPHSEOFFOO3 and VivMaOO1 mentioned the different channels and the role it plays in upgrading safety. According to their concise testimonies,

> "*Communication of safety is through safety meetings, safety induction, safety programs, signage and notice board; we talk about the task before it goes on. We have email correspondences where reports are sent on safety, and we can analyse the report and see what the trends are and how we can address the trends. We have other means of communication, phone calls, and we can be in contact; we use all that to express and manage safety in the workplace, as well as when site work is concerned. So, we can say it's cordial and effective enough"* (x4).

Interestingly, this information was in line with a key finding from study one, where 90% of participants confirmed that they were satisfied with the mode of safety communication in the workplace because of its effectiveness in combating safety issues (see Table 5). Since creating a meaningful safety and health communication channel is one of the first steps towards building a better occupational safety culture, this information retrieved implies that the Nigerian oil and gas industry provides the platform to workers where they can store and access useful safety information to reduce extraneous risks to their health and safety. Therefore, such practices should be maintained.

Safety communication has also been found to influence workplace safety by encouraging the sharing and acceptance of safety information, which increases knowledge about balancing tasks and safety demands to reduce the perceived risk (McLain and Jarrell, 2007). According to Choudhry (2017), with safety communication, workers can interpret whether the demands of management to work both safely and productively are serious, reasonable, or it requires placing one's safety at risk, as production and safety are sometimes seen as two opposite ends of a spectrum. Unfortunately, most companies fail to create a balance between both. To understand this trend in the Nigerian oil and gas context, the priority given to safety or production by management in the workplace was examined, and information retrieved from five participants such as NPDCHSEOFOO2; NPDCMANOO1; SEPHSEOFFOO3; SEPMAOO1; VivSUPOO2.

An overview of their statement indicated that,

> *"In as much that production is essential in the pursuit of profit, put them fifty/fifty because, without the safety aspect, production must not start. So, safety is the driving factor for production because once you compromise the safety, invariably, you are not sure of getting to that production target you are aiming at for that day, virtually the equipment will be at risk, the staff will be at risk, once the staffs are no longer in good health and the equipment are no longer available, you're already back to zero"* (x4).

However, a contradictory opinion of participant SEPFEOO2, a frontline employee from one of the local Nigerian oil and gas companies, disclosed that there are moments when management value production over the safety of workers by stating that,

> *"Well, to be honest, you know this is a production company, if we don't produce, there will be no income and definitely if we keep on doing that, if there is no production over a long time, I mean we may run out of business. So, there are sometimes, not all the time they might compromise some safety procedures just to get us to produce the oil and gas and so, the balance tilt towards production more than safety in some cases"* (x1).

This contribution made by SEPFEOO2 revealed a discrepancy in the shared perception of safety culture across the industry. This revelation was consistent with one of the quantitative findings

from the pilot study where over 60% of participants agree or strongly agree that in some instances, they feel pressured by management to put production before safety in their installation (See section 5.2.3). These findings clearly illustrate the lack of strategy and knowledge leaders in Nigeria's oil and gas industry have for successful workplace safety management. These leaders with no safety strategies are often experts in one field of the company and tend to entrust the other aspects to specialists. This, in turn, leads to conflicting priorities. An organisation that prioritises production over safety may experience an increase in work-related illness and accidents of workers and a poor health and safety record. Since helping workers to handle this dual responsibility (safety and production) is obligatorily the responsibilities of the management, managers in the Nigerian oil and gas industry must be leaders who have different perspectives, effective safety strategy communication skills and vision of the relationship between safety and productivity in the workplace to create a balance for effective safety culture development (McLain and Jarrell, 2007).

According to (Gao et al., 2019; Pandit et al., 2019; Haas, 2020), the communication of safety issues in a regular manner amid the workforce, supervisors, and management is an efficient management practice towards safety enhancement in workplaces. Availability and utilisation of health and safety information provide a logical way to oversee health and safety with continual improvement, helping to prevent occurrence and cost of accident. Therefore, more value should be placed on safety in the workplace (Gao et al., 2019). In this light, information from participants regarding the availability of safety information in their workplaces was investigated. It was found that safety information is accessible and available to them through different means as disclosed by seven interviewees, particularly NPDCFEOO4 NPDCHSEOFOO2: LEEMaOO3 LEEMaOO2; LEEHseMaOO1; NPDCMANOO1 and SEPFEOO2, whose point of views maintained that,

> *"Safety information here is not confidential; information is communicated to everyone, we have posters, toolbox talk, organisation's website, safety meetings, we have the email that we communicate with everyone. We have posters we have signage here and there within the facility. All this is to communicate with the people, so information is not hidden"* (x7).

Based on these contributions, it is important that safety information communicated using these mediums should be efficient and serve the intended purpose as it is central to reducing the risk of injury and illness in the workplace. Furthermore, according to Pandit et al. (2019), the extent to which management places value on safety and its importance should also be expressed and made visible to the workforce for them to perceive a climate that upholds safety as this can promote their safety participation and compliance. To ascertain this in the Nigeria oil and gas industry, information about workers perception on how management place value, importance, and emphasis on safety was explored and contributions were made by six interviewees who were noted to be LEEHseMaOO1; NPDCFEOO4; NPDCFEOO4; NPDCMANOO1; SEPHSEOFFOO3 and SEPMAOO1.

> According to their statement in summary, *"Safety is discussed in this organisation in all activities. We need safety to survive, and safety is our core, key-value in this organisation. Then as you walk in, you can see that everybody is on their PPE. We don't cut corners; all safety procedures are well followed. So, safety is our life wire, why? Because one little mistake can bring the whole of this facility down, and that is something we do not want to happen. Yes, management talks about safety as often as the need arises, especially when we are carrying out a task that involves safety operations like lifting and hoisting and other things that we do regularly; we make sure that the staff are aware of the risk involved in that activity"* (x6).

In line with these responses, it is important that employees perceive management commitment to safety to be positive, as such feeling can influence their knowledge and motivation towards behaving safely.

5.4.4 Management provision of safety training and its impact on worker's safety performance

Safety training is important to enhance employees' capacity to respond to threats or emergencies and simply engage in safe behaviours (Niu et al., 2019; Freitas et al., 2019). For effective safety cultural practices in the Nigeria oil and gas industry, management should provide workers with

health and safety training to ensure they are aware and understand the hazard they are exposed to (Reiman et al., 2019; Tear et al., 2020). To determine this, the importance and effectiveness of safety training and information on worker's safety behaviour were examined. It was interesting to know the viewpoint of nine interviewees, specifically LEEHseMaOO1; LEEMaOO2; SEPFEOO2; SEPHSEOFFOO3; VivMaOO1; VivSUPOO2; NPDCHSEOFOO2; NPDCSUPOO3 and NPDCFEOO4 expressed in summary that,

> "*Our safety training is very effective; I think training has sharpened our minds and make us more sensitive to hazards and risks, and even when they are becoming complaisant by seeing those risks regularly, safety training helps to bring it up again as a risk and not just something that is normalised. It has helped to eliminate major accidents and educate us on how to report the unsafe act. Trainings are done and properly done to make sure workers are ready for duty"* (x9).

In relation to these responses, such health and safety practices contribute to developing a positive safety culture in the workplace and thus should be reinforced in the safety policies and practices in the Nigeria oil and gas companies. It was found by Lee et al. (2019) that employees are more likely to abide by safety protocols if they are aware of the potential damage that their violation could cause. Therefore, it is important that management show commitment to enhancing employees' safety knowledge through training, which improves their safety compliance and safety participation (Asivandzadeh et al., 2020; Zhang et al., 2020). In this study, participant's perception of management commitment to safety training was assessed. However, only one interviewee NPDCMANOO1 made a meaningful contribution by stating that,

> *"Management is ever willing to train people on workplace safety and to give refresher courses"* (x1).

Concerning this input, the fact that much information regarding management commitment to safety training could not be from most of the participants in this study already sends a signal that some gaps may exist in that aspect of safety practices in the organisation. Therefore, it is important that management in the Nigerian oil and gas industry show commitment to maintaining continuous and effective safety training programs which are visible to their

workforce, beginning from the day of employment and should be recurring intermittently or periodically for their better safety performance of work and towards the development of the right safety culture.

The work of Ardeshir and Mohajeri (2018) explained that the duration and time invested in workers' safety training organisation and the types of training programs workers undergo contributes to their motivation in participating and complying with safety rules and procedures in the workplace. So, much time must be invested in safety training to create adequate time and a continuous learning platform for workers to gain knowledge and be aware of the necessary risks and hazard associated with their job roles to prevent injuries and accidents. To explore this view, the different types of safety training programs workers undergo in the Nigerian oil and gas companies and the duration of safety training was assessed, and four interviewee responses were retrieved. Contributions made by four interviewees, notably SEPFEOO2; SEPHSEOFFOO3; VivMaOO1, and VivSUPOO2 revealed that,

> *"Although it is difficult to gauge the actual duration, we do fifteen, twenty minutes daily for toolbox talk daily, we spend two hours for HSE meeting once a month and then the trainings we do, there are established accredited body that does these trainings, so we book one for a week, two weeks, three weeks, you know it's difficult to say the time but what we do quite a lot. Yes, so much good time, Soo it depends on the training that we are talking about. The management tries to ensure that industry standard is maintained for the duration of those training. So, enough time is committed to training"* (x4).

In line with this submission, other two interviewees SEPFEOO2 and LEEMaOO2 stated that,

> *"Many of our workers who are on-site have been trained for the activities that they are doing, both technical training and safety training. There are some that the validity period is for two years, and when the expiration date is approaching, they try to do refresher training"* (x2).

With regards to these contributions, for effective safety culture and practices in the Nigerian oil and gas industry, it is important that workers are engaged in different types of training courses,

both general and those that are specific to the organisation. Such safety training programs can be daily, weekly, or monthly. The identification and discussion of job hazards during pre-task briefs should also be in place including, the use of personal protective pieces of equipment by workers at work. This will not only be beneficial to the workplace but also the workers by making them responsive and knowledgeable in safety and health policies.

