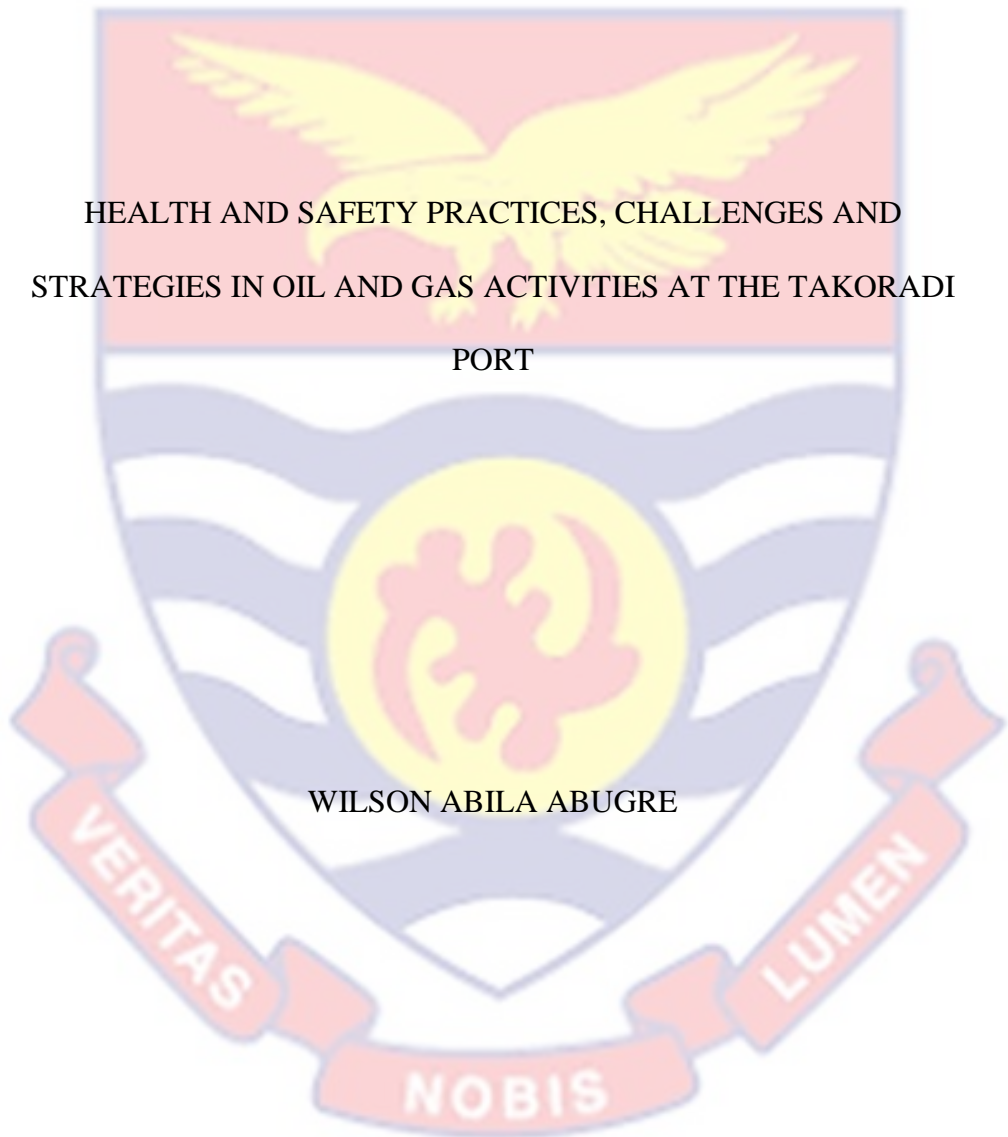


UNIVERSITY OF CAPE COAST

HEALTH AND SAFETY PRACTICES, CHALLENGES AND
STRATEGIES IN OIL AND GAS ACTIVITIES AT THE TAKORADI
PORT

WILSON ABILA ABUGRE



2021

UNIVERSITY OF CAPE COAST

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PORT

BY
WILSON ABILA ABUGRE

Dissertation submitted to the Institute of Oil and Gas Studies of the College of
Humanities and Legal Studies, University of Cape Coast, in partial fulfilment
of the requirements for the award of Master of Business Administration degree
in Oil and Gas Management

DECEMBER 2021

DECLARATION

Candidate's Declaration

I hereby declare that this dissertation is the result of my own original research and that no part of it has been presented for another degree in this University or elsewhere.

Candidate's Signature: Date:

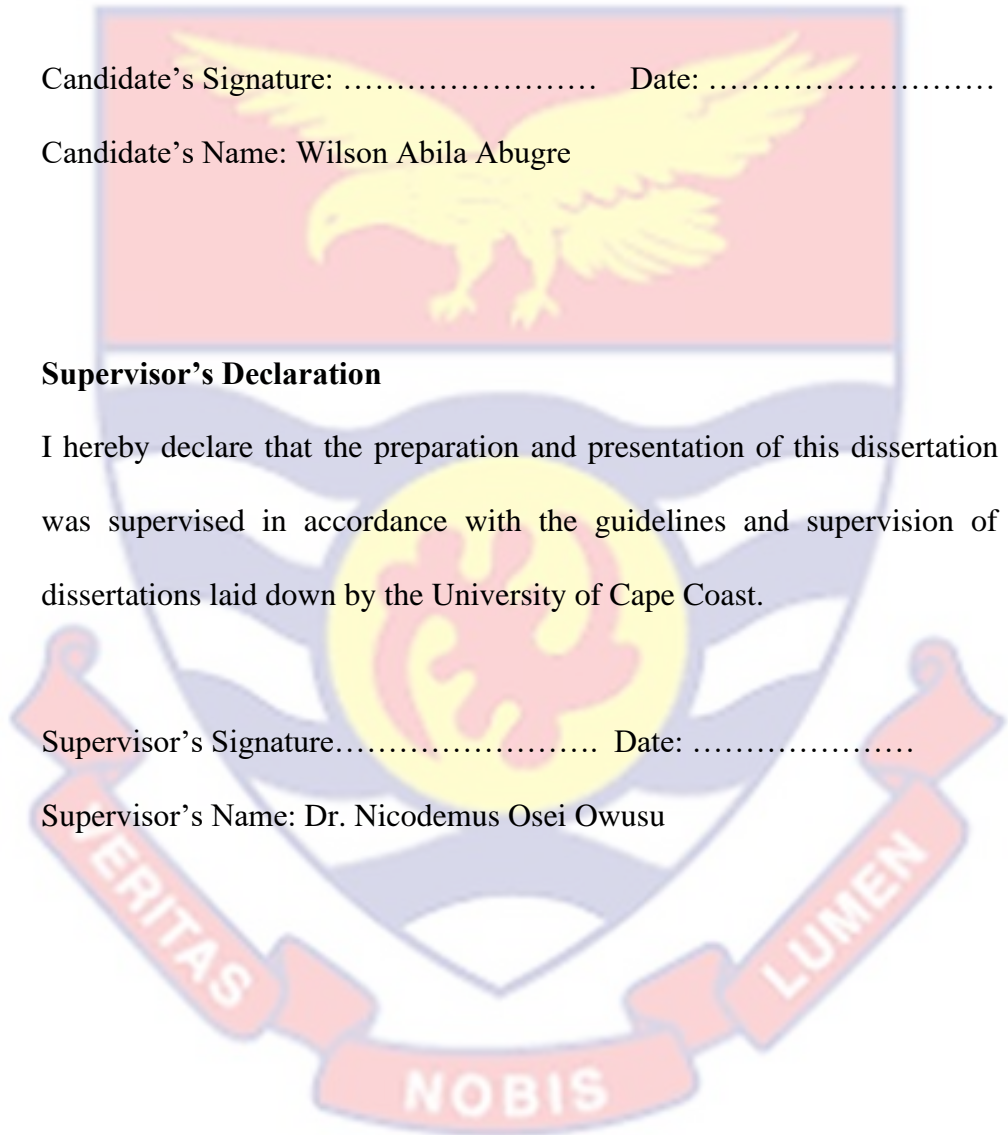
Candidate's Name: Wilson Abila Abugre

Supervisor's Declaration

I hereby declare that the preparation and presentation of this dissertation was supervised in accordance with the guidelines and supervision of dissertations laid down by the University of Cape Coast.

Supervisor's Signature..... Date:

Supervisor's Name: Dr. Nicodemus Osei Owusu



ABSTRACT

The oil and gas industry is deemed as one of the most risky sectors globally, posing several health and safety hazards to employees in their line of duty. This study therefore examined the health and safety practices, challenges and strategies to mitigate these challenges within the Takoradi Port of Ghana. Using a quantitative approach and a descriptive design, the study collected data from 200 randomly sampled respondents and the data was analysed, using tables frequencies, means and relative importance index. Among other things, the study found that health and safety practices within the sector at the Port include the provision of PPE, emergency assembly points, availability of first aid kits and clinical services, availability of alarm systems, safety information communication systems, visitor safety training and adequate safety facilities. However, these practices are also confronted with challenges such as lack of awareness on health and safety measures, poor risk assessment management process, insufficient training of site personnel on health and safety issues, lack of proper technology to monitor and assess health and safety trends and indicators, lack of legal and regulatory framework and lack of access to materials and PPE. It was also revealed that some strategies that can be devised to mitigate these challenges in the oil and gas sector include; improving the working conditions of employees, sensitizing and building the knowledge level of workers, effective health and safety regulations and capacity building of the regulatory institutions. The study, therefore, recommends that the regulation and enforcement of the safety protocols be implemented effectively and rigorously.