5.4.5 Enhancing worker's safety behaviour in the workplace through their involvement

Employee involvement provides viable solutions to improve safety problems and reveals their commitment to safety, which can increase worker's motivation to assume safety responsibility and reduce potentially unsafe behaviours and injuries of an organisation (Bayram, 2019). According to Bahari and Clarke (2013), workers awareness about their involvement in safety in the workplace is regularly based on their interactions with management staff or safety personnel who efficiently indulge workers when reviewing possible workplace adjustment to make a noteworthy distinction in safety compliance (Trinchero et al., 2019; Umar, 2020). During employee involvement, interactions on safety issues between management and sharp-end workers must conserve personal respect, including corrective situations. In doing so, employees will feel enthusiastic about safety, the workplace, and leadership support in fostering a safe working environment. To understand the level of workers enthusiasm and perception about their workplace, this information was explored. The outcome of the findings from four interviewees' such as LEEMaOO3; SEPHSEOFFOO and VivMaOO1; VivSUPOO2 revealed that,

> *"of course, yes, and I think they feel it's good; if it's not a good place to work, they won't be with us, we've had some of them for a very long time. We have people who have been in the company for ten, twelve, fifteen years or so, and the more they grow, the more they acquire more trainings and expertise emm, they keep improving themselves, the opportunities are broader, they have opportunities to go somewhere that is big, the fact that they are still here tells that there is a reason they are here, and to me, I can say they feel it's a good place to work"* (x4).

With these contributions, workers feeling enthusiastic about their workplaces create and increase employees' persistent safety participation and compliance, which is a fundamental prerequisite for a total safety culture development in the workplace. Employees themselves play a major role in determining their safety through their responsibility for safety (Khasanah, 2019). According to (Bayram, 2019; Umar, 2020), even when a company takes all reasonable precautions in terms of preparing the site and the work to be risk-free, enforcing compliance through disciplinary measures, providing training and personal protective equipment (PPE), workers can still make decisions to work in ways that endanger them, especially when production is high. Their ability to identify risks, and their subjective analysis of the magnitude of those risks, are among the factors that determine their responsibility to safety. To determine this, the perception of participants (management and frontline workers) on their safety responsibility was examined, where seven participants, particularly NPDCFEOO4; NPDCMANOO1; NPDCSUPOO3; NPDCSUPOO3; SEPFEOO2; SEPHSEOFFOO3and VivSUPOO2 expressed a similar opinion. A succinct of their expression revealed that,

> *"Everybody is responsible for safety, especially your own personal safety, the safety of your colleague, the safety of the business, the safety of the managers, so we are all responsible for the safety of everything here"* (x7).

In accordance with their responses, it was noteworthy that employees were aware that safety is everybody's responsibility. Such information and awareness by employees are fundamental to inculcating the right culture to safety in the workplace. According to (Kasim et al., 2019; Nkolimwa et al., 2020), there are consequences to not engaging employees on safety-related matters for effective cultural change in the workplace. Most of the time, when workers are not involved, the whole change process does not work. Workers may feel that their well-beings are not taken into consideration and may also have the opinion that management talk about safety only to avoid health and safety fines from the government (Emmanuel and Ahmed, 2020; Razali et al., 2020). To this effect, management's perception of employee's safety involvement and the reason or importance of their engagement was explored in this study, and seven interviews found

to be VivMaOO1; SEPMAOO1; SEPFEOO2; LEEHseMaOO1; LEEMaOO2; NPDCFEOO4 and NPDCSUPOO3 made meaningful contributions. In summary, their statement revealed that,

> *"Management has given everybody, every staff, that singular privilege, that anything that has to do with safety, their own personal safety, the organisational safety or work safety, is paramount. Nobody hinders you when you are talking about safety, or peradventure you refuse to do anything on account of safety is been seriously respected, and nothing will ever stop anybody from allowing you to air your mind as regards your fear of certain aspect of work or the job that you feel it's not safe or any activity that is ongoing that you perceive as an unsafe. The importance of engaging workers is to ensure the process works because safety concerns everyone and enables you to be your brother's keeper. Obviously, you cannot be safety compliant if it's not a joint effort. There must be a joint effort for you to be able to observe and get a one hundred per cent or near one hundred per cent safety or non-incident situation, so yes"* (x7).

Following these contributions, for safety culture development or improvement in high-risk industries like the Nigeria oil and gas industry, it is important for workers to know that management is genuinely interested in their safety contributions. This is very essential, as it enables employees to respond to safety issues with inventive thinking, ideas, suggestions, and decision-making that can be beneficial to the organisation. For workers to be aware that they are involved in safety procedures, the management must consider several factors such as providing positive feedback, showing workers respect, putting their ideas into consideration, and effective safety communication (Deepak and Mahesh, 2019; Tear et al., 2020). In this view, the ways management engage employees in safety and the reason why their engagement is important was investigated. According to the testimonies from five interviewees known to be LEEMaOO2; NPDCFEOO4; NPDCHSEOFOO2; SEPHSEOFFOO3 and SEPMAOO1, it was revealed that,

> *"Everybody is encouraged to be involved in the day-to-day management of our organisation. First and foremost, every weekly basis, we normally have what they call HSE safety meetings, safety trainings, inductions, unsafe act and unsafe condition program, where everybody will assemble in our auditorium and various learning from incidents the*

one within our plant, then the one within the country and the international will be discussed and then the key learning from it will be heard from everybody and how people can avoid such as pitfall in the future will be cascaded down. Management also intervenes during the unsafe act by workers" (x5).

In conformation with their responses, such organisational safety practices are positive and will ultimately benefit the organisation and the employee.

5.4.6 Motivating workers safety behaviour, using the reward system

Safety motivation influences adherence to safety procedures and has been found to ensure the safety of individuals and organisations, and even society (Chen and Chen, 2014). The impact of safety motivation on workers safety behaviour has previously been discussed in (section 2.9.1) of this report, and the significant association between safety motivation and safety behaviour was shown in (section 4. 4. 6). According to Frazier et al. (2013), there are several ways to keep employees motivated in the workplace and safety incentives are thought to be one of the top high-impact zero-accident motivation strategies organisations adopt, and these are usually in the form of reward, awards, and recognition (Fernandez-Muniz et al., 2007; Wu et al., 2010; Kim et al., 2020). One explanation may be that individuals who carry out discretionary activities, such as participating in safety activities, receive positive reward and encouragement, which motivates them to comply with further activities (Kim et al., 2020). Although, it is argued by (Fang and Wu, 2013; Guo et al., 2016) that using safety incentive to motivate and promote workers safety behaviour may prevent them from reporting injuries in order not to deter their receipt of rewards. However, Shu et al. (2011) is of the opinion that such cases can only come to be when incentive program is not a driving force towards promoting reporting culture.

In this study, the importance of a reward system on workers motivation and the different safety motivation strategies adopted in the Nigeria oil and gas industry was investigated. On this note, a summarised statement from five interviewees such as SEPFEOO2, NPDCSUPOO3, NPDCHSEOFOO2, LEEMaOO2 and NPDCFEOO4 revealed that,

"There are different ways they encourage safe working practices. There is a reward they give for the best facility in terms of safety practices, and when you can stop some hazards or accidents from happening, you will be recognised and rewarded. So, they try to encourage that by reward and recognition. We have the HSE manager and an HSE team, so sometimes they come up with gifts and incentives to encourage people to be aware and take ownership of what is happening in their work environment. There is a punishment for those that compromise safety rules and regulations. We may have HSE meetings where we reward those who are doing very well in recording unsafe acts, so, you know, in that way, you are motivating them to record more to bring out more of those issues so that they can be addressed (x5).

In relation to these inputs, workers' safety incentive programs employ an integrated threshold for safety performance with the intention of rewarding workers who successfully fulfil the requirements of a certain performance criterion (Mooren et al., 2014). If the workers manage to reach or cross this safety threshold at the end of the given reward period, they will be granted a reward (Mooren et al., 2014). By connecting the safety incentives to aspects of the safety policies and practices, Nigeria oil and gas companies can motivate their workers to implement the formulated criteria for upholding safety at work effectively. However, Nigeria's oil and gas industry should not just focus on incentive mostly as a motivation strategy because if used incorrectly, can have the opposite effect, and make workers reluctant to report safety issues. Eventually, it will build an unsafe environment. Alternatively, supervisors should keep an eye out for workers using proper safety procedures and inform the management. Workers who constantly perform with safety in mind should be given incentives as a form of motivation. According to (Panuwatwanich et al., 2017; Kim et al., 2019) further noted that for the development of effective organisational safety culture, it is always important that the workforce feel motivated. Part of it should be that they must find reporting mediums and procedures effective and less time-consuming to enhance reporting culture existing within the organisation, consequently encouraging safety participation and compliance. To ascertain this point of view in the context of Nigeria's oil and gas industry, different mediums used to report unsafe behaviour

were examined, and five interviewees particularly LEEMaOO3 NPDCHSEOFOO2; NPDCMANOO1; SEPHSEOFFOO3 and VivMaOO1 expanded on this notion by disclosing that,

> *"We report unsafe act through the unsafe act or unsafe condition form. The medium can also be oral, by mail, or directly by making a call; you can report by a dropbox; we have boxes in different places. Then somebody goes there to pick an item on the box, you know to communicate to management the ideas, If it's something that you want to send further away you need to take pictures, you need to write. You need to possibly take video clips, so, all means, all available media is what we use"* (x5).

In line with this view, it is very essential that employees in the Nigerian oil and gas industry are aware that their confidentiality will be maintained and that the information they submit using these mediums will be acted upon; otherwise, they will decide that there is no benefit in their reporting. Studies of (Graves et al., 2019; Kim et al., 2020) added that management must ensure incidence reporting medium is efficient and reports should be properly documented as this is useful in the workplace to investigate the root cause of accidents. Employees involved in work-related accidents can use such reports to take time off work or claim compensation with time. To explore this point of view in the Nigerian oil and gas industry, the usefulness of reporting medium was revealed by participants. However, five interviewees, particularly VivMaOO1 SEPHSEOFFOO3 VivMaOO1; NPDCSUPOO3 and LEEMaOO3 expressed concerns about the need for improvement or review of the reporting system. A summary of their addition expressed that,

> *"It's fit for purpose, we've been using the same system, and you know the result shows for it, but that does not mean that we are hundred per cent there or we are that perfect, there is always room for improvement because as new types of equipment are coming, new technologies are coming, it also comes with its own new set of hazards. So, it can also be reviewed to have an electronic element"* (x5).