KEY WORDS

Challenges

Health and Safety

Occupational hazards

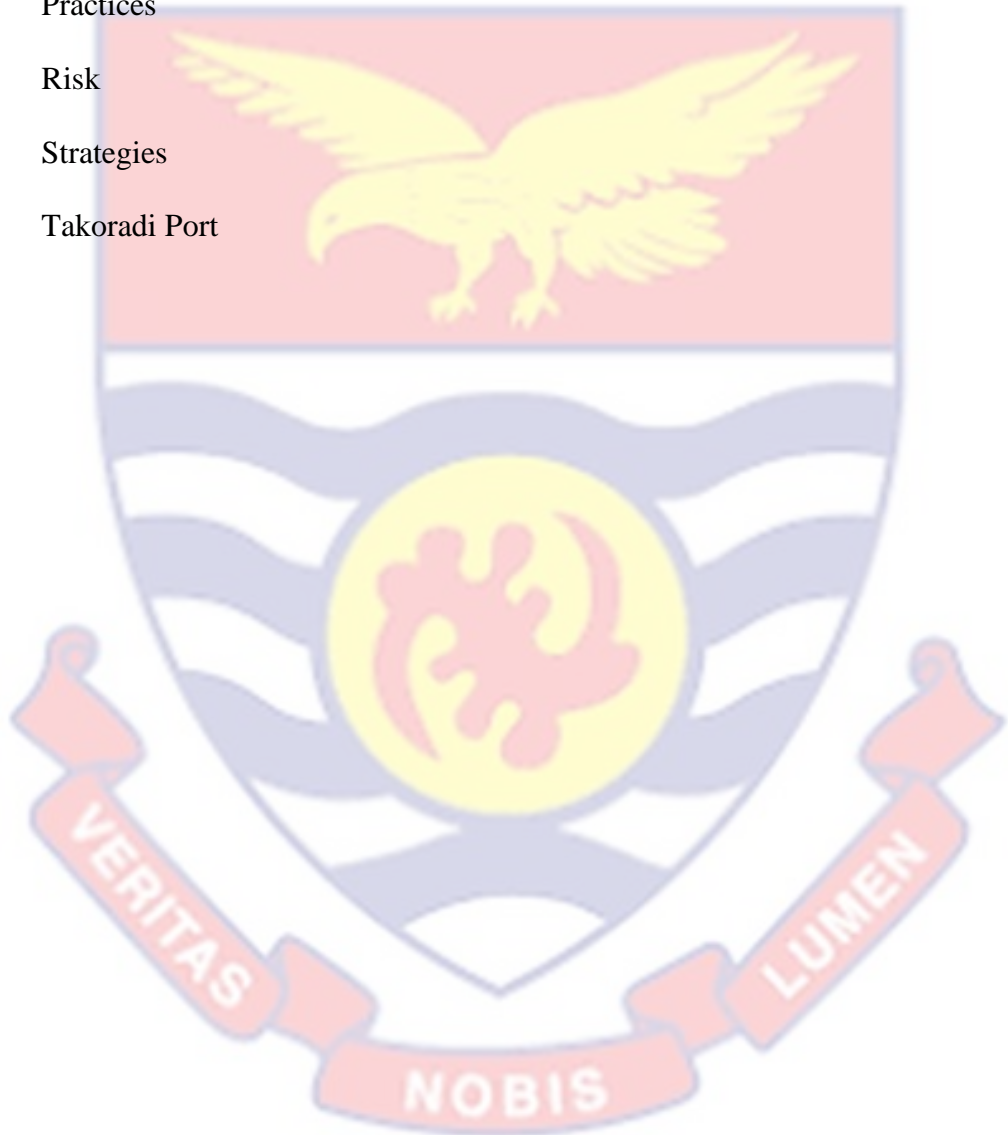
Oil and Gas

Practices

Risk

Strategies

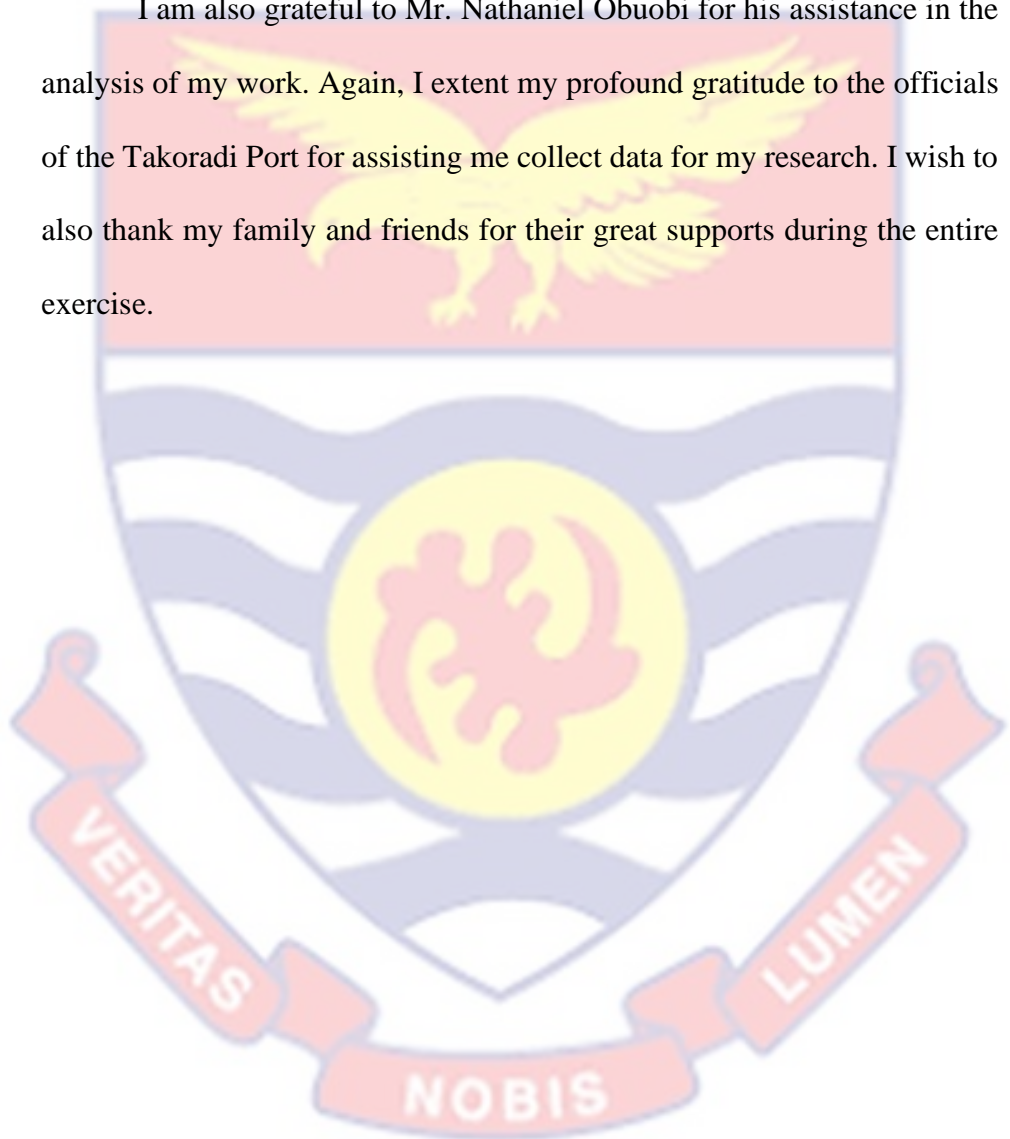
Takoradi Port



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DEDICATION

To my entire family for their prayers, the encouragement and support.



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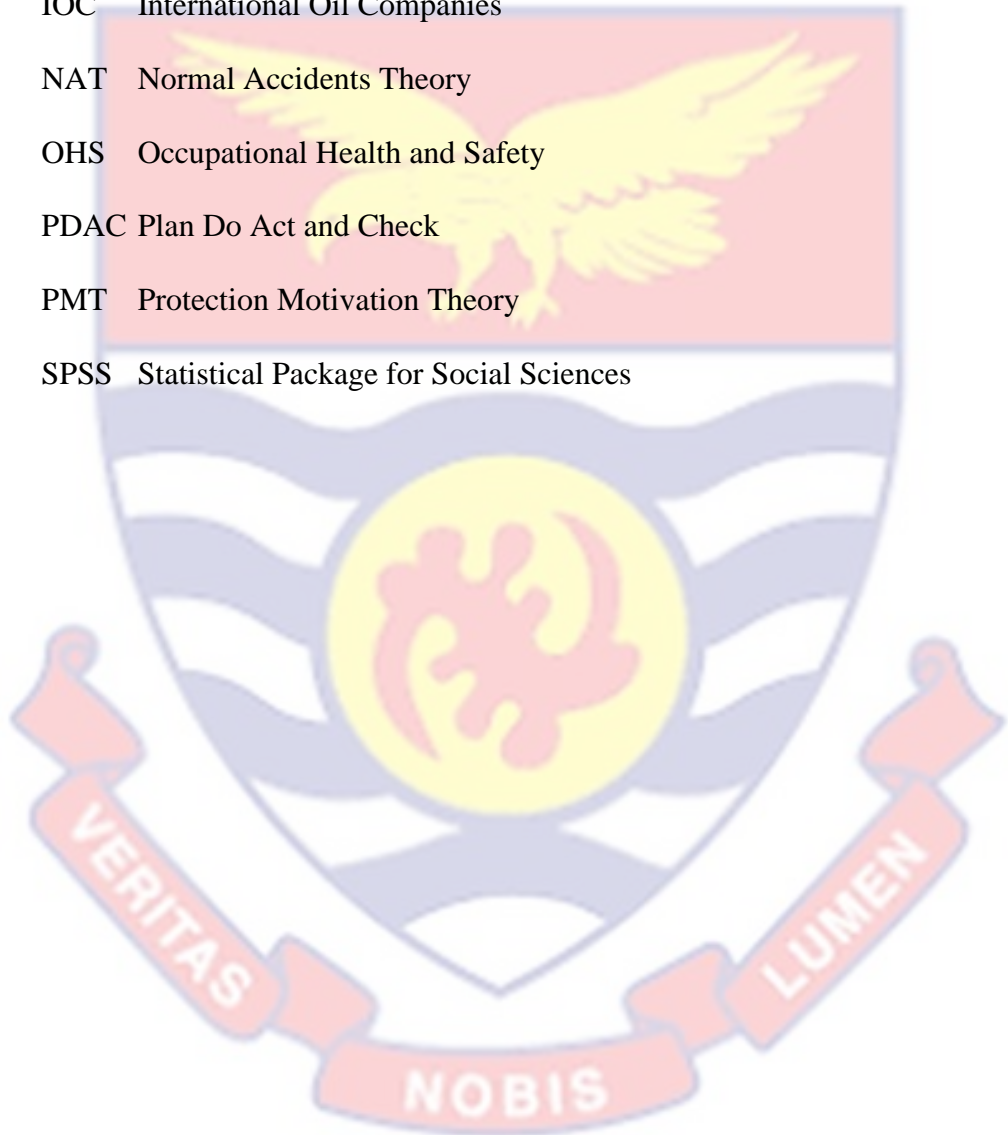
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LIST OF ACRONYMS

EPA	Environmental Protection Agency
HET	Human Error Theory
HS	Health and Safety
ILO	International Labour Organization
IOC	International Oil Companies
NAT	Normal Accidents Theory
OHS	Occupational Health and Safety
PDAC	Plan Do Act and Check
PMT	Protection Motivation Theory
SPSS	Statistical Package for Social Sciences



CHAPTER ONE

INTRODUCTION

The oil and gas industry is widely regarded as one of the riskiest in the world. Employers, regulators, and governments have all expressed concern about occupational health and safety in this area. This is because the oil and gas sector is a significant engine of the global economy, and events such as changes in oil production capacities in oil-producing countries are likely to have an impact on oil supply levels which result in volatility in oil prices in countries that do not produce oil. The changes in the production capacities could to some extent be ascribed to the dangers that the operators face at the work place which makes them unable to work as expected. As a result of this, certain studies have looked into the health and safety practices in the oil and gas industry in various countries (Dahl, & Kongsvik, 2018). Ghana's oil and gas industry faces similar challenges as a newcomer to the oil-producing world. The Takoradi Port, which hosts the majority of Ghana's oil and gas activity, has been dubbed the country's oil and gas hub. As a result, there is a need to look into the health and safety procedures, difficulties, and strategies for handling oil and gas at Ghana's oil and gas hub, Takoradi Port.

Background to the Study

In the coming years, fossil fuels are expected to remain a significant part of the global energy mix (Brockway, Owen, Brand-Correa & Hardt, 2019). To fulfill rising demand, the majority of future production growth will have to come from locations that are more technically difficult and costly to extract from than previously (ILO, 2015). Extraction of oil and gas is linked to serious mishaps. The Worldwide Offshore Accident Database,

according to the International Labour Organization (ILO) (2015), is a comprehensive database on accidents. It contains more than 6,000 catastrophic reports spanning 1975 to 2012. These fatal accidents do not only affect direct economic costs but also destroy companies' reputation (ILO, 2015). In the oil, gas, and petrochemical industries, the handlers - operators, technicians, and safety employees - are largely unaware of the hazards of flammable and deadly gases. Constant training and knowledge replenishment are essential to avoid potential events that may arise as a result of complacency. A mixture of substances is likely to be found in most industrial locations where there is a risk of explosion or fire due to the presence of flammable gases or vapors (Haridoss, 2017). The oil and gas business, according to Osabutey, Obro-Adibo, Agbodohu, and Kumi (2013), is one of the riskiest industries in terms of employee health and safety.

Furthermore, one of the most significant operational risks in the oil and gas business has been identified as occupational safety (Oppong, 2014). According to Oppong (2014), fatal accident prevention is a serious risk for the business to cope with because fatal accidents are commonly related with lifting mishaps, either on decks or associated with drilling activities and explosions. The International Labour Organization (ILO) (2015) recommends that employers make further efforts to improve employee health and safety at work. Over 2.3 million work-related accidents are claimed to occur annually around the world, with over 6000 people dying (Liu, Nkrumah, Akoto, Gyabeng, & Nkrumah, 2020).

Nonetheless, depending on the level of industrialization, the severity of work-related injuries and accidents varies per country. Emerging economies, in particular, continue to be the most vulnerable to this threat (Van-Heerden, Musonda & Okoro, 2018). Ghana is one of these developing countries, with a projected accident rate of 15,702 per 100,000 workers and fatal accidents at 1852, with a mortality rate of 20.6 per 100,000 workers across all industries (Oppong, 2014). Ghana's petroleum industry is one of the most productive in the world, but it is also one of the riskiest (Samimi, 2020). Employees in the business are likely to be exposed to occurrences like hydrocarbon leaks, blowouts, fires, explosions, falling items, and hydrogen sulphide emissions, as surmised by Sutton (2013). As a result, accident prevention must be considered and prioritized from the start of operations.

In Ghana, a survey by General Reinsurance Africa Limited in 2015 revealed that the petroleum sector's most catastrophic and risky incidents are blasts, which typically kill workers and destroy apparatus inside the impact zone. Slips and falls, burns, and electrocutions are among the other types of wounds that workers in this field are susceptible to, according to the Ministry of Health (2012) report. According to Oppong (2014), workers in the Ghanaian oil and gas industry suffer from work-related dangers including leg injuries, cuts, and slashes, as well as injuries to the hands, fingers, and eyes. Poor safety infrastructure, insufficient provision for safety frameworks, a large number of unqualified health-related experts, insufficient occupational health and safety monitoring mechanisms for injuries and accidents, and the inaccessibility of wellbeing, health, and

safety information were cited as some of the significant challenges industries face in the wake of these disastrous events (Achaw & Boateng, 2012; Liu *et al.*, 2020). In the middle of these difficulties, employees are the victims of the majority of the dangers, wounds, and occupational accidents that occur in the workplace. Workers' commitment is harmed by workplace accidents and injuries (Achaw & Boateng, 2012).

Theories on accident causation, such as Petersen's accident-incident theory, normal accidents theory, human error theory, and the distraction hypothesis, have all demonstrated that system failures are frequently the cause of human errors. As a result, senior management is responsible for improving occupational wellbeing, while workers are responsible for adhering to safety regulations (Abad, Lafuente, & Vilajosana, 2013). Even more importantly, improving safety does not simply involve providing safety frameworks or a pleasant working environment for employees, but also training and teaching individuals to improve their health and safety knowledge. Safety awareness, as established by Neal, Griffin, and Hart (2000), is a major factor of worker security performance.

Despite the fact that Ghana's oil and gas industry is still in its early stages, there is a long history of mishaps and fundamental workplace accidents in the business. The devastating effects of recent fires in Ghana's oil and gas industries on lives and property, as well as the country's economy, have quickly elevated the importance and practice of occupational health and safety in associated businesses in the country (Liu *et al.*, 2020). At all stages of the oil and gas business, safety and health risks are widespread. Production, facility operations, maintenance,

building, transportation, storage, and usage of oil-derived goods are among these steps. There's also the impact of by-products and waste products on both employees' health and the environment, as well as the complexity of the instrumentation and technology used in the oil and gas business.

The weak regulation in Ghana raises questions about the ability of the oil and gas industries to effectively safeguard the health and safety of their employees and also the environment (EPA-Ghana, 2010). Undeniably, standards and regulations across the globe that provide guiding principles for safety practice specifically in the oil and gas industry should be geared towards having safe operations of their plants to ensure the safety of their employees. Occupational injuries as disclosed by Mekkodathil, El-Menyar, and Al-Thani (2016) are associated with a greater fatality rate, a longer period of incapacity, and a higher cost of treatment than non-occupational injuries. Owing to this, it is essential for every organization to ensure that health and safety systems are implemented to reduce the work-related accidents. A safety week was organised in 2018 at the Port of Takoradi in order to distribute a safety orientation card so as to keep staff and visitors informed about safety precautions so that accidents can be avoided (Sakyi, 2020).

Statement of the Problem

Africa is blessed with vast natural resources. However, most countries in Africa are overwhelmed with poverty and remain the poorest continent in the world. The discovery of oil in Ghana resulted in the anticipation among Ghanaians that there would be accelerated developments which will lead to the improvements in their living conditions

(Oppong, 2014). After the oil discovery, a lot of emphasis is laid on the management of the revenue than the occupational health and safety of the employees during handling and processing (Abdulai, 2013). There is no or very little, if any, dialogue on health, safety and environmental concerns. However, Powell (2018) reported that occupational safety is documented to be one of the key operational risks in the oil and gas industry.

The prevention of severe accidents is the most important risk for the oil and gas industry to manage. These severe accidents are commonly linked with lifting incidents (handling activities), or have connection with drilling activities and explosions. Powell (2018) also claimed that installation integrity (mostly structural integrity and predominantly hydrocarbon containment) constitutes the next significant risk for the oil and gas industry. Specifically, in the Takoradi Port, a report on the expansion project of the Takoradi Port by the African Development Bank Group in 2014 revealed that during the demolition of the clinker jetty and existing dolphin structure at the oil berth, dredging and reclamation work, and the construction of terminals and associated structures workers were exposed to hazards. These includes fire and explosion risks from welding, inhalation of dust and fumes, accidents from falling objects, injuries from operation of construction machinery/equipment, transportation of construction materials as well as accidents on the dredger resulting in workers drowning.

It is well documented in literature that severe accidents recorded in the oil and gas industry does not only result in deaths but also destroys equipment and the reputation of the organizations involved. Even though

past studies have zeroed in on a few safety related issues, including assessing the intervening role of safety information in safety management and safety behaviour (Osabutey *et al.*, 2013; Oppong, 2014) only a limited number of those inquiries have focused on occupational health and safety practices and management in the Ghanaian oil and gas sector, with none focusing on safety awareness, practices and compliance in this profoundly risky industry.

It is against this background that this research seeks to investigate occupational health and safety practices, challenges and strategies in handling oil and gas at the Takoradi Port and also to find out if the companies have the ability to handle the new developments in the oil and gas sector so as to ensure the safety, health and welfare of its workforce, assets and the environment.

Purpose of the study

The main aim of this research was to investigate into the health and safety practices, challenges and the strategies in the oil and gas industry at the Takoradi Port.

Research Objectives

The specific objectives of this study are to:

1. assess health and safety practices in handling oil and gas at the port
2. examine the challenges faced in ensuring health and safety practices in the industry
3. assess the strategies adopted in mitigating the challenges in the industry

Research Questions

Specifically, the study seeks to answer the following questions:

1. What are the health and safety practices in handling oil and gas at the port?
2. What are the health and safety challenges confronting the oil and gas industry at the port?
3. What strategies can be adopted to mitigate the challenges in the industry?

Significance of the Study

With Ghana's oil and gas industry growing at a fast pace, this research is very significant in the sense that it will assist management and other key persons in oil and gas companies train their staff in pertinent issues in handling oil and gas operations. The study will further serve as a ringing bell to employees who are directly involved in the day-to-day operations of the firms and equip them on the measures, they need to be aware of and practice in order to reduce the occupational health and safety hazards they are likely to be exposed to in their line of work. Regulators in the oil and gas industry will get to know the level and state of compliance to health and safety protocols in the port and how employees regard these measures. This knowledge, that is the outcome of the study can be tapped to inform future actions they will take in the regulation of oil and gas companies in Ghana. The study potentially provides empirical evidence that would be useful to the managers of the ports as well to enable them beef up their monitoring and evaluation of these oil and gas firms to prevent and reduce health and safety accidents in the

port. The study also makes relevant contributions to current literature on the issue. This study will therefore form a basis on which further studies could be conducted, especially on health and safety practices in our ports since this is the first of its kind in Ghana.

Delimitation of the Study

The research is delimited to studying the health and safety practices in handling oil and gas at the Takoradi Port. The study focused on companies operating in the oil and gas sector at the Takoradi Port. In all, there are about 40 oil and gas related firms in the port with close to 400 employees. These would represent the unit of analysis for this study. Only oil and gas related firms in the port are considered for this study because the main aim of the study is to assess the health and safety practices, challenges and strategies in handling oil and gas at the port.