In alliance with these additions, a reviewed and up to date reporting medium that is fit for purpose is necessary for the Nigerian oil and gas industry because it is vital to obtaining data about the severity and frequency of incidents, level their performance against other similar

organisations, and identify systems' deficiencies to improve performance and provide insights into human factors in areas such as training, management, and fatigue.

5.4.7 Learning from past incidence to prevent re-occurrence

Learning from incidents or accidents and creating safety notifications demonstrates a culture of continuous improvement in safety standards and performance in the workplace. Workforce involvement in the process will also create a greater team spirit and feeling of self-value (Moura et al., 2017). According to (Vinodkumar and Bhasi, 2010; Kunzle et al., 2010), one of the major ways organisations learn from past incidence is through the provision of corrective feedback by management and safety staff in an organisation formally and informally to employees who perform their jobs safely or unsafely. In addition, leaders should regularly thank employees (as individuals and in groups) for their efforts to work safely and over time, acknowledging people who work safely, as this will help mitigate the common misconception that safety personnel are simply safety police instead of assisting them in learning and improving workplace safety (Kunzle et al., 2010; Clarke, 2013). Providing feedback of accidents or near misses to employees will also help the workforce work together for a safer environment (Drupsteen et al., 2013). In this regard, the importance of workers feedbacks and reports was assessed in the Nigerian oil and gas industry.

> In the statement of participant LEEMaOO2, *"feedback is given all most immediately, so those who are doing well are encouraged to continue why those who are defaulting are immediately corrected, so they don't endanger the workplace"* (x1).
>
> Related opinion from participant NPDCMANOO1 revealed that *"workers have to receive feedback anyhow. The essence of the feedback is for you to be enlightened, for you to know what went wrong, and then for you to know how to guide against it"* (x1).
>
> Further input made by participant SEPMAOO1 stated that *"the reports help them work out moralities and mitigate re-occurrence. So, it's something that you know helps to build robust safety measures in every organisation"* (x1).

In line with these contributions, such safety practices are important in preventing workers' injuries and accidents in the Nigeria oil and gas industry and should be preserved in safety management practices to further enhance workers' safety behaviour. A study by Lindberg et al. (2010) added that the channel by which employees receive feedback in an organisation is diverse but must be found imperative to improve the workplace and encourage a two-way safety conversation. In this way, both management and employees will be involved in the process to create a channel where workers feel safe, comfortable, and not feeling pressured giving or receiving feedback. The different channels of providing feedback in the Nigeria oil and gas industry was explored, and three interviewees such as NPDCFEOO4; NPDCSUPOO3 and SEPHSEOFFOO3 in summary disclosed that,

> *"Anytime there are issues, and then a report of an incident is generated to top management, there is usually corresponding feedback, there are different ways management gives us the feedback, either a cascading feedback from higher authority to the concerned personnel via their supervisors or the departmental head or eventually monthly when they normally have their forum where they cascade the feedback directly to the employee or the staff concerned via emails. The group managing director can communicate all the observations back and the line of thought and action that the top management has taken back to the workers via email or via all these telecommunication conferences they interact with us"* (x3).

Management committing to giving and receiving feedback will reduce unsafe situations and promote a better safety culture in the workplace. According to Drupsteen and Guldenmund (2014), after organisation learns from past events, they should derive competent ways of preventing re-occurrence of similar incidents in the future. Some of the best risk control measures confirmed effective and found commonly adopted by organisations are frequent safety communication at work, incident review and investigation of the root cause of accidents and near misses, which helps to prevent or reduce the safety risk of workers to a reasonably practicable level and enable workers to understand how and why things went wrong. It was noteworthy to know that such practice is already in place in the Nigeria oil and gas industry when information

on ways of preventing incidence re-occurrence was explored where interviewee one LEEHseMaOO1 revealed that,

> *"Incident must be investigated, having investigated it to prevent reoccurrence, then you disseminate the information, we do what they call learning from incidence, we cascade to workers, I think with this it will prevent reoccurrence, it will not happen again"* (x1).

In line with this submission, another interviewee (NPDCHSEOFOO2) explained,

> *"We do a lot of safety communication, in which we now review some of the incidents in other company, why are we doing so? To prevent reoccurrence in our own company and to create awareness, by so doing the incident level here has been reduced, and the worker is aware or conscious that if I do this, this will be the result"* (x1).

Based on these findings, investigating incidents, and communicating safety issues helps to identify deficiencies in the risk control management, which will enable the workplace to enhance their risk control management in the future and learn lessons that will apply to other parts of the organisation. In addition, information regarding the prevalence of incidence and fatalities of workers in the Nigeria oil and gas companies was a piece of vital information achieved from the qualitative data in this study. Though not part of the safety culture element, the information helped to compare the finding with the statistic available in the published journal on the fatalities and injuries of Nigeria oil and gas workers.

5.4.8 The prevalence of incidence and fatalities of oil and gas workers

Statistic on injuries and fatalities of workers in the oil and gas sector is said to be one of the highest in the world Ehiaguina and Moda (2020), and records have been argued to be most time underestimated or scarce (Akinyele, 2010; Taiwo, 2010). For instance, Hamalainen et al. (2009), who carried out their study in the Nigeria oil and gas industry, found that workers in Nigeria stood around 24 death tolls per 100,000 workers, which is one the world's highest. In comparison, this study was unable to replicate similar findings when interviewees were asked to describe the rate

of injuries and fatalities. However, none of the participants admitted that any fatalities have occurred within their facilities since their years of employment except for minor injuries, slips and falls, mainly because of workers acting in an unsafe manner (see section 4.13.3.8). This confirms the notion across previous health and safety studies in Nigeria's oil and gas industry that information on accident and injury records or history is hardly public by the industry (Ezejiofor, 2010; Ezejiofor et al., 2014). Nonetheless, four interviewees notably NPDCFEOO4, NPDCHSEOFOO2, NPDCSUPOO3 and LEEMaOO3 explained in the interview process that vandalism or third-party sabotage is one of the most serious problems they encounter in their organisation. In summary, their statement explained that,

> *"Yes, we have had so many incidents of pipe burst, fire incident and the rest but mainly due to third parties or communities or unknown person trying to do some illegal bunkering and vandalising pipeline, in the process of doing that illegal bunker they may experience fire outburst or gas release"* (x4).

In relation to these responses, oil spill incidence through pipeline vandalism appears to be peculiar to Nigeria. If the relevant Nigerian agencies take no urgent measures, frequent pipeline cuts may continue to spill for weeks and months and can undermine Government's efforts at meeting its obligations in spill management. The need for implementing adequate security systems for pipeline management has been addressed from time immemorial. However, the Nigerian government has taken no stringent rules and action, together with the oil and gas sector, to combat the issue (Udofia and Joel, 2012; Albert et al., 2019).

6.0 CHAPTER SIX: CONCLUSION

Findings from this study indicate that safety culture influences different types of unsafe behaviours of workers at different levels in the Nigeria oil and gas industry. Therefore, strengthening the organisational safety culture is important if one is to fully establish a better safety performance of workers in the Nigeria oil and gas industry. Thus, it can be concluded that positive safety culture in the Nigeria oil and gas industry may reduce the negative impact associated with workers unsafe behaviour, consequently reducing workplace injuries and accidents.

From the discussion drawn from the key findings in this study, it can be noted that safety in the Nigeria oil and gas industry is weak. Even though individual organisations have demonstrated that they have a positive outlook for safety culture, this does not transcend the whole industry. Some key factors suppressing the evolution of industry-wide safety culture have been the inadequate implementation of safety policies. Although it was found that workers and managers are aware of safety expectations in their parts, the existing culture of safety in Nigeria oil and gas industry seems not to have any impact on workers safety. A major overhaul to safety culture in the industry must be undertaken before any changes can be seen or observed.

It is difficult to define organisational safety culture in the Nigeria oil and gas industry considering that the industry is goal-oriented when they seek to meet goals to fulfil production or meet demands. However, the desire for companies to fulfil their production goals might compromise their commitment to the safety of workers, and such practices should not be the reality for the Nigerian oil and gas industry.

The literature review of this work has noted elements of safety culture that needs to be improved on for Nigeria's oil and gas companies to enhance workers behaviour and improve their safety practices. These areas have all been observed and noted in the results where the failure of the managers and workers to commit to the policies on safety has been identified as a major issue in the Nigeria oil and gas industry. Related issues regarding compliance have been highlighted in the results where most participants admitted that they ignore safety regulations to get the job done on time, and their supervisor puts pressure on them to get the job done in time. This means

Nigeria oil and gas industry has not fully accepted and embraced safety in its workplace. The safety culture needs to come naturally in the minds of all workers in the oil and gas setting in Nigeria, where workers will have an instinct that safety is a paramount part of their daily activities, and its jeopardy can cost them their lives. Therefore, it can be easier to impose or plan a safety culture where the attitudes of the workers are open to safety practices in the workplace. It is also crucial to recognise that companies with a good safety culture can motivate their workers to observe the rules and standards of a good workplace. The empowered worker also helps ensure that the working conditions are safe and where any unsafe conditions are observed, the worker would not be afraid to speak his mind about it to his managers or supervisors. Workers would also share their responsibility in ensuring that the workplace is safe.

6.1 Recommendations

6.1.1 Recommendation for safety policy improvement

Succinct safety policies have been developed by diverse industries initiatives, which set out the overall approach to the safety management system in the organisation and important to expressing management commitment to the safety and health of employees. However, Nigeria's oil and gas industry has failed in the initial stages of enforcement of such a safety policy established. This is somewhat a result of a non-commitment to best safety cultural practices, specifically to certify fast production or cut cost, which has also escalated risk to injuries, accident and illness of workers associated with work duties (Laharnar et al., 2013; Kilaparthi, 2014). Therefore, improvement of safety policies and practices associated with diverse areas of safety cultural elements found with shortcomings in this study, encompassing management commitment, leadership style, communication, employee involvement and third-party sabotage, is needed in the Nigeria oil and gas industry to enhance safety and health on operations on sites.

Concerns on the need for the improvement of management commitment were raised by frontline employees in this study. Management commitment towards safety has been reported to be one of the main factors affecting the successful implementation of organisational safety

policies and practices that help to promote positive safety culture used to drive safe behaviours of workers (Nævestad et al., 2018; Graves et al., 2019; Muchiri et al., 2019; Stemn et al., 2019). To establish a positive safety policy in the Nigeria oil and gas industry, there is a need for management commitment right at the start to become visible and to be promoting workplace safety policies. In addition, they need to involve employee's safety participation, deriving ways to understand and develop policies that work for their workforce, encourage workers on safety, improving their knowledge on safety issues and investing much time in safety-related matters (Fruhen et al., 2019a; Wijethilake and Lama, 2019).