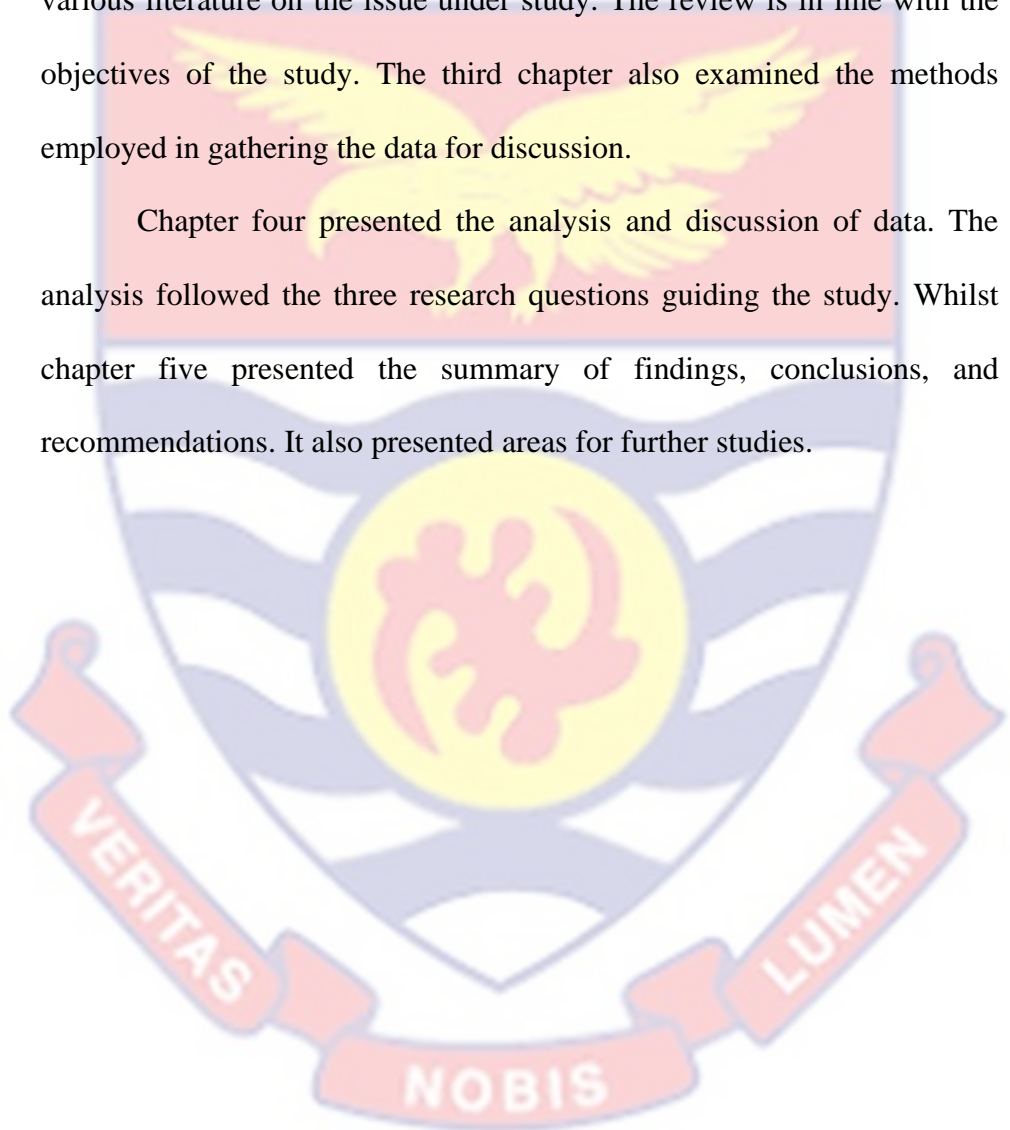
Limitation to the Study

The current study may suffer from generalizability of findings. The study is confined to the setting of a single port in Ghana, the Takoradi Port. Hence, findings may not represent the realities in other ports and harbours in Ghana. Also, it is anticipated that the researcher will be under time and cost pressures due to the limited time space within which the study must be completed. This may preclude the possibility of collecting data from a large sample of respondents. In spite of all the above confronting challenges, conscious efforts have been made to bring these limitations to a negligible level, making the findings reliable and authentic.

Organization of the study

This research was divided into five chapters. The first chapter looked at the introduction of the study, research problem, research objectives and questions, the significance of the study, definition of terms, scope of the study, and chapter organization. Chapter two examined the various literature on the issue under study. The review is in line with the objectives of the study. The third chapter also examined the methods employed in gathering the data for discussion.

Chapter four presented the analysis and discussion of data. The analysis followed the three research questions guiding the study. Whilst chapter five presented the summary of findings, conclusions, and recommendations. It also presented areas for further studies.



CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter presents the review of relevant literature on the health and safety practices, challenges and strategies in handling oil and gas. This chapter is generally sectioned into three; theoretical literature, conceptual and empirical literature review. The theoretical literature focused on the theories related to the health and safety practices whereas the conceptual review operationalized some of the key terminologies used in the work. The empirical literature shed light on the previous studies on health and safety practices, challenges and strategies especially in the oil and gas industry. The chapter closes with gaps in the literature and a summary.

Theoretical Review

This section presents the theoretical justifications and underpinnings for the study. Workplace health and safety are underpinned by a number of theories. Three of these theories namely the normal accidents theory, protection motivation theory and the human error theory would be discussed in this section.

The Normal Accidents Theory

The theory of normal accidents (NAT) was propounded by Perrow (1984) as an approach to assessing occupational health and safety issues. The theory sees key accidents as more or less inevitable or sometimes normal in socio-technological systems that are both tightly coupled (failures spread fast) and interactively complex (failures spread in unforeseeable ways), such as offshore petroleum installations, nuclear power plants,

chemical plants, and other oil and gas related sectors. As expounded by Trinh, Feng, and Jin (2018), the normal accident theory (NAT) assumes that accidents involved the unanticipated interaction of a multitude of events in a complex system rather than the result of a few or a number of component failures. According to Perrow (1999), due to the complexity and interdependence of systems, accidents occur in a number of unexpected ways and some failures are ordinary defects that run out of control. Tight coupling of systems and the interactive complexities of same make the oil and gas industry susceptible to several occupational health and safety hazards.

A failure in one part of the organization (system) will spread and disrupt the flow in other parts of the system (Perrow, 1999). In reality, a little failure can quickly grow into catastrophic mishaps, putting the health and safety of people in the oil and gas industry at risk. The NAT implies that the inherent safety hazards of oil and gas projects or enterprises are directly proportional to the project's complexity, and that the more tightly connected and complex a system is, the more prone it is to accidents. The ability of Normal Accidents Theory to uncover the ways in which power connections and structures affect frontline employees and contribute to the development of safety risks is what makes it so valuable.

More especially for the oil and gas sector, there is a higher level of complexity in the systems and this even makes it riskier and more prone to occupational accidents. Evidence also suggests that both the upstream and downstream sectors of the oil and gas industry are inherently risky and for that matter, preventive measures must be taken more seriously to forestall

the occurrences of some accidents and hazards that are preventable and also to secure the health and safety of their employees (Liu, Nkrumah, Akoto, Gyabeng, & Nkrumah, 2020). The theory comes in handy in discussing issues relating to the health and safety practices in the oil and gas sector and therefore forms a core of the theoretical framework for this study.

The Protection Motivation Theory (PMT)

Of the numerous theories identified with explaining risk and occupational health and safety issues, one of the most cited, according to Merazga, Sammari, Malik, and Noor (2020), is the protection motivation theory. As indicated by this theory, individuals are bound to protect themselves when they envision negative results, and desire to dodge them and think they have the capacity to take preventive actions. Some researchers perceive the PMT to contend that individuals weigh factors, for example, the seriousness of the danger, their individual vulnerability, and the potential advantages of protective actions prior to deciding whether or not to undertake a risk.

By and large, PMT hypothesizes that there is a linkage between risk perceptions and accidents and injuries, and that employees take protective precaution and measures when they are motivated and have the urgency to do as such. The choice to take defensive actions in the work environment is a process (Lindell & Perry, 2012). For this reason, employees weigh their response efficiency and self-adequacy against the potential costs brought about. Utilization of personal protective equipment and other defensive measures will in general increase as these practices become standardized

and adjusted, and also as employees understand the need for them to take responsibility of their own safety at the workplace.

The theory also holds that health and safety concerns and practices and utilization of protective gears increases when employees have a cause for concern, primarily because of a past experience. Kiefer, Müller, Singer, and Hollender (2019) revealed that employees were likely to communicate worry about risky equipment and work environment air quality given that they had recently encountered a work-related injury. In both these cases, employees' interests and concerns to secure and protect themselves were highlighted due to direct encounters of accidents or wounds.

Human Error Theory

Rigby proposed this theory in (1970). Human error, he defined, is any group of human activities that, in actuality, surpass some acceptable limit. The human error theory (HET) identified human factors as the primary source of organizational dangers. The HET can be divided into two categories: behavior models and human factor models (Abdelhamid & Everett, 2000). Human traits were identified as the main cause of errors in the behavior models, which investigated the propensity of individuals to commit errors under various contextual settings. Extreme environmental characteristics and the over-loading of human physical and psychological capacities were elements that contributed to human mistake, according to human factors models. Reasons (2000) latent failure model was improved by the HET, which explained how active failures (or unsafe worker activities) happened in a hazardous working environment. According to these beliefs, human error is an entity that must be managed by an error

management strategy in order to prevent workplace mishaps. As these errors compound, the likelihood of workplace accidents and dangers rises.

Application of the theories to the study

The normal accidents theory basically underlines the notion that accidents are inevitable in organizational settings and for that matter, there is the need to take measures to ameliorate their occurrence at the workplace. Especially in the oil and gas industry where operations are inherently risky and involves several complexities, employees and management of oil and gas related firms need to take precautions and practice basic safety measures in order to avert themselves from work-related health and safety hazards. Again, there is the need for compliance to safety protocols in such organizations to prevent putting lives and property at risk.

The protection motivation theory also plays a substantial role in addressing health and safety issues at the workplace. The theory is particularly important as it highlights what informs some safety practices in an organization and the likelihood of compliance to OHS protocols due to happenings in a firm. The theory can be applied to the health and safety practices in handling oil and gas issues when antecedents that have caused accidents and injury to employees are noted and their reactions thereafter have also been examined.

The human error theory on the other hand focuses on the human aspects of organizational hazards and the role people have to play to prevent accidents and other work-related risks. This theory is important in assessing the health and safety practices because it highlights those aspects that are

directly under the responsibility of employees in safeguarding themselves from accidents and hazards.

Conceptual Review

Health and safety practices

Organisations mostly put in place series of health and safety measures to help prevent the frequent occurrences of accidents and injuries. Zerguine, Tamrin and Jalaludin (2018) stipulated those organisations invest in health and safety issues to help reduce the occurrence of accidents and injuries. These investments include the implementation of new safety processes and the frequent provision of essential safety devices. Moreover, health and safety practices involve enhancement of companies' working environment, provision of safety equipment and training of employees on how to use it (Vinodkumar & Bhasi, 2010). Safety program installation and annual audits are predicted to considerably reduce work-related injuries because they remain the most effective framework for preventing accidents (Laal, Mirzaei, Behdani, Mohammadi & Khodami, 2017).

Challenges to compliance of health and safety practices

It is expected that workers and other stakeholders comply with the safety measures implemented by management. However, there are several barriers that prevent employees to comply with these measures. The barriers include low level of awareness and sensitization programmes to help boost employees' appreciation of the systems put in place to reduce accidents. More so, most firms treat the implementation of safety measures as mere paper work to meet regulatory obligations rather than being part of their company's Safe Operations policies or practices (Liu *et al.*, 2020). Other

challenge has to do with the low involvement of relevant stakeholders as management fail to include relevant employees with expert knowledge in the many disciplines in the development and implementation of systems (Nwankwo, Muku, Amosa, Ike & Ogionwo, 2020).

Empirical Review

The significant role of workplace organizational policies and practices in promoting worker safety is increasingly recognized. There is the need for an improved understanding of the occupational health and safety practices and its impact on organizations and employee performance especially in high-risk industries like the oil and gas sector. This section presents the review of previous related studies in the area of health and safety practices in the oil and gas sector.

Health and Safety Practices in Handling Oil and Gas

Traditionally, the oil and gas industry has been noted as a high-risk area, especially the offshore sector where employees are confronted with not just process risks related with the exploration, stockpiling and processing of hydrocarbons on stages but different types of accidents associated with the harsh workplace environment and transportation of petroleum products (Broni-Bediako & Amorin, 2010). This means that being aware of safety measures and precautions as an employee is very vital for your own safety and wellbeing as well as those of your organization.

Accidents and hazards of any degree might be preventable at the workplace once great safety arrangements, management techniques, and social and preventive practices are appropriately positioned. Occupational accidents can be recognized before the beginning of any operational action, and this remains a basic rule of accident prevention (Oppong, 2014). In spite

of the fact that the reasons for accidents and risks may differ across industries, the recognizable proof and investigation of health and safety practices suggest similar evidence and results (Liu *et al.*, 2020).