The challenges relating to the impact of national culture on workers safety perception was expressed by participants with managerial positions in this study (see section 4.13.3.1). According to (Fruhen et al., 2019b; Tear et al., 2020), most safety policies in oil and gas companies in Nigeria are shaped by European regulations. Most European countries already have a wealth of experience in oil and gas operations and the possible dangers in such a setting. These countries have also developed policies that are already meant to reduce the risk of the hazards in oil and gas industry. Although Nigeria oil and gas industry can learn from these countries, however, it is important that management in this sector identify, understand, and consider inculcating safety policies that are specific to the nation's cultural environment and other specific qualities such as worker demographic, presence of foreign/local workers, and language for effective safety culture management in the industry.

In this study, frontline employees have also revealed that production is sometimes prioritised over safety in their workplaces and the fear of being fired when safety issues are raised has also been expressed. Based on the results, the safety culture and the employees seem to be two separate entities. This means that workers have been denied their share of safety, and the safety culture is not promoted by management in the workplace. Even with the knowledge that there are safety policies that should be in place in the workplace, some workers and managers do not know how to implement these practices. As a result, they are unknowingly creating their unsafe workplace. As part of effective safety policies and practices in Nigeria oil and gas industry, it is mandatory that top managers show commitment to safety by ensuring the safety and health of

their workers even in certain circumstances when organisations are facing production stress, pressure or demand is prioritised, this can subsequently reduce workplace injuries and accidents. Leaders are at the very frontline of implementing workplace safety policies and regulations. Supervisors must be aware that they must set a good example in the workplace and that they would be strict in imposing safety standards and policies. There are inherent dangers of the oil and gas industry, and as such, the leaders must be extra vigilant to provide better outcomes for the safety of their workers. However, all parties must work with each other. Emphasis must always be made on the need for safety for employees to perceive that it is important (Byrd et al., 2018; Stemn et al., 2019; Umar, 2020). There should be cordial relationships between frontline employees and managers/ supervisors, which is crucial to the improvement of workplace safety, therefore enabling trust among the workforce in terms of safety strengthens employee's enthusiasm to abide by their leader's guidance on matters regarding safety and programs within the organisation, and their perceptions towards leader's behaviour towards safety (Muchiri et al., 2019; May et al., 2019).

Furthermore, workers must be engaged and involved in the decision-making process at work, especially with regards to safety matters. This is because when workers are regarded as just resources, it impacts their perception and commitment towards risk control activities which ultimately affect the optimal performance of the company. In terms of safety training, safety policy should be restructured in a way that more time and money is invested in training. The more attention is given to safety training, the fewer accidents to be reported (Emond and Taylor, 2018; Stemn et al., 2019; Zeinalabedin et al., 2020).

Pipeline vandalism has also been revealed to be a serious threat to Nigeria oil and gas sector. Security and technological measures need to be enforced and implemented as part of safety policy to stop oil pipeline vandalism and detect leakages and failure in oil pipelines. This will also enable pipeline operators to monitor the safety of oil pipelines installed remotely (pipelines above and underneath the ground) (Udofia and Joel, 2012). This proposed system should be able to detect an intrusion into the pipeline system early enough and alert the pipeline operators before the pipeline is vandalised and be able to capture a video/photo footage of the vandalism

scene in case the vandals go ahead to vandalize the pipelines to steal crude oil (Albert et al., 2019). This will go a long way in reducing the theft of pipeline products, environmental degradation, and accidental deaths resulting from the explosion of those flammable substances when leakage occurs (Udofia and Joel, 2012).

Throughout this study, the participation of the government in ensuring oil and gas safety has not been considered to any extend in this study. Yet, their role is very much crucial because they are among the parties who would draft, frame, and implement regulations on safety. The government can also provide significant sanctions towards oil and gas companies who are seen to violate the rules on safety. They can make demands on these companies to be more vigilant in the workplace and provide standards or behaviour. Ultimately, the government is an important unit in workplace safety; without its support, the policies cannot be laid out, and any actions associated with workplace safety would not be as reliable or valid. Creating a preventive plan will not suffice if the written safety policy might not guarantee the companies' safety goal (Ismail et al., 2012; Graves et al., 2019). As such, the safety policy must be reviewed and updated (Iavicoli et al., 2011). To do so, safety control is needed to check the achievements and defects, and subsequently to update the safety policy and prevention plan to bring them closer to the safety goal (Law et al., 2006).

6.1.2 Recommendations to theory

This study recommends that the concept of safety in the Nigeria oil and gas industry must be reworked based on the context of developing countries, where the development of safety policies is still poor. Even as developed countries have extensively developed their safety practices and have improved their resources on safety, the same cannot be said for developing countries. It is important to therefore establish theories and models applicable to a specific region. These theories would be supported by the practices, culture, specific qualities, beliefs, and behaviour of the area or region. Under these conditions, the policymakers would therefore have to be guided by these specific localised qualities.

6.1.3 Recommendations for safety policies and practices

In practice, the Nigeria oil and gas industry needs to significantly improve its safety regulations and policies, including its implementation. Government agencies set up to detect any issues or gaps in implementing safety policies much impose strict penalties on violators to ensure compliance. Sufficient planning and proper management are important to the safety and efficiency of oil and gas operations. As has been demonstrated above, there are many incidents which are credited to tripping, slipping, and falling in oil and gas site, and by having an orderly site plan for the workplace, the workers would be properly appraised of the layout of the site and be able to prevent accidents.

The use of PPEs cannot also be overemphasised. These PPEs also must comply with the best standards authorised by safety agencies. These PPEs include protective clothing, helmets, hard hats, gloves, goggles, boots, and other equipment, which would help minimise the impact of injuries in the workplace and protect the worker from different physical, chemical, heat, electrical, and burn impacts in the worksite. Aside from the use of these PPEs, PPE programs also must be set in place. This program would address the hazards present in the workplace. It would help implement the training of the workers on the proper use of these PPEs. It is important for the workers to understand why they are wearing PPEs. These PPEs serve different purposes, including eye protection, face protection, hearing protection, hand protection, foot protection, head protection, protection from falling, and respiratory protection. Surveying the worksite and assessing the knowledge of the workers on the use of these PPEs is also important because it would help establish gaps in the worker's knowledge about the use of PPEs. Addressing these gaps would therefore become easier.

The use of first aid kits is also an essential part of oil and gas operations. First aid kits must always be available at the worksite. These kits must adequately fill the needs of the employees, including possible and likely injuries they would encounter in the workplace. Trained first aiders must always also be available on-site. Blankets and stretchers must also be available, including medical transport to the nearest medical facility. Health and safety warning signs should be available in designated areas. These safety signs should include the wearing of protective equipment when

entering a specific area of the construction worksite. For instance, some areas may require the use of goggles or headphones to prevent any harm to the ears or the eyes. These signs must also be fully visible, readable in the language comprehendible by all employees in the workplace. The workers must also know the meaning of the signs if the signs are only images without any text translation. These signs should also include directions for fire exits, fire action evacuation plans, earthquake evacuation signs, and other safety signboards.

It is also important for managers, especially site managers, to write down safety policies for their worksite to set safety and health standards. Ultimately, such safety should be one of their objectives. This policy must mention the senior leaders who would be responsible for ensuring that the standards are met. This executive would also have the authority to assign responsibilities to the management and the supervisors within all levels and ensure that these responsibilities are fulfilled. Therefore, oil and gas safety policies are written statements that different site managers must establish before any operations are carried out. As soon as it is developed, the safety plan must be incorporated into a training program that has to secure the participation of all site workers before their jobs are carried out. Site meetings are therefore important to inform workers of their job on-site, their risks, and the supervisors also must ensure that they can communicate important matters on safety to their workers. Site meetings also help sensitise and inform workers on their current health and safety and that they may need to undergo more training and to know more about their safety needs and considerations. This study recommends that the workers and managers in the Nigeria oil and gas industry must move from the safety level of being reactive to being more proactive. Developing policies and regulations on safety are a significant step towards reaching such a proactive level and generative.

6.1.4 Recommendations to knowledge

This study also presents recommendations related to knowledge, mostly on the value of safety practices in the oil and gas setting. This study recommends that information related to each oil and gas incident must be published and studied with the hopes of ultimately avoiding any repeats of these incidents. It also acknowledges that the Nigeria oil and gas industry is very much behind

in terms of its technology on safety. In addition, standards on safety materials are not set in place in the country, making the Nigeria workplace a dangerous place for employees. It also recommends that more information on applicable safety resources must be made available, especially in the use of hard hats, stress management, the prevention of heatstroke, prevention of falls, and possibly the prevention of equipment-related injuries.

6.1.5 Recommendation for future research

This study recommends future research to investigate the relationship between safety leadership and safety behaviour in the Nigeria oil and gas industry. The relationship between elements that constitute a positive safety culture and mindful safety practices, a component of safety behaviour, should also be explored. Previous studies carried out in other industrial sectors saw the need to explore how different groups of workers' demographic factors influence their perception towards organisational safety culture. The outcome of their study was found useful because it gave room for the improvement of workers perception towards safety climate and made clarity on their safety roles and responsibilities, all of which contributes to achieving a positive workplace safety culture. However, this study only investigated workers personal demographic information and their safety behaviour, in which significant association was found. Therefore, it will be noteworthy if future research examines the relationship between different groups of workers demographic factors and safety culture in the Nigeria oil and gas industry. Demographic factors such as educational background is considered imperative for evaluating the employees' attitudes and perceptions toward their working safety climate environment. Though this was omitted in this study, participants' educational background should be considered in future research in Nigeria's oil and gas industry as an important personal factor contributing to workers' safety-related behaviours. Since this study serves as a starting point to understanding the existing safety cultures of Nigeria oil and gas industry, additional studies are also warranted to develop a framework that can be used specifically by Nigeria oil and gas industry to establish correlations between organisational safety culture and workers safety performance so that management can highlight key areas to invest if they are interested in uplifting the safety

performance of the workplace. The establishment of the framework will potentially engage all levels of management and frontline workers so that they can all commit to developing a positive safety culture for better safety in the workplace.