Occupational health and safety issues are divided into two categories, according to Swuste Theunissen, Schmitz, Reniers, and Blokland (2016), thus, process safety and personal safety. Personal safety refers to factors such as synthetic and noise introduction, ergonomics, and exposure to mechanical and electrical threats, to name a few, which result in employee accidents and fatalities (Mearns & Hope, 2005). Process safety, on the other hand, connotes considerable dangers in the oil and gas industry, particularly catastrophic spills, explosions, and fires that result in accidents, injuries, property destruction, and environmental degradation (Knegtering & Pasman, 2009; Swuste *et al.*, 2016). The effects of process safety occurrences are normally, more extreme than those of personal safety, possibly causing numerous wounds and catastrophes (Knegtering & Pasman, 2009). The implication here is that, there are certain practices that are likely to cause either of the safety concerns when practiced or some other practices that when in place can help reduce the occurrence of some OHS hazards.

Employees' performance at work is determined by their degree of knowledge, talents, and inspiration, according to Neal, Griffin, and Hart (2000); consequently, if they possess these three basic skills, they practice safe work behavior based on safety standards and systems. In Nigeria for instance, Umeokafor (2017) suggested that the use of faulty equipment and tools is prevalent among workers in the petroleum sector. Some employees

might be less lenient toward hazards forced on them by others than those risks they decide to take for themselves, which suggests that helping employees recognize the outcomes their actions could expose others to is one approach to lead them away from high-risk practices and be propelled to protect themselves as well as other people through engaging in only best practices that promote health and safety (Merazga *et al.*, 2020). Generally, the protection motivation theory states that being inspired to secure oneself requires not just sufficient danger awareness, but also the equipment and abilities to take preventive measures.

According to Dabup (2012), the primary goal of health and safety practices is to guarantee that hazards to workers, the general public, and the environment are adequately managed. He goes on to say that good management of health, safety, and the environment increases employee well-being, improves business reputation, and helps businesses achieve high-performing teams and cost savings. Yanar, Lay, and Smith (2019) backed up this argument, claiming that employee treatment is the most predictive determinant of Health and Safety performance.

As shown by Toseafa, Bata, and Toseafa (2018), employees in the petroleum industry are reported to be exceptionally exposed to hazardous and risky substances, however OHS PPE were insufficient for workers. The lack of safety management frameworks distracts workers' mental wellbeing and capacity to work effectively. This is corroborated by Lette, Ambelu, Getahun, and Mekonen (2018) who discovered that the failure of firms to make available safety equipment and educate personnel on its utilization will probably lead to high-rate work-related accidents.

Tang, MacDermid, Amick and Beaton (2011) reported that organizations with devoted OHS committees, active return-to-work programs, supportive employer participation, early communication amongst injured employees and workplace stakeholders, and the advancement of a people-oriented organizational culture among other safety practices have been reported to be key in avoiding new accidents and also in enhancing work reintegration for injured employees. Liu *et al.* (2020) recommends that achieving an acceptable level of health and safety is also possible when organizations promote employee health by giving the employee a high level of decision-making power, social support, personal development and professional training.

Salas and Hallowell (2016) also argued that some practices that do not promote health and safety at the workplace tend to become stressors to the workers at the job. Some of these practices include role ambiguity, high work pace and heavy workload. These practices can have negative repercussions on the individual's health and psychological wellbeing. Again, employees with higher workload tend to engage in more unsafe practices to meet deadlines and schedules at work (Zhou, Goh & Li, 2015). This is because the workers would be compelled to focus on accomplishing their assigned tasks and responsibilities rather than on their personal health and safety.

Furthermore, Zhang and Fang (2013) also studied the relationship between health and safety practices and the rate of accidents in the construction industry and found that, frequent training of staff members in safety control protocols as an OHS practice is negatively related to the

number of injuries accounted for. This implies that as the organization intensifies its safety training activities for its employees, it is able to reduce the number of injuries and accidents recorded at the workplace. They therefore recommended that organizations must pay the needed attention to safety training for their employees so as to improve their safety awareness levels and reduce OHS hazards.

Other practices that have been recommended to have positive impacts on organizational atmosphere and workplace safety include good housekeeping, regular maintenance of equipment, frequent change of protective clothing, active role of top management, adherence to safety measures, management's commitment to safety, among others (Zhou, Goh & Li, 2015).

Challenges faced in complying to occupational health and safety management principles

Even though much effort has been expended by regulatory authorities and stakeholders to fashion out policies, regulatory standards and health and safety management principles, adherence to these protocols at the individual and firm level in the oil and gas sector leaves so much to be desired (Umeokafor, 2017). That is to say, compliance to health and safety principles in the sector is not at its optimum. The literature documents several issues and challenges that obstruct firms from complying with OHS principles at the workplace.

Suhartina *et al.* (2020) contend that some organizations fear facing the law when they don't comply with occupational health and safety protocols and for that matter, they would not want to openly talk about them during investigations even in the aftermath of accidents. Hale, Borys, and

Adams (2015) also indicated that organizations are sometimes feel restricted from being innovative when they comply with these health and safety principles and hence cripples industrial development. Those who tend to comply also become bureaucratic in their operations. For this reason, several proposals have been made in most countries to repeal these regulatory standards that rather serve as regulatory barriers and burdens to organizations (Audiffren *et al.*, 2013). Hale and Swuste (1998) refer to these regulatory standards as “invisible barriers”.

Another challenge, according to Hasle and Limborg (2006) is that compliance to regulatory health and safety principles is a complicated task, especially for small and medium sized enterprises. This is because small firms are structured differently, relative to larger firms and they are those that encounter most of these risks. Salguero-Caparrós, *et al.* (2020) also concluded that in small and medium enterprises, due to their constraints from financial, material and human resources, compliance to regulatory standards is difficult. Again, the regulations in themselves are sometimes cumbersome. They finally recommended that organizations should adopt proactive strategies that would help them ameliorate some of these challenges and enhance compliance.

High technical requests, privacy, financial costs, and other practical issues are some of the difficulties related with compliance to regulatory standards (Jacinto *et al.*, 2011). Swuste *et al.* (2016) further suggest that commercial competitiveness and economic pressure are likely challenges that can hinder the compliance to these regulatory requirements in health and safety management.

Strategies to mitigate health and safety challenges

In a bid to better occupational health and safety compliance matters around the work environment, firms and governments have consistently applied health and safety management systems from the 1990s (Bergh, Hinna, Leka, & Zwetsloot, 2016; Hasle & Zwetsloot, 2011). This is because environmental health and safety is gradually becoming a vital component of organisational strategy (Marshall & Serwinowski, 2010). Akamangwa (2016) suggests that most of the compliance strategies do not provide adequate relevance to occupational health, safety and well-being of employees in their line of duty. This means that safety practices and its compliance are not being communicated clearly in many organisations. Salguero Caparros *et al.* (2020) also opined that, strategies on health and safety are mostly associated with large firms, with small firms receiving less attention. As a strategy to reduce regulatory compliance challenges in small organisations, Hale *et al.* (2015) recommended self-regulation and the reduction in bureaucratic procedures for small and medium enterprises in the sector. Another strategy recommended by Hollnagel (2017) is the development and strengthening of skills and capabilities that to build resilience in legal compliance. This can be done through the learning, anticipating, monitoring and responding to regulatory changes.

Niskanen *et al.* (2014) reported in another study that health and safety regulators should audit and monitor enterprises' management systems more efficiently and effectively, as well as provide advise when necessary. Anku-Tsede (2016) also looked into the Ghanaian oil industry's health and safety policies and regulatory regime. The study discovered that oil industry partners work to promote health and safety within their

companies as a strategy. The study concluded that, in order to improve occupational safety in oil companies, regulatory authorities and frameworks should exert coercive pressure on IOCs to become more proactive in safety issues.

According to Marshall and Serwinowski (2010), organisations in the oil and gas industry that qualify to be called sector leaders have strategies for environmental health and safety, and legislative and regulatory strategies to curb safety challenges. Such organisations also allow for flexibility in the management of health and safety challenges while focusing on long term strategic decisions in the sector. This also enables the organization to focus its tactical resources and strategies on human capital liability risk, reputational risk and risk management in general.

More so, Chauhan (2013) opined that managing oil and gas health and safety is aimed at assessing and identifying the safety hazards and challenges within the firm and devising remedial strategies and appropriate controls to curb same. The author provides a strategic model that oil and gas companies can adopt in their health and safety risk management process. He suggests that PDAC (Plan Do Act and Check) approach. The Planning phase involves setting a health and safety strategic roadmap which involves setting targets, priorities and objectives. The Do-Strategy involves health and illness management, risk and illness management, training and assessment and regulatory compliance. The Acting phase looks at management review and actions for continuous improvement. The final part

includes checking and monitoring trends, performance indicators, audits and modelling (Chauhan, 2013).

Forseth and Roseness (2021) further examined the role of dialogue in as a regulatory strategy in the Norwegian oil and gas sector. their study analyzed reports, texts, documents and data from focus group interviews. The study proposed that regulators can use dialogue as a regulatory strategy to management health and safety compliance. They also recommended that regulators use conditional sense giving, a form of dialogue, to allow the regulatees frame their health and safety challenges as deficiencies that can be corrected rather than human errors that ought to be penalized.

Premised on the fact that environmental health and safety challenges are rising in the Nigerian oil sector, Muazu and Tasmin (2019) conducted a comprehensive literature review to uncover the underlying problems and causes of these challenges. The study found that environmental health and safety performance in the sector is on a decline as fatalities and incidents surge. Among other things, the study recommended that the regulatory framework of the sector the upgraded and enhanced. Training and risk management culture should be inculcated into oil firms, while the deployment of dynamic and state of the art technologies and an enterprise-wide risk management strategy be adopted to resolve such issues. They propose that the regulators and oil and gas companies adopt and implement operational excellence strategies to improve health and safety performance. In this regard, a proactive strategy that considers all factors wholistically is required to help mitigate most of these health and safety problems and challenges within the oil and gas sector.

Gaps in the Literature

From the comprehensive literature review conducted, it is observed that there are quite number of studies on occupational health and safety. However, most of these studies are domiciled in sectors other than the oil and gas industry, with the construction industry dominating. Again, most of these studies were conducted in organizations in foreign countries other than Ghana. It is also noted that majority of the literature reviewed talks about offshore operations in the oil and gas sector but in recent times, our ports and harbours have become important hubs in the oil and gas value chain.

In this line of enquiry, this study seeks to investigate the occupational health and safety practices within the ports and harbours of Ghana, using the Takoradi Port as a case study. The study will highlight the knowledge and awareness levels of employees, the various safety practices in use and other issues that have to deal with compliance with health and safety regulatory requirements in Ghana.

Chapter Summary

In this chapter, the Normal Accidents Theory (NAT), the protection motivation theory (PMT) and the Human Error Theory (HET) were reviewed to provide the theoretical justifications for the study. Past studies were also reviewed in line with the objectives of the study and the gaps in the literature were identified.

CHAPTER THREE

RESEARCH METHODS

Introduction

The study methods used to examine the health and safety practices in the oil and gas sector at the Takoradi Port are discussed in this chapter. As a result, this chapter assists in ensuring that the evidence gathered allows the study to answer questions or test theories as clearly as feasible. The chapter entails the research design, research approach, data collection technique, target population, sampling techniques adopted, the instrument used to collect data, data analysis method and ethical issues to be considered for the study and the chapter summary.

Research Design

The research design specifies the methods and procedures for gathering and analyzing the required data, and research design is a series of advanced decisions that make up the master plan. It gives a structure for describing the relationships between the variables in the study (Cooper & Schindler, 2014). Flexible, adaptive, efficient, and cost-effective research designs should be used. It should contain as few errors as feasible while minimizing bias and maximizing accuracy of the data obtained. An exploratory, descriptive, or explanatory research design is possible (Saunders & Lewis, 2012).

The study adopts the exploratory and descriptive research designs to explore and further describe the health and safety management practices in handling oil and gas at the ports. Exploratory research is undertaken to

elucidate ambiguous conditions or uncover potential business opportunities (Zikmund, Babin, Carr & Griffin, 2010). That is to say, exploratory research is not an end unto itself. It aids scholars to advance concepts more clearly, establish priorities, provide operational definitions, and improve the final structure of the research (Cooper & Schindler, 2014). The descriptive research further used to describe the state of events within the research area to give a better description of the situation. This would help give a clearer picture of the health and safety practices at the port and inform future decisions regarding the safety practices, challenges and strategies in handling oil and gas activities.

The study employed a cross-sectional survey. This is because the data would be gathered at one point in time to enable the study answer its objectives and hypotheses (Bongomin, Munene, Ntayi & Malinga, 2018). Sarantakos (2012) suggests that cross-sectional research design enables researchers to collect a huge amount of data from a large number of people on a wide diversity of respondents. This is because the sampled variables being examined are simply observed as they are without any attempt to influence or manipulate them, a cross-sectional research survey would be chosen. Despite its benefits, cross-sectional research has certain drawbacks. Cross-sectional study approaches, for example, do not allow researchers to assess time in terms of exposure and effect (Hausman & Rapson, 2018).

The cost of conducting the study rises in tandem with the size of the sample or the number of variables (Bongomin *et al.*, 2018).

Research Approach

Creswell and Creswell (2018, p.3) defined research approaches as "the plans and procedures for study that encompass the steps from general assumptions to precise methods of data collection, analysis, and interpretation." A research approach, is the nature of a researcher's research direction and scope definition and comes in three forms, thus, qualitative, quantitative, and mixed research approaches (Creswell, 2014). The quantitative research method was used in this study. This type of study employs arithmetical and statistical processes to answer questions, with a focus on maximizing objectivity, replicability and generalizability of findings (Creswell, 2014). Thus, in order to meet the research objectives a quantitative technique was used.

Study Area

Ghana's first port, Takoradi, opened for commerce in 1928 to boost the country's multinational trade. The Port is located on latitude 4°53'20"north, 1°34'50"west, 225 kilometers west of Accra, Ghana's capital. The Port's strategic location offers it an excellent route to and from Europe, America, and Asia (Ghana Ports and Harbours Authority (GPHA), 2019). It is strategically located to serve Ghana's northern hinterland as well as the international trade of Burkina Faso, Mali, and Niger, the three Sahelian landlocked countries. In 2019, the Port handled 38% of Ghana's seaborne traffic, 75% of the country's seaborne fares, and 17% of Ghana's seaborne imports. Manganese, bauxite, clinker, wheat, bulk and bagged cocoa, quicklime, containerized cargo, and mining and oil and gas industry gear are among the major items carried through the Port (www.ghanaports.gov.gh).

Since the discovery of massive quantities of oil in 2007 around 70 nautical miles from the Port, the Port of Takoradi has made a huge contribution to Ghana's economy and continues to be the primary strategic logistical support base for offshore oil and gas prospecting and production in Ghana and beyond. Without a doubt, vessel calls have increased from 600 per year (before to the discovery of oil) to 1628 per year in 2019. Calls on offshore supply vessels climbed from 11% in 2007 to 60% in 2019 (see www.ghanaports.gov.gh). Over twenty enterprises in the oil and gas value chain, both domestic and international, are currently based at the port. Tullow, ENI, Schlumberger, Zeal Environmental, Springfield, Goil Ghana, Ghanstock, Halliburton, Viking Offshore Ltd, Cirrus Oil Ltd, Belmet 7, and others are among the companies involved.

Interestingly, the vision of the Port is to be a world-class Port, the dominant oil and gas services hub of West Africa. This goes to suggest that the port plays a key role in the oil and gas sector in Ghana and West Africa has a whole. More so, on a five-point core values, the Port ranks commitment to employees as the first. If the port as an organization believes that a safe, healthy and conducive work environment is needed for the success of the organization, then other firms within the port, especially oil and gas related ones, will have no cause to go contrary. This makes the Takoradi Port a very important place to undertake this research and assess the oil and gas health and safety management practices within the port.

Population of the Study

The study focused on health and safety practices, challenges in handling oil and Gas at the Takoradi Port. According to the 2019's report

by the Ghana Ports and Harbours Authority (GPHA), there are close to forty (40) oil and gas related firms in the Takoradi Port, with a total staff number of about three hundred and ninety (390) employees. Therefore, this study concentrated on these employees as the target population for the study. Due to the dynamic nature of the firms in terms of operations (since some are into storage, transport, ancillary services, waste management among others), this population was selected in order to assess the health and safety management practices within these firms and at the port.

Sample Size and Sampling Technique

Sampling techniques can be categorized into two; probability and non-probability techniques. With probability sampling, scholars use a random choice of elements to eliminate or reduce sampling bias whereas with the non-probability sampling, the chance of selecting population elements is unknown (Cooper & Schindler, 2014). Moreover, with probability sampling technique, each member of the population has an equal probability of being included in a sample in this design (Taherdoost, 2016). Cluster probability sampling technique was employed in this study. This is a technique where researchers mostly divide the population into multiple groups or clusters and select sample randomly. Mostly the population is mutually homogeneous yet internally heterogeneous groups exist in the total population. Cluster sampling is beneficial for researchers whose participants are dispersed across wide localities since it saves them time and money (Rapp, Peters & Dachsbacher, 2019).

Yamane's 1967 recommended formula was used to compute the sample size for the investigation.

This formula is given as:

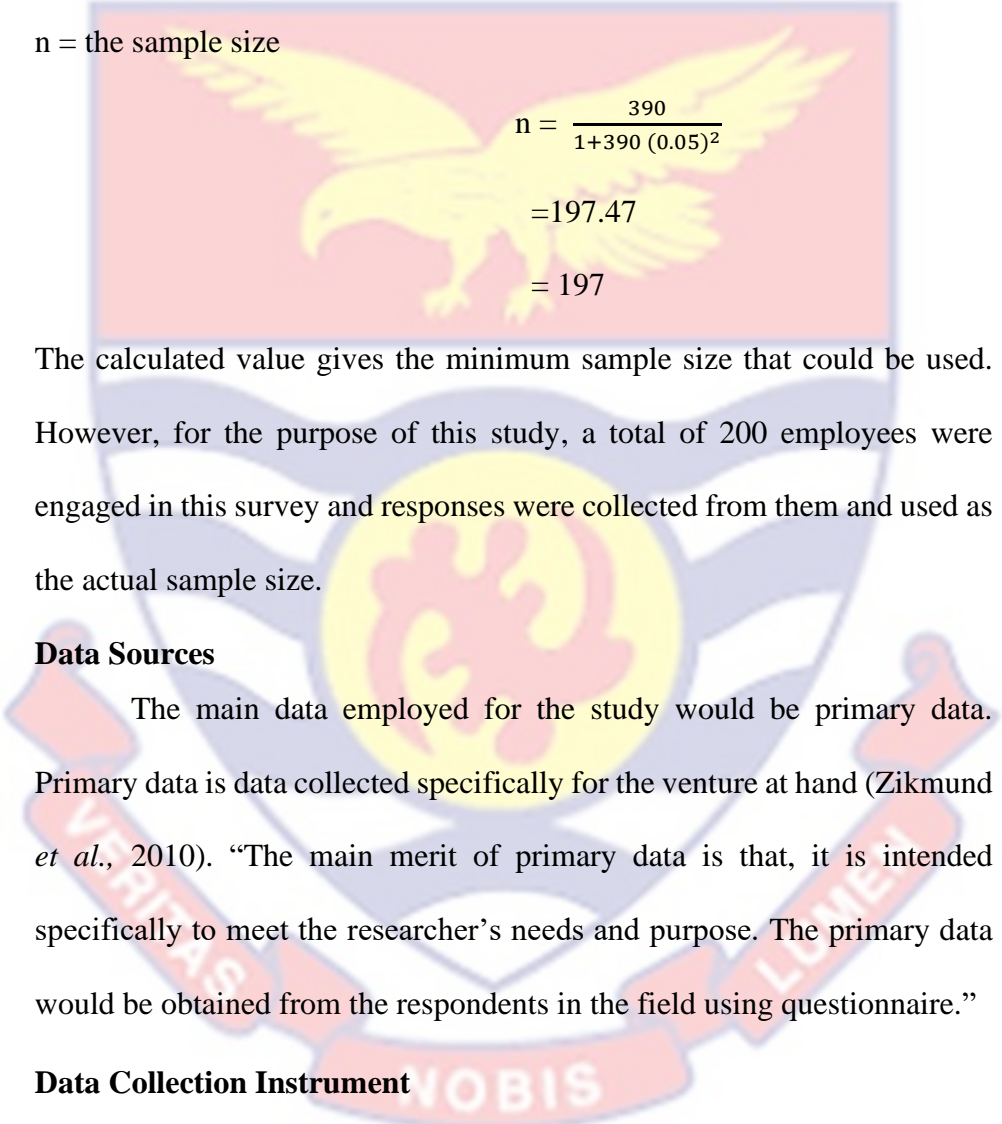
$$n = \frac{N}{1+N(e)^2}$$

Where,

N= the total population (390)

e= the 5 %margin of error which is 0.05 in the social sciences

n = the sample size


$$\begin{aligned}n &= \frac{390}{1+390(0.05)^2} \\ &= 197.47 \\ &= 197\end{aligned}$$

The calculated value gives the minimum sample size that could be used. However, for the purpose of this study, a total of 200 employees were engaged in this survey and responses were collected from them and used as the actual sample size.

Data Sources

The main data employed for the study would be primary data. Primary data is data collected specifically for the venture at hand (Zikmund *et al.*, 2010). “The main merit of primary data is that, it is intended specifically to meet the researcher’s needs and purpose. The primary data would be obtained from the respondents in the field using questionnaire.”

Data Collection Instrument

Since the study took a quantitative approach, a structured questionnaire was employed to elicit responses from the study's sample. The questionnaire items were included in the study to improve the study's validity and trustworthiness (Sarantakos, 2012). Yirenkyi (2017), Rengamani and Venkatraman (2015), and Osabutey *et al.* (2017) have all

utilised items from earlier studies published in internationally recognized publications that have been proven to be reliable and valid. The questionnaire was pre-tested, with all of the items going through validity and reliability checks. The main study's data was collected over the course of one month, thus, December, 2020 from a total of 200 employees who were randomly selected for the study. The author adopted the questionnaire of Liu *et al.* (2020).

Data Processing and Analysis

The data gathered from the survey was first cross-checked to ensure that all questions are answered by respondents accurately and the responses are correct, error-free and without any missing data. The questionnaires were then given serial numbers before entering them into the analytical software. The quantitative data was processed using SPSS version 22. The responses were recorded using codes assigned to various questions within each variable in this study. Missing values and outliers in the data were checked using data screening. The quantitative data was presented using descriptive statistics such as tables, percentages, and frequencies.