6.2 Validation of qualitative findings

Qualitative research is often characterised by uncertainty and flexibility, by a tension between rigour and creativity, by the need for critical compromises (Burnard et al., 2008). Therefore, validating the qualitative data in this study will help the trustworthiness of its interpretation, findings, and conclusion. Validation of qualitative findings is not only carried-out with academic literature and academia but also with the researched population, either by working collaboratively or by having a “critical reference group” which should include a range of stakeholders critical to the study (Kihn and Ihantola, 2015). Access to the different oil and gas companies that participated in this study was by invitation, and the researcher had already earned the trust of the oil and gas workers during the time of seeking their consent on participation and explaining to them the importance of the research to their safety performance. To ensure internal validity in the qualitative data, a critical reference group was usually established within each of the companies visited, usually comprises of two to three individuals. These individuals are sometimes employees (secretary, either male or female) from the administrative buildings including, an individual who is associated with the oil and gas industry (a community member from a department that provided the permit to access the oil company). Their involvement in the research process was important in guarding against interviewer bias and privileging one type of information from participants' responses. The members of the critical reference group were also involved in the coordination and development of the recruitment strategy and sampling framework. The randomisation process conducted during the respondents' selection helped improve the external validity of the research results. The oil and gas companies chosen for this research were also randomly chosen from a list of oil and gas companies in the Niger Delta region of Nigeria to improve the generalisability of the results.

Recourse to member checks was limited because the researcher had promised the participants complete anonymity, and follow-up would have been almost impossible. However, two participants were contacted by the researcher due to the initial relationship established. A plain-language report of the write-up of the interview analysis and interpretation containing sufficient detail and reflexivity was sent to them to assess whether the findings are valid. Within two weeks period, letters of validation confirmation from both participants were sent to the researcher by the participants via email expressing their opinion that all findings ring true, proving that the qualitative findings of this study are coherent and reliable. Every stage of the initial data analysis process and interpretation of the qualitative data was also guided, monitored by senior academic staff (my supervisors), trained, qualified, and experienced in qualitative research to ensure credibility and validity of the findings. Due to triangulation in the method of data collection from the involved companies, all published work of the quantitative data obtained was sent to Petroleum Technology Development Fund (research sponsors) for dissemination to the individual studied companies.

6.3 Contribution to Knowledge

The research work will be of great importance because the information obtained from this work will help develop occupational safety and health, especially in the Nigerian oil and gas context, and provide management in these sector strategies to improve employees' safety performance in the workplace. This study also contributed to knowledge by establishing a significant association between demographic factors and worker's safety behaviour and to improve safety of workers in the industry, demographic factors be essentially considered. Furthermore, this study also contributed to knowledge by revealing safety culture as a major factor impacting workers' safety behaviour at work in the Nigeria oil and gas industry. The study also demonstrated to management and employees how the primary elements of safety culture can be improved to enhance workers' safety performance. Therefore, strengthening the different elements of safety culture will help reduce the rate of accidents and injuries of workers. This can be achieved by management prioritising safety in the workplace, efficient and effective safety

leadership, sufficient training of workers, regularly involving workforce on safety related issues, safety awareness and constant communication and encouraging and motivating worker's safety practices. The study finding has helped fill the knowledge gap in the existing literature regarding the impact of unsafe behaviour on workers safety performance, particularly in the Nigeria oil and gas industry. This study can also serve as a user manual to Nigerian oil and gas companies engaging in the implementation of behavioural-based safety programs, consisting of recommendation on Improvement of safety policies and practices associated with diverse areas of existing safety cultural elements found with shortcomings in Nigeria oil and gas industry.

6.4 The strengths and limitations of this study

This study used a mixed method of data collection, which complement the limitations associated with a single method and supports the robustness of the study's findings. The combination of quantitative and qualitative research methods enabled the researcher to fully explore the existing safety culture in the Nigeria oil and gas industry and workers perception on how it influences their safety behaviour. Another strength of this study rests on the magnitude of the cohort, the range of the organisations, their sectors, and the workgroups included. The data analysis provides evidence concerning the link between workers' safety culture and safety behaviour in the Nigeria oil and gas industry. However, some major limitations were acknowledged in this study. In the quantitative survey, not every piece of information available on the mechanism linking safety culture and safety behaviour was measured in the questionnaire. Though the individual effect of each construct of safety culture on the safety behaviour of workers was analysed, the Cronbach's alpha reliability score of items used to measure all constructs ranged from poor to high internal consistency; this may have led to a bias of subjective findings. However, most of the items with very poor reliability values were deleted before performing correlation analysis and performing confirmatory factor analysing the dimensionality of items were confirmed. Thus, the overall quantitative findings in this study are said to be reliable. Also, using a quantitative approach (e.g., questionnaire), it was assumed that

participants were open and honest when responding to the questions in the questionnaire and that their responses were reflective of their reality at the time of questionnaire completion.

The qualitative research method was adopted in this study to complement the limitations of the quantitative research method. The sample size of the interview study sufficiently effectuates saturation benchmark for qualitative data analysis Francis et al. (2010), which is another main strength of this study. However, limitations stemming from using the qualitative research method were also considered. This data collection method relied on participant's (management staff and frontline workers) perspective to gain insight into the current state of safety culture in oil and gas companies in the Niger Delta region of Nigeria and how the circumstances impact workers safety behaviour/performance. However, most of the time, within the studied companies, participants who volunteered and were willing to participate in the interview were not allowed by the management to partake in the interview process. Instead, the organisation elected the participants they feel should be suitable to give out information on related issues in the organisations. This might have them in a desirable way to make a good impression in the interviews and surveys, so responses might not reflect their actual actions and motives Fruhen et al. (2019a) and might have led to the reason why findings on fatality records were not admitted and contradictory to the findings on statistics of fatalities of published work in Nigeria oil and gas industry (Hamalainen et al., 2009). Nevertheless, Fruhen et al. (2019b) stated that such a tendency for participants to present themselves in a better light is not necessarily detrimental to research findings as it should only lead to an upward shift in the distribution of response.

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APPENDICES

Appendix I: Participant information sheet study two

Tittle: Assessment of Safety behaviour of oil and gas workers in the Niger Delta region of Nigeria and its impact on safety response at work.

Invitation paragraph: I would like to invite you to take part in a research study. Before you decide you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully. Ask questions if anything you read is not clear or would like more information. Take time to decide whether or not to take part.

What is the purpose of the study?

The project aimed at assessing employees' behaviour that affect safety performance in Nigeria oil and gas industry.

Why have I been invited?

As part of the work force in the industry, frontline employees are considered having direct contact with health and safety risk within the oil and gas industry, they will hold information on factors that affect safety behaviour and safety response at work. This inform reason for the selection.

Do I have to take part?

Participation is voluntary and willing participant can withdraw from the study at their will. Before an individual is recruited, background information around the subject will be provided and consent form will be used to keep record of individuals that gave their consent to take part in the study.

What will happen to me if I take part?

Research methods for study 2: Quantitative: (Close-ended questionnaire)	
Participants	Front-line employees are required to fill out a close-ended questionnaire

Duration of participant involvement	30-45 minutes
Number of times participants meet researcher	1 (one)
Where will the research take place	Onsite/online platform
Duration of the study	It depends on the availability or number of participants per area of the organisation
Confidentiality issues: In line with the general data protection regulation (GDPR), participants personal details will not be asked on the questionnaire and those interviewed their identity will not be included on transcript to ensure anonymity. For traceability, unique code will be assigned to each volunteer and only the researcher will have access to the completed questionnaire and audio records from each interview conducted. Other measures taken to ensure data is kept confidential and securely throughout the process will include the use of the university H drive for the storage all information/data for at least 10 years.	

What will happen if I don't carry on with the research?

If you decide to withdraw from the study all the information and data collected about you to date, will be destroyed and assigned code removed from all study files.

What will happen to the results of the research study?

The result of this study will be published in the form of thesis and either conference or [1]journal article. In addition, part of the data may be use to inform teaching delivery around the subject.

What are the possible benefits of taking part?

Considering the paucity of data around the subject in Nigeria, information generated will help inform good practice among stakeholders in the industry and help to play important role on how best to reduce avoidable accidents as witnessed in the oil and gas sector of the country.

What will I have to do?

Participation is voluntary and only require your consent to take part in the survey/interview.

Expenses and payments?

There will be no any form of financial reward for taking part in the study.

What are the possible disadvantage and risk of taking part?

Considering the study form there is no known risk in taking part.

What if there is a problem

If you have a concern about any aspect of this study, the researchers (Ehiaguina Efua: +447448385011) will make effort at providing response to concern raised and should an individual will require further help, such concern should be channelled to Dr Haruna Moda (h.moda@mmu.ac.uk) for further clarification.

Will my taking part in the study be kept confidential?

All information which is collected about participants will be kept strictly confidential and securely on password protected H-drive, and any information about participant which leaves the University will remain anonymous to protect individual privacy.

Who is organising or sponsoring the research?

The study is sponsored by Petroleum Technology Development Fund (PTDF) as PhD programme in collaboration with Manchester Metropolitan University as host University.

Further information and contact details:

1. General information about research (www2.mmu.ac.uk)
2. Specific information about this research project (efua.ehiaguina@stu.mmu.ac.uk)
3. Advice as to whether they should participate (H.moda@mmu.ac.uk)

Appendix II: Participant information sheet study three

Tittle: Assessment of Safety behaviour of oil and gas workers in the Niger Delta region of Nigeria and its impact on safety response at work.

Invitation paragraph: I would like to invite you to take part in a research study. Before you decide you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully. Ask questions if anything you read is not clear or would like more information. Take time to decide whether or not to take part.

What is the purpose of the study?

The project aimed at assessing employees' behaviour that affect safety performance in Nigeria oil and gas industry.

Why have I been invited?

As part of the work force in the industry, frontline employees are considered having direct contact with health and safety risk within the oil and gas industry, they will hold information on factors that affect safety behaviour and safety response at work. This inform reason for the selection.

In addition as a senior manager and supervisor, it is hoped that information on effort made at management level around promotion of safety culture and positive safety behaviour within the organisation will be gained informed your selection on the study.

Do I have to take part?