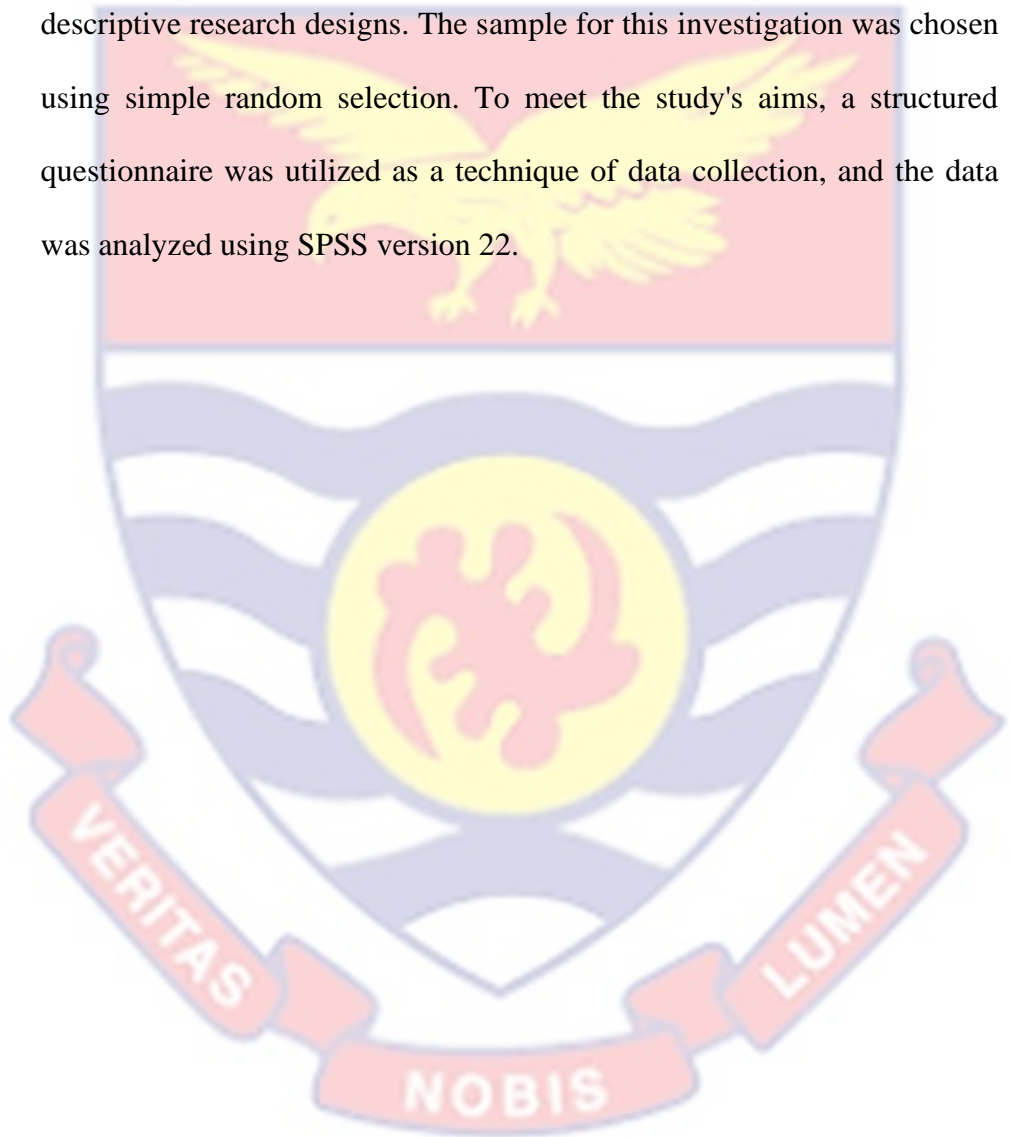
Ethical issues

Studies that use human respondents advances peculiar and intricate ethical and legal issues. Ethics in research is precisely interested in the analysis of ethical issues that are posed when people are the units of analysis. All ethical issues that involved researcher-respondent's relationships were adhered to in this research. Participants were educated on their rights to opt-out of the study and refuse to answer questions they

considered sensitive. Participants' confidentiality and anonymity were also protected which according to Punch (2007) is very paramount.

Chapter Summary

To investigate the Health and Safety practices in handling oil and gas in Ghana's Takoradi Port, the researchers used exploratory and descriptive research designs. The sample for this investigation was chosen using simple random selection. To meet the study's aims, a structured questionnaire was utilized as a technique of data collection, and the data was analyzed using SPSS version 22.



CHAPTER FOUR

RESULTS AND DISCUSSIONS

Introduction

This chapter presents the findings of the analysis and the discussion of the results for the study. The chapter basically presents the descriptive statistics of the respondents' demographics and the empirical discussions of the main results. The results are discussed according to the objectives of the study.

Response Rate

As pointed out earlier, the study had a sample size of 200 employees of the oil and gas related companies in the Takoradi Port. As a result, questionnaires were self-administered to all 200 randomly selected respondents over a period of two weeks and were given ample time to complete the questionnaires before the researcher returned for them. A total of 192 completed questionnaires were retrieved from this process. This gives a successful response rate of 96%. According to Muthama (2016), a study with a response rate of anything above 50% is a good basis for an empirical analysis. Based on this, the researcher proceeded to analyze the data gathered through the questionnaire administration process.

Respondents Demographics.

This section presents the demographic characteristics of the respondents of the survey. This is summarized in table 1.

Table 1: Summary of Respondent’s Demographics

Variable	Items	Freq	Percent
Age	18 – 25	4	2.1
	26-35	52	27.1
	36-45	98	51.0
	above 45	38	19.8
		192	100
Sex	Male	165	85.9
	Female	27	14.1
		192	100.0
Education	Basic/Middle School	10	5.2
	Senior High	58	30.2
	Tertiary	124	64.6
		192	100.0
Company type	Foreign company	40	20.8
	Ghanaian private	30	15.6
	state owned	122	63.5
		192	100.0
Length of service	6 months – 1 year	2	1.0
	1 year – 2 years	10	5.2
	Above 2years	180	93.8
		192	100.0

Source: Field Survey (2021)

From Table 1, it is observed that the age bracket of respondents that dominated the study are those in the bracket of 36 to 45, representing 51% of the respondents.” This is followed closely by those in the bracket of 26 to 35 years, having a percentage of 27.1%. Respondents within the ages of 18 to 25 were only 4, representing 2.1%, while those above 45 years are 38, representing 19.8%. This suggests that the oil and gas sector is dominated by workers in their youthful age. This is because the risky nature of the industry would require exuberant personalities to work in the sector. This is consistent with Fullarton and Stokes (2007), who also revealed in their study that the oil and gas industry thrives on a younger workforce.

The results from the demographics also revealed that majority of the respondents were males (165), forming about 86% of the sample size while females numbered 27, approximately 14% of the sample. Dahl and Kongsvik (2018) found that oil industries in most oil producing countries such as Norway are dominated by over 90% of males. This is also likely to be due to the risky nature of the industry. The educational background of the respondents revealed that majority (64.6%) employees surveyed had a form of tertiary education, followed by senior high school graduates (30.2%) and basic school leavers of 5.2% respectively.

The results further revealed that 63.6% of the respondents worked for state-owned companies while 20.8% worked for foreign companies. The final 15.6% are employees of private Ghanaian oil and gas companies. This goes to support the assertion that, due to the higher capital requirements in the oil and gas sector, the industry is mostly dominated by governments and foreign investors with local indigenes having a small part to play. The final demographic variable taken was the length of time of service with the respective companies. The results revealed that over 180 of the respondents had been working in the industry for over 2 years, with only 12 people being with their respective firms for less than 2 years. This implies that the respondents of this survey have had quite a good number of working experiences within the sector and for that matter, they would provide appropriate data for the current study.

Empirical Analysis

The main purpose of the study was to examine the health and safety practices, challenges and strategies in the oil and gas sector at the Takoradi

Port. To achieve this purpose, three objectives were specified for the study and data was collected to analyse same. The results were also analysed based on their means, standard deviations and relative importance index (RII). Means and standard deviations for each item were computed using SPSS version 22 whereas the RII was computed using Microsoft Excel. The computations for the relative importance index are presented in the appendix of the study. The following section presents the analyses of the results and its discussion in relation to the literature.

Objective One: Health and safety practices in handling oil and gas at the port

To assess the health and safety practices in handling oil and gas at the port, respondents were asked to indicate their degree of agreement with nine statements on oil and gas handling practices in the sector based on items adapted from previous studies.” The results are presented below;

From Table 2, it can be observed that the most prominent oil and gas handling safety practice is the provision of PPE, with a relative importance index (RII) of 0.786. The table also reveals that 50 of the respondents strongly agreed that adequate PPEs are provided for employees in the course of the discharge of their roles. 92 of the respondents also agreed that there is adequate provision of PPEs while 41 of the respondents also fairly agreed to the assertion.

Table 2: Health and Safety Practices

Item	1	2	3	4	5	Mean	SD	RII	Rank
Adequate provision and use of PPE	4	5	41	92	50	3.93	0.875	0.786	1 st
Availability of Alarm Systems	8	18	58	71	37	3.58	1.036	0.716	4 th
Visitor safety training	17	30	54	67	24	3.27	1.138	0.653	8 th
Availability of first aid kits and clinical services	6	18	41	85	42	3.72	1.009	0.745	3 rd
Dedicated Safety Officers	6	19	62	75	30	3.46	1.063	0.708	5 th
Safety information communication system	4	25	66	73	24	3.54	0.975	0.692	6 th
Adequate safety facilities	26	28	40	78	20	3.46	0.943	0.639	9 th
Ignition control measures	8	17	69	77	21	3.45	0.948	0.689	7 th
Emergency assembly points	10	4	35	84	59	3.93	1.021	0.785	2 nd

Source: Field Survey (2021)

Interestingly, some four respondents strongly disagreed to this assertion while another 5 people also disagreed that there is adequate provision of PPE in their workplaces. This finding corroborates the results of Lette et al (2018) who discovered that the failure of firms to make available safety equipment and educate personnel on its utilization will probably lead to high-rate work-related accidents. The results also somewhat contradict those of Toseafa, Bata, and Toseafa (2018), who reported that OHS equipment and protective clothing were insufficient for employees in their study.

The next important health and safety practice at the port, according to the relative importance index is the availability of an emergency assembly point. With a mean of 3.93 and a standard deviation of 1.021, 59 of the respondents strongly agreed that there were emergency assembly points at their workplaces in the port. Another 84 of the respondents agreed that emergency assembly points were available. 35 of the respondents had a fair agreement that emergency assembly points were available while 10 and 4 of the respondents strongly disagreed and disagreed respectively.

Another important safety practice according to the respondents, is the availability of first aid kits and clinical services. On a relative importance index of 0.744792, mean of 3.72 and 1.009 standard deviations from the mean, 6 of the respondents strongly disagreed to this statement while 18 also disagreed. 41 of the study's respondents were in fair agreement with the statement. Similarly, a larger proportion of the respondents agreed that there were clinical services and first aid kits available at their workplace while the last 42 of the respondents strongly agreed to this. The results are consistent with those of Zhou, Goh and Li (2015) who concluded that adequate provision of first aid and other services positively impacts organisational atmosphere and workplace safety.