Participation is voluntary and willing participant can withdraw from the study at their will. Before an individual is recruited, background information around the subject will be provided and consent form will be used to keep record of individuals that gave their consent to take part in the study.

What will happen to me if I take part?

Research Method for study 1: Qualitative: (Semi-structured interview)	
Participants	Manager/Supervisor/front-line employees will be required to partake in an audio recorded semi-structure interview.
Duration of participant involvement	45 minutes to 1hour per participants
Number of times participants meet researcher	At least once for the face to face interview
Where will the research take place	At agreed location with the participant
Duration of the study	It depends on the availability or number of participants per area of the organisation

Confidentiality issues: In line with the general data protection regulation (GDPR), participants personal details will not be asked on the questionnaire and those interviewed their identity will not be included on the transcript to ensure anonymity. For traceability, unique code will be assigned to each volunteer and only the researcher will have access to the completed questionnaire and audio records from each interview conducted. Other measures taken to ensure data is kept confidential and securely throughout the process will include the use of the university H drive for the storage all information/data for at least 10 years.

What will happen if I don't carry on with the research?

If you decide to withdraw from the study, all the information and data collected about you to date, will be destroyed and assigned code removed from all study files.

What will happen to the results of the research study?

The result of this study will be published in the form of thesis and either in conference or journal article. In addition, part of the data may be use to inform teaching delivery around the subject.

What are the possible benefits of taking part?

Considering the paucity of data around the subject in Nigeria, information generated will help inform good practice among stakeholders in the industry and help to play important intervention strategy to reduce avoidable accidents as witnessed in the oil and gas sector of the country.

What will I have to do?

Participation is voluntary and only require your consent to take part in the survey/interview.

Expenses and payments?

There will be no any form of financial reward for taking part in the study.

What are the possible disadvantage and risk of taking part?

Considering the study form there is no known risk in taking part.

What if there is a problem?

If you have a concern about any aspect of this study, the researchers (Ehiaguina Efua: +447448385011) will make effort at providing response to concern raised and should an

individual will require further help, such concern should be channelled to Dr Haruna Moda (h.moda@mmu.ac.uk) for further clarification.

Will my taking part in the study be kept confidential?

All information which is collected about participants will be kept strictly confidential and securely on password protected H-drive, and any information about participant which leaves the University will remain anonymous to protect individual privacy.

Who is organising or sponsoring the research?

The study is sponsored by Petroleum Technology Development Fund (PTDF) as PhD programme in collaboration with Manchester Metropolitan University as host university.

Further information and contact details:

1. General information about research (www2.mmu.ac.uk)
2. Specific information about this research project (efua.ehiaguina@stu.mmu.ac.uk)
3. Advice as to whether they should participate (H.moda@mmu.ac.uk)

Appendix III: Safety culture questionnaire used for pilot study data collection

Section 1: Demographic information

Name of oil and gas industry: Shell ☐ Chevron ☐ Conocco ☐ Total ☐

Oando ☐ Transcorp OPL ☐ schlumberger ☐ Exxon-mobil ☐ Conoil ☐

NNPC ☐ NLNG ☐ Addex ☐ Petrobras ☐ Statoil ☐ Nexen Inc ☐

Other:_____

Age: 18-25 ☐ 26-35 ☐ 36-45 ☐ 46-55 ☐ 56-65 ☐ 66-75 ☐

Gender: Male ☐ Female ☐ Other ☐

Job category: Production ☐ Engineering ☐ Drilling ☐

Maintenance ☐ Engineering ☐ Crane operator ☐ Admin/Management ☐

Construction ☐ Other:_____

Work Experience: 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ 25-30 ☐

Other:_____

Employment type: Contract ☐ Part-time ☐ Full-time ☐

Section 2: Safety culture

1. **Management commitment and style of leadership**

You will find below statement about safety culture at work. For each statement, please indicate whether or not you agree with each. (*Circle one number on each line)*

		Strongly Disagree	Disagree		Neutral	Agree
Management Commitment	1. In my organisation safety is as important as quality of the work and getting the work done on time.	1	2	3	4	5
	2. Workers and management work together to ensure the safest possible conditions.	1	2	3	4	5
	3. No major shortcuts are taken when worker safety is involved.	1	2	3	4	5
	4. The safety of workers is a high priority for my organisation.	1	2	3	4	5
	5. My organisation acts quickly when a safety concern or problem is raised.	1	2	3	4	5
	6. My organisation listens carefully to workers' ideas about improving safety.	1	2	3	4	5
Leadership style	7.My supervisor talk more about safety than production	1	2	3	4	5
	8.My supervisor accept responsibility for my safety	1	2	3	4	5
		1	2	3	4	5

	9.My supervisor visit the worksite to check we are working	1 2 3 4 5
	10.My supervisor involve work group in decision making	1 2 3 4 5
	11.My supervisor encourage safe working by setting good example	1 2 3 4 5
	12.My supervisor is not scared of taking blames for his error	1 2 3 4 5
	13.My supervisor puts pressure on me to get the job done on time	1 2 3 4 5
	14.I trust my supervisor	1 2 3 4 5
	15.My supervisor values contribution to the team	1 2 3 4 5
	16.My supervisor has difficulty motivating the team to work safely	

2. Safety Communication

You will find below statement about safety culture at work. For each statement, please indicate your response. (*Circle one number on each line)*

		Strongly Disagree	Disagree	Neutral	Agree ,
Safety communication/ Motivation	17. There are frequent communications about safety in my workplace.	1	2	3	4 5
	18. Workers are told when they do not follow good safety practices.	1	2	3	4 5
	19. Formal safety inspections are regularly conducted in my workplace	1	2	3	4 5
	20. Workers who act safely receive positive feedback.	1	2	3	4 5
		1	2	3	4 5

	21. The crew is always given feedback on accident that occur on this installation.	1 2 3 4 5
	22. Formal inspections are regularly done to see if workers are following safety rules.	1 2 3 4 5
	23. Changes in safety rules and procedures are promptly communicated to all affected employees.	1 2 3 4 5
	24. Lesson learned from accident and injury are communicated to employees.	1 2 3 4 5
	25 I feel that this company is a good place to work.	

3. Employee and Co-worker involvement

You will find below statement about safety culture at work. For each statement, please indicate your response. (*Circle one number on each line)*

		Strongly, Disagree	Disagree	Neutral	Agree ,	Strongly .
Employee involvement with safety	26. Workers are regularly asked about their safety concerns.	1	2	3	4	5
	27. Where I work, I feel free to report safety concerns.	1	2	3	4	5
	28. I feel if I say too much about safety I might get fired.	1	2	3	4	5
	29. I understand what my rights and responsibilities are for safety.	1	2	3	4	5
	30. There is sometimes pressure to put production before safety on this installation	1	2	3	4	5
		1	2	3	4	5

	31. I take shortcuts which involve little or no risk	1	2	3	4	5
	32. I ignore safety regulations to get the job done	1	2	3	4	5
	33.This installation has a 'no blame culture'	1	2	3	4	5
	34. Workers are involved in conducting safety audits and inspection					
Co-workers involvement	35. Co- worker often help and remind each other to work safely.	1	2	3	4	5
	36.Workers refuse to do work if they feel the task is unsafe	1	2	3	4	5
	37. I encourage fellow workers to work safely	1	2	3	4	5

4. Safety training

You will find below statement about safety culture at work. For each statement, please indicate whether or not you personally agree. (*Circle one number on each line)*

		Strongly Disagree	Disagree	Neutral	Agree	
Safety training	38. Safety is given a high priority in training programs.	1	2	3	4	5
	39. My organisation invests a lot of time in safety training for workers.	1	2	3	4	5
	40: I am confident that I have all the training I need	1	2	3	4	5
	41. My workplace ensures I understand what my responsibilities are for safety.	1	2	3	4	5
	42. At my workplace, there are rules and procedures about how to work safely.	1	2	3	4	5

	43. I am clear on how the safety rules affect me.	1	2	3	4	5
	44. I am not allowed to use any equipment without training	1	2	3	4	5
	45. I am provided with all Personal protective equipment to keep me safe at work	1	2	3	4	5

Please indicate any question you may have found difficult to understand

Please include any additional comment in the box below around existing safety culture at work

Appendix IV: List of items measured under safety management practices after regrouping of items

Safety Management practices (items measured)
1) In my organisation safety is as important as quality of the work and getting the work done on time
2) Workers and management work together to ensure the safest possible conditions.
3) No major shortcuts are taken when worker safety is involved
4) The safety of workers is a high priority for my organisation.
5) My organisation acts quickly when a safety concern or problem is raised

6) My organisation listens carefully to workers' ideas about improving safety
7) My supervisor talk more about safety than production
8).My supervisor accept responsibility for my safety
9).My supervisor visit the worksite to check we are working safely
10).My supervisor involve work group in decision making
11).My supervisor encourage safe working by setting good example
12).My supervisor is not scared of taking blames for his error
13).My supervisor puts pressure on me to get the job done on time
14) I have confidence on my supervisor actions on safety measure taken at work
15)My supervisor values safety contribution made by the team
16)My supervisor has difficulty motivating the team to work safely
17) There are frequent communications about safety in my workplace.
18) Workers are told when they do not follow good safety practices.
19) Formal safety inspections are regularly conducted in my workplace.
20) Employees are given frequent feedback on accidents that occur on this installation
21) Formal inspections are regularly done to ensure workers are following safe system of work
22) Changes in safety rules and procedures are promptly communicated to all affected employees.
23)Lesson learned from accident and injuries are communicated to employees
24) I am satisfied with the mode of safety communication in my organisation

25) My organisation invests a lot of time in safety training for workers.
26) I feel there is'no blame culture' at my place of work which makes corrective measure easy to implement

Appendix V: List of items measures under safety compliance in pilot study after re-grouping of items

Safety compliance (items measured)
1. I am not allowed to use any personal safety equipment without training
2. I am provided with all Personal protective equipment to keep me safe at work
3.Workers refuse to do work if they feel the task is unsafe
4. I ignore safety regulations to get the job done on time
5. In some instance I feel pressured to put production before safety in this installation
6. I am clear on how the safety rules affect me.
7. I understand what my rights and responsibilities are for safety.
8. At my workplace, there are rules and procedures about how to work safely.

Appendix VI: List of items measured under safety participation (pilot study) after re-grouping of items

Safety participation (items measured)
1 Safety is given a high priority in training programs.
2 I encourage fellow workers to work safely
3. Workers are regularly asked about their safety concerns.