The fourth item that was highly ranked on the relative importance index was the availability of alarm systems as a safety practice in the port. Such alarms are used to alert employees of any seemingly impending danger or risk and to also assemble employees when the need be. In summary, more than half of the respondents (108) agreed that alarm systems are available while only 24 out of the 192 respondents disagreed

on the availability of safety systems. 58 of the respondents, representing 30% of the respondents were also in fair agreement to this.

Furthermore, the results revealed that based on the RII, the respondents ranked the presence of dedicated safety officers (5th), the availability of safety information communication system (6th) and ignition control measures (7th) as the next three vital health and safety practices in the oil and gas sector at the Takoradi Port. In relation to safety communication, Tang *et al.* (2011) asserts that a system of communication that allows employees to freely open up and voice out their grievances on safety issues also promote workplace safety and reduces occupational hazards. Again, Dahl and Kongsvik (2018) notes that when management openly communicates about health and safety issues, it is regarded as an appropriate and important for mindful safety practice in organisations, and therefore recommends the need for safety information sharing.

Other practices such as visitor training safety (8th) and adequate safety facilities (9th) were also highlighted. The low rank of the statement on adequate safety facilities seems to suggest that a number of the employees in the sector are not too impressed about the safety facilities in the port. This is highlighted by the high number of respondents disagreeing to the statement while only 20 of the respondents strongly agreed to the statement. Consistently with this results, Dahl and Kongsvik (2018) also suggest that training employees and other stakeholders around the workplace in the oil and gas industry allows these people to gain the knowledge and skills necessary to identify safety risks and also act accordingly. The availability of safety facilities also prevents employees

from cutting corners to adhere to safety practices in the sector (Jacinto, Soares, Fialho, & Silva, 2011).

Objective Two: Challenges faced in ensuring health and safety practices in the industry

The second objective of the study aimed at assessing the health and safety challenges employees face in the oil and gas sector in the course of their daily activities. The respondents were required to indicate their level of agreement to seven items on a five-point likert scale. The responses were analysed in terms of their means, standard deviations and relative importance index (RII). The analysis is presented below;

The responses of the employees surveyed gives an indication of what they think are the challenges faced in complying with oil and gas health and safety directives in the Takoradi port. With a fair mean of 3.2 and a standard deviation of 1.216, respondents suggested that the lack of awareness on health and safety measures in their line of duty is the major challenge faced in the sector. The responses revealed that 98 of the respondents totally agree with this statement while 40 of the respondents were in fair agreement with the assertion. 54 of the respondents however were on lower levels of agreement with the assertion that lack of awareness on the health and safety measures posed a greater challenge.

Table 3: Health and Safety Challenges in the Oil and Gas Sector

Item	1	2	3	4	5	Mean	SD	RII	Rank
Lack of a legal and regulatory framework	24	34	83	44	7	2.88	1.021	0.575	6 th
Ineffective enforcement agency	17	33	86	45	11	3.00	0.997	0.600	5 th
Inadequate training of site workers on HS&E issues	21	34	70	53	14	3.03	1.090	0.605	4 th
Lack of adequate technology to monitor and evaluate HS&E trends and indicators	22	33	68	52	17	3.05	1.122	0.609	3 rd
Lack of access to materials and PPE	35	41	53	57	6	2.78	1.150	0.556	7 th
Poor risk assessment management process	23	29	65	62	13	3.07	1.107	0.614	2 nd
Lack of awareness on health and safety measures	26	28	40	78	20	3.20	1.216	0.639	1 st

Source: Field Survey (2021)

The assertion was ranked first with a relative importance index of 0.639. This implies that the sensitization programmes on safety and health issues in the port is low. It is therefore prudent to argue that management of the various oil and gas companies in the port would be able to reduce cost

associated with workplace accidents and injuries which in turn maximise the profit of the firm, if employees are made aware of the various health and safety measures available to help reduce accidents. This finding however contradicts the findings of Akinradewo and Arijeloye (2019) who had earlier suggested that employees are mostly aware of the occupational health and safety regulations, even though their compliance is low. Umeokafor (2017) also indicated that a major cause of casualties in the sector is attributable to the lack of knowledge and skills for maintenance at the workplace.

The next important factor considered as a challenges by oil and gas workers in the port (using the RII) is the poor risk assessment management process (mean=3.07, SD=1.107) within oil and gas related firms. The results suggest that 13 of the respondents strongly agree that there is poor risk assessment in the industry while 62 of the respondents agree. 65 of the respondents were also found to be on moderate agreement whereas 28 disagree and 26 strongly disagree. The higher rank assigned to this challenge by the workers implies that to approach taken by management to assess risks related to their field of work needs to be improved since injuries and accidents occurrence are likely to reduce if managements implement new risk assessment and safety procedures. Similar findings were reported by Toseafa *et al.* (2018), who documented that the absence of proper risk assessment procedures and safety management frameworks distracts workers capacity to work effectively.

More so, it was indicated from the RII that the lack of adequate technology to monitor and evaluate health and safety trends and indicators

(RII = 0.6094) in the sector also posed a challenge to OHS management. From the results, the respondents were somewhat split about whether technology to monitor and evaluate was a major challenge. Only 17 people were of strong agreement to this while 52 agreed to the statement. 68 of the respondents were neutral while a combined number of 55 were in different forms of disagreement. This suggests that trends in monitoring and evaluating the safety practices in the port do not meet the satisfaction of employees in the sector. Similar to this results, Skogdalen, Utne, and Vinnem (2011) suggested that due to the higher risk of the industry, state of the art technology is needed to monitor and evaluate the effectiveness of safety practice and to ensure safety compliance in offshore oil and gas firms.

Other challenges were ranked based on the responses, indicating that inadequate training of site workers on health and safety issues (fourth), ineffective enforcement agency (fifth), Lack of a legal and regulatory framework (sixth) and Lack of access to materials and PPE (seventh) are other challenges in occupational health and safety management in the oil and gas sector. The lower ranking of these factors also show that they are not the main challenges in the industry. The fourth challenge faced by employees in the industry is also important because if there exist well-established safety systems and workers do not have the needed safety knowledge to conform with the standards, safety rules and guidelines, they would not be able to understand the safety protocols in controlling risk and hazard exposures. The results of this study also corroborate previous existing studies. For instance, Lette *et al.* (2018) discovered that the failure

of firms to make available safety equipment and educate personnel on its utilization will probably lead to challenges such as high-rate work-related accidents. Akinradewo and Arijeloye (2019) also recommended that due to the high-risk nature of some industries such as the oil and gas, regulatory and enforcement bodies should be commissioned and empowered to enable them enforce health and safety rules in those industries.

Objective Three: Strategies to mitigate challenges faced in oil and gas safety compliance

The third and final objective of the study examined the strategies (employed and recommended) that the petroleum related firms use to ameliorate the health and safety challenges, enhance safety practices and improve compliance to legal and regulatory requirements. This objective was assessed using five items on a five-point likert scale. The results are presented in the table below;

Each respondent was asked to rate the above factors relative to their perception of how the factors can help mitigate the health and safety challenges in the industry. The relative importance index computations revealed rather interesting results. Comparing the factors of this objective to the other factors, it is observed that the RII in Table 4 were higher than those computed for the other objectives in the other two tables. This shows the level of consistency and agreement by the respondents in terms of their believe on how these factors can be helpful in mitigating the challenges mentioned earlier.

Table 4: Health and Safety Strategies to mitigate Challenges

Item	1	2	3	4	5	Mean	SD	RII	Rank
(a) Effective regulation can lead to better health and safety outcomes	6	13	20	82	71	4.04	1.015	0.807	4 th
(b) Capacity building among regulatory institutions.	7	8	34	78	65	3.97	1.007	0.793	5 th
(c) Knowledge building and sensitization of workers on HS&E issues	5	11	17	76	83	4.15	0.983	0.830	3 rd
(d) Improved working conditions	8	8	15	64	97	4.22	1.041	0.844	2 nd
(e) An integrated risk assessment management process	4	8	16	72	92	4.25	0.927	0.850	1 st

Source: Field Survey (2021)

The results revealed that an overwhelming majority of the respondent agreed that there is the need for an integrated approach to the risk assessment and management process in these organisations. With a near perfect mean of 4.25 and 0.927 deviations from the mean, 92 of the respondents strongly agree to this statement as against only 12 who had lower levels of agreement with the strategy. 72 of the respondents were also in agreement with this strategy while the other 16 were of moderate agreement to this strategy and assertion. Such an approach includes an all-involved decision-making process, employee and management commitment towards health and safety issues, a comprehensive policy

statement on health and safety and the prioritisation of the health and safety needs of employees (Blanc, 2018).

Furthermore, the respondents revealed that the next strategy to mitigate the challenges in complying with health and safety practices in the oil and gas sector is to improve the working conditions in the sector. Having a relative importance index of 0.8438, a mean of 4.22 and a standard deviation of 1.041, 97 respondents strongly agreed that improving working conditions in the sector is a good way to mitigate most of the challenges encountered in the sector. In addition, 64 of the surveyed employees also agree to this fact while 15 people were moderate in their assessment. Some 16 people were also at the lower levels of agreement on the likert scale. This assertion is true because, actions taken to improve working conditions such as creating a safe a conducive working environment, first aid facilities, adequate provision of PPE and advances in other employment conditions also go a long way to curb unhealthy practices and ensure sustainable workplace behaviour (Akamangwa, 2016). This can help ameliorate the number of accidents and hazards within oil and gas firms.

The next approach or strategy towards improving health and safety of practices and mitigating the challenges as per the RII is Knowledge building and sensitization of workers on Health and Safety issues. With a RII of 0.8302, mean of 4.15 and 0.928 deviations from the mean, the results indicate that 83 of the respondents strongly agreed that there is the need for knowledge building and sensitization of employees in the sector as a way of reducing health and safety hazards. Another 76 of the surveyed respondents also agree to this, while 17 were moderate in their agreement

to this assertion. A total of 16 respondents were on the lower parts of the scale.

The implication of this finding is that, since employees are the ones who come into contact with most of these risks and safety hazards, there is the need for them to be given adequate training in health and safety related issues so as to enable them comply and work in a hazard free environment. There is also the need for capacity building and sensitization of these employees in all sectors of the industry. The results are similar to those of Haridoss (2017) who concluded that constant training and refreshment of knowledge is crucial to avoid possible occurrences which may result from complacency. Similarly, Abad *et al.* (2013) reported that enhancing safety does not really mean providing safety frameworks or conducive climate for workers alone but training and educating employees to improve their health and safety information.

Furthermore, the results indicated that the effective regulation can lead to better health and safety outcomes in the sector. this is evidenced from the high mean of 4.04, 1.015 deviations from the mean and a relative importance index of 0.8073 as the 4th highest ranked strategy. In all, 71 respondents were in strong agreement with this statement whereas a further 82 also supported the statement. Again, 20 people fairly agreed while about 19 respondents agreed at the lower levels of the scale. This strategy suggests that there should be enhanced regulation of the activities of the sector especially in terms of organisational health and safety issues and enforcement of the regulations should be strict. Jacinto *et al.* (2011) also suggest that the implementation and application of health and safety

regulations is the first and basic strategy to prevent occupational hazards in the petroleum sector.

The final strategy proposed in this study was capacity building among regulatory institutions. This statement had the least mean of 3.97 (SD = 1.007) and the least RII of 0.79375. In response to the statement, 65 of the respondents strongly supported the suggestion of building the capacity of regulatory institutions. Another 78 of the respondents were also in agreement with this factor while 34 also agreed