4 Workers who act safely receive positive feedback.
5 Workers are involved in conducting safety audits and inspection
6 Co- worker often help and remind each other to work safely.
7 Where I work, I feel free to report safety concerns.
8 I feel if I say too much about safety I might get fired.
9 I am confident I have all the training I need to perform each task safely
10 I feel that my company is a good place to work
11 My workplace ensures I understand what my responsibilities are for safety.

Appendix VII: Questionnaire used for data collection in full study
Section 1: Demographic information

Name of oil and gas companies: Shell ☐ Chevron ☐ Total ☐

Oando ☐ schlumberger ☐ Exxon-mobil ☐ Conoil ☐ NNPC ☐ NLNG ☐ VIV ☐ Limited ☐ SEPLAT ☐ NPDC ☐ Total ☐ Other:_____

Age: 18-25 ☐ 26-35 ☐ 36-45 ☐ 46-55 ☐ 56-65 ☐ 66-75

Gender: Male ☐ Female ☐ Other ☐

Job category: Production ☐ Engineering ☐ Drilling ☐

Maintenance ☐ Engineering ☐ Crane operator ☐ Admin/Management ☐

Construction ☐ Other:_____

Work Experience: 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ 25-30

Other:_____

Employment type: Contract ☐ Part-time ☐ Full-time ☐

Section 2: Safety culture

1. **Management commitment and style of leadership**

You will find below statement about safety culture at work. For each statement, please indicate whether or not you agree with each. (*Circle one number on each line)*

		Strongly Disagree	Disagree	Neutral	Agree	
Management Commitment	7. Safety is given high priority by the management	1	2	3	4	5
	8. Safety rules and procedures are strictly followed by the management	1	2	3	4	5
	9. Corrective action is always taken when the management is told about unsafe practices	1	2	3	4	5
	10. Members of the management do not attend safety meetings	1	2	3	4	5
	11. I feel that management is willing to compromise on safety for increasing production.	1	2	3	4	5
	12. When near-miss accidents are reported, my management acts quickly to solve the problems	1	2	3	4	5
Safety Leadership style	13. My supervisor talk more about safety than production	1	2	3	4	5
	14. My supervisor accept responsibility for my safety	1	2	3	4	5
		1	2	3	4	5

	15. In my workplace management do not show interest in the safety of workers	1 2 3 4 5
	16. My supervisor do not involve work group in decision making	1 2 3 4 5
	17. My supervisor encourage safe working by setting good example	1 2 3 4 5
	18. My supervisor puts pressure on me to get the job done on time	

2. Safety Communication and Motivation

You will find below statement about safety culture at work. For each statement, please indicate your response. (*Circle one number on each line)*

		Strongly Disagree	Disagree	Neutral	Agree ,
Safety communication	19. There are frequent communications about safety in my workplace.	1	2	3	4 5
	20. Workers are told when they do not follow good safety practices.	1	2	3	4 5
	21. Workers who act safely receive positive feedback.	1	2	3	4 5
	22. Changes in safety rules and procedures are promptly communicated to all affected employees.	1	2	3	4 5
	23. Lesson learned from accident and injury are communicated to employees.	1	2	3	4 5
Safety Motivation	24. My supervisor recognise or reward my good safety performance	1	2	3	4 5

	25. My supervisor has difficulty motivating the team to work safely	1 2 3 4 5
	26. I feel that my organisation is a good place to work	1 2 3 4 5
	27. Incentive and bonus offered by my organisation helps to improve my safety performance	1 2 3 4 5

3. Employee involvement

You will find below statement about safety culture at work. For each statement, please indicate your response. (*Circle one number on each line)*

		Strongly, Disagree Disagree Neutral Agree , Strongly
Employee involvement with safety	28. Management always welcomes opinion from employees before making final decisions on safety related matters	1 2 3 4 5
	29. I feel if I say too much about safety I might get fired.	1 2 3 4 5
	30. Employees do not sincerely participate in identifying safety problems	1 2 3 4 5
	31. Management promotes employees involvement in safety related matters.	1 2 3 4 5

	32. Management consults with employees regularly about workplace health and safety issues	

4. Safety training

You will find below statement about safety culture at work. For each statement, please indicate whether or not you personally agree. (*Circle one number on each line)*

		Strongly Disagree	Disagree	Neutral	Agree	
Safety training	33. Safety is given a high priority in training programs.	1	2	3	4	5
	34. My organisation invests a lot of time in safety training for workers.	1	2	3	4	5
	35: I am confident that I have all the training I need to enable me assess hazard in the workplace	1	2	3	4	5
	36. Workers are given sufficient safety training when entering firm, changing jobs, or using new technique	1	2	3	4	5
	37. I am allowed to use any equipment without training	1	2	3	4	5

Section 3: Safety behaviour

1. **Safety compliance, Safety participation and Mindful safety practices.**

You will find below statement about workers safety bahaviour at work. For each statement, please indicate whether or not you agree with each. (*Circle one number on each line)*

		Strongly, Disagree	Disagree	Neutral	Agree ,	Strongly

Safety Compliance	38. I use all necessary safety equipment to do my job.	1 2 3 4 5
	39. I ensure the highest levels of safety when I carry out my job.	1 2 3 4 5
	40. I carry out my work in a safe manner.	1 2 3 4 5
	41. I follow correct safety rules and procedures while carrying out my job.	1 2 3 4 5
Safety Participation	42. I voluntarily carryout tasks or activities that help to improve workplace safety.	1 2 3 4 5
	43. I put extra effort to improve safety of the workplace.	1 2 3 4 5
	44. I encourage my co-workers to work safely.	1 2 3 4 5
	45. I always point out to management if any safety related matters are noticed in my company.	1 2 3 4 5
		1 2 3 4 5

	46. I help my co - workers when they are working under risky or hazardous condition	
Mindful safety practices	47. I ask my colleagues to stop working if I think that they are performing their activities in a manner that threatens safety	1 2 3 4 5
	48. If I observe dangerous situations I report them	1 2 3 4 5
	49. I understand what my rights and responsibilities are for safety	1 2 3 4 5
	50. I am clear on how the safety rules affect me	1 2 3 4 5

Appendix VIII: Safety culture interview questions used for data collection in full study after pilot tested

Overview of introduction to the safety culture interview:

- *Introduce yourself (as the interviewer)*
- The purpose of interview is to explore your perceptions of safety on this site to help us identify strengths and opportunity areas
- There are no right or wrong answers – just your views and experiences
- All responses are kept anonymous – they will only be used as part of a report about the whole site
- We should take between 45minutes to 1hour
- I'll be audio recording throughout the interview process, is this okay?
- Today's session is voluntary – are you happy to participate?

How would you best describe your position in this organisation (management, supervisor or frontline employee)?

How would you best describe your work in this organisation (i.e. key tasks)?

Overall, what is it like to work in this organisation?

Now we are going to cover some more specific areas of safety culture, and I have some standard questions to ask so we can develop a picture of how people think and act towards safety in this organisation.

Management Commitment

- How often in your opinion do management talk about safety when in the workplace and is this visible to the workforce?
- Still on this, do you think management deal quickly and effectively with safety issues raised?
- What balance do their actions show between safety and production?
- In your opinion what can you say aboutmanagement commitment to overall safety issue at work?

Safety Leadership style

- Overall, how committed are managers to worker's health and safety
- How often do management go to the workplace to ensure employees are working safely?
- Describe the quality of relationships between managers and workers onsite.
- How do management encourage safe working practices?

Safety Communication

- In your opinion do you think there is an effective two-way communication about safety at work and what is the mode of communication?
- How often are safety issues discussed within the organisation?
- In your opinion how open do you think employees freely discuss/raise concern about safety issues at work?
- What do think are the reason to this?

Employee involvement

- How are workers across all levels involved in safety?
- Do you think employees input on safety issues are taken seriously by the management?
- How often do employees report unsafe conditions or near misses?
- Who is-regarded to be responsible for safety?
- Is there genuine cooperation over safety – a joint effort between all in the company?

Training/information

- How effective is employee's safety training programs?
- How do you know that employees feel confident that they are up to date with relevant safety training that they need to work safely?
- How has safety training improved employee's perceptions of hazards and risks?
- How much time do you invest in safety training?
- How easily available is safety information?

Motivation

- How would you ratemanagerspromptness toward providing feedback on safety performance?
- In your opinion do managers motivate employees on safety issues
- Describe the mechanism manager use in dealing with them unsafe act and do you think this approach is motivational?
- Compared to work performance incentives, do you feel safety performance during a period is rewarded to motivate employees?
- Looking at the number of reported accidents within the industry in general, how do you think the idea of zero accident is handled in your organisation?
- In your opinion do you think zero incident goals motivate safety behaviour among employees
- What do employees believe are the expectations of managers?

Do employees feel that this is a good place to work (why/why not)?

Learning Organisation

- Cast your mind on accident/incidence that may have occurred onsite, in your opinion do you think he company have acted promptly to avoid reoccurrence of similar incidence?
- Can you describe the existing mediumof reporting such act?
- Reflecting on this medium, do you think the reporting platform is fit for purpose and encourage reporting of accident or there is need for review?
- Do reports get acted upon and do they get feedback?

Appendix IX: Acknowledgement letter for qualitative result validation from interview participant

RC: 236461

VIV LIMITED

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10/12/2020

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

This is to confirm that I, Olubayo Valentine held a one-on-one interview session with Efua Ehiaguina that took place on the 26th of June, 2019.

It was an exciting and fruitful session and i can confirm that the attached interview Transcript is an exact representation of our conversation that day.

Best Regards.

VIV LIMITED
Sign:.....
Date:.....

Valentine Olubayo
HSSE/Business Development Manager

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KM 3, NPA Expressway, Ekpan-Warri, Delta State.
Tel: 08034545821, 08033462903, 07092011922, 07034734271
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P. O. Box 13722, Port Harcourt.
Tel: 084-766924, 08035091882, 08023083251
www.vivlimited.com

Appendix X: Consent form presented to each interview participant

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CONSENT FORM

Title of Project: Assessment of Safety Behaviour of Oil and Gas Workers in the Niger Delta Region of Nigeria and its Impact on Personal safety response at Work

Name of Researcher: Efua Ehiaguina

Participant Identification Code for this project: ……..

Please initial all boxes

1. I confirm that I have read and understood the information sheet dated…….. for the above project and have had the opportunity to ask questions about the interview procedure. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason to the named researcher. ☐

3. I understand that my responses will be sound recorded and used for analysis for this research only. ☐

4. I give permission for my interview recording to be archeived as part of this research project, making it available to future researchers (optional). ☐

5. I understand that my responses will remain anonymous ☐

6. I agree to take part in the above research project. ☐

7. I understand that at my request a transcript of my interview can be made available to me. ☐

_____	_____	_____
Name of Participant	Date	Signature
_____	_____	_____
Researcher	Date	Signature

To be signed and dated in presence of the participant

Once this has been signed, you will receive a copy of your signed and dated consent form and information sheet by post.

Appendix XI: Acknowledgement letter for qualitative result validation from interview participant

LEE ENGINEERING

LEE ENGINEERING AND CONST. CO. LTD.

ENGINEERING • PROCUREMENT • CONSTRUCTION • MAINTENANCE

Solar Turbines
Authorized Representative

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

Following the one-on-one interview session that took place on the 26th of June, 2019 between I (Idaresit Iyeke) and Efua Ehiaguina, I am pleased to confirm that the session was a fruitful one. I also confirm that the attached Interview Transcript as endorsed by me is valid.

Best Regards.

13/10/2020

Idaresit IYEKE (Mrs.)

HSE Manager (Projects)

LEE ENGINEERING AND CONST. COMPANY LIMITED

Appendix XII:

Table 27: the percentage of responses for each item used to measure safety management practices

Safety management practices (Items measured)	Strongly Disagree	Disagree	Neural	Agree	Strongly Agree
	Frequency (%)				
Q1 In my organisation safety is as important as quality of the work and getting the work done on time	0.2	0.4	4.1	47.6	47.6
Q2 Workers and management work together to ensure the safest possible conditions.	0.2	0.4	3.0	58.9	37.4
Q3 No major shortcuts are taken when worker safety is involved	0.9	6.7	11.9	50.2	30.3
Q4 The safety of workers is a high priority for my organisation.	0.2	0.6	5.6	61.3	32.3
Q5 My organisation acts quickly when a safety concern or problem is raised	0.0	0.4	6.1	60.6	32.9
Q6 My organisation listens carefully to workers' ideas about improving safety	0.0	0.6	10.2	51.7	37.4
Q7 My supervisor talk more about safety than production	0.4	9.5	16.0	50.4	23.6

Q8 My supervisor accept responsibility for my safety	0.2	2.8	11.0	55.0	31.0
Q9 My supervisor visit the worksite to check we are working safely	0.0	0.2	6.1	59.1	34.6
Q10 My supervisor involve work group in decision making	0.0	0.9	7.6	56.5	35.1
Q11 My supervisor encourage safe working by setting good example	0.2	0.4	8.9	58.9	31.6
Q12 My supervisor is not scared of taking blames for his error	0.6	4.1	14.5	46.3	34.4
Q13 My supervisor puts pressure on me to get the job done on time	18. 0	13.0	15.4	37.7	15.6
Q14 I have confidence on my supervisor actions on safety measure taken at work	0.2	0.6	8.4	56.1	34.6
Q15 My supervisor values safety contribution made by the team	0.2	0.4	6.5	63.2	29.7
Q16 My supervisor has difficulty motivating the team to work safely	11.0	13.0	12.1	40.0	23.8
Q17 There are frequent communications about safety in my workplace	0.0	0.2	5.4	55.4	39.0
Q18 Workers are told when they do not follow good safety practices	0.0	0.6	7.8	56.1	35.5

Q19 Formal safety inspections are regularly conducted in my workplace	0.0	1.3	8.7	54.8	35.1
Q20 Employees are given frequent feedback on accidents that occur on this installation	0.2	0.9	8.4	56.9	33.5
Q21 Formal inspections are regularly done to ensure workers are following safe system of work	0.0	0.4	8.7	56.7	34.2
Q22 Changes in safety rules and procedures are promptly communicated to all affected employees.	0.0	1.1	6.7	60.0	32.3
Q23 Lesson learned from accident and injuries are communicated to employees	0.0	1.5	8.9	53.0	36.6
Q24 I am satisfied with the mode of safety communication in my organisation	0.0	0.2	8.9	60.8	30.1
Q25 My organisation invests a lot of time in safety training for workers	0.2	2.4	10.2	55.8	31.4
Q26 I feel there is‘no blame culture’ at my place of work which makes corrective measure easy to implement	0.6	6.5	23.6	44.8	24.5

Apendix XIII:

Table 28: the percentage of responses for each item used to measure safety compliance

Safety compliance (items measured)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	Frequency (%)				
Q1 I am not allowed to use any personal safety equipment without training	0.0	0.6	5.8	55.6	37.9
Q2 I am provided with all Personal protective equipment to keep me safe at work	0.0	0.9	6.5	50.0	42.6
Q3 Workers refuse to do work if they feel the task is unsafe	0.4	3.5	13.9	50.0	32.3
Q4 I ignore safety regulations to get the job done on time	2.6	14.7	20.1	38.7	23.8
Q5 In some instance I feel pressured to put production before safety in this installation	0.9	8.2	21.6	41.6	27.7
Q6 I am clear on how the safety rules affect me	0.0	0.0	6.3	55.0	38.7
Q7 I understand what my rights and responsibilities are for safety	0.0	0.6	5.8	62.8	30.7

Q8 At my workplace, there are rules and procedures about how to work safely	0.0	0.2	4.5	56.5	38.7

Appendix XIV:

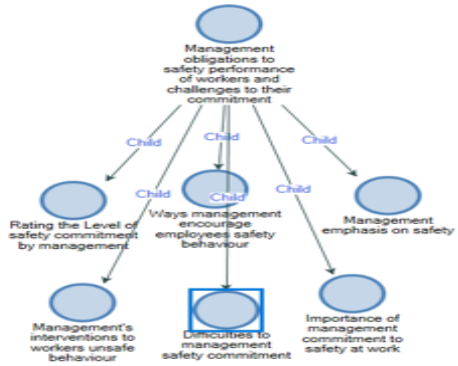
Table 29: the percentage of responses for each item used to measure safety participation

Safety participation (items measured)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
			Frequency (%)		
Q1 Safety is given a high priority in training programs	0.0	2.2	6.1	57.4	34.4
Q2 I encourage fellow workers to work safely	0.2	0.4	6.5	49.1	43.7
Q3 Workers are regularly asked about their safety concerns	0.2	3.0	9.7	58.9	28.1
Q4 Workers who act safely receive positive feedback	0.6	1.1	11.9	56.3	30.1
Q5 Workers are involved in conducting safety audits and inspection	0.0	1.7	10.6	58.7	29.0
Q6 Co- workers often help and remind each other to work safely	0.2	0.4	7.1	52.2	40.0
Q7 Where I work, I feel free to report safety concerns	0.0	0.4	10.2	57.1	32.3

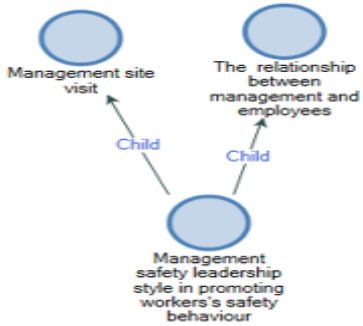
Q8 I feel if I say too much about safety I might get fired	8.4	10.4	15.8	34.2	31.2
Q9 I am confident I have all the training I need to perform each task safely	0.4	1.7	8.9	58.0	31.0
Q10 I feel that my company is a good place to work	0.0	0.4	4.8	58.9	35.9
Q11 My workplace ensures I understand what my responsibilities are for safety	0.4	0.6	6.3	60.0	32.7

Appendix XV:

Figure 23: illustrates final themes that emerged and their associated sub-themes.



Theme 1



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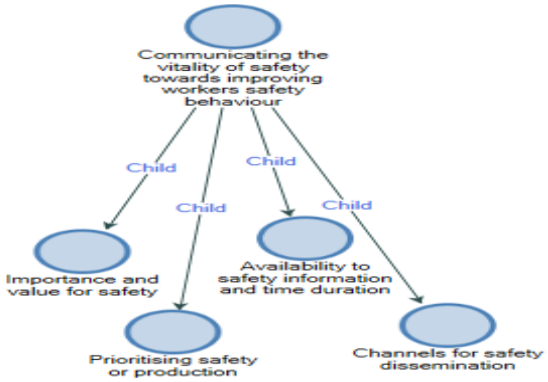

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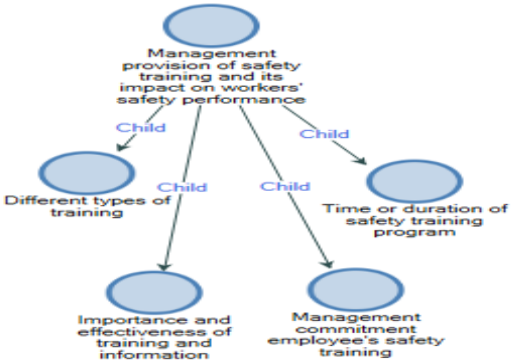
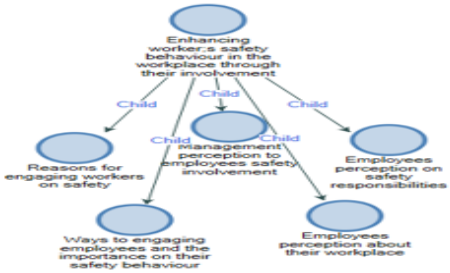
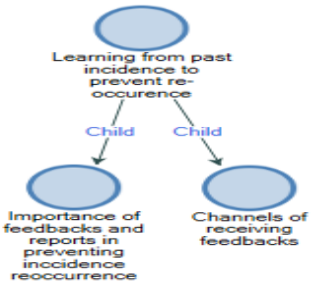


Theme 4

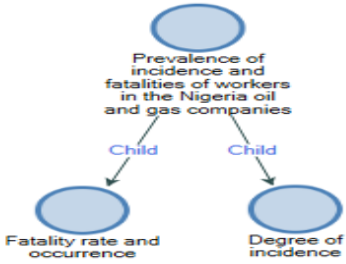


Theme 5

Theme 6



Theme 7



Theme 8

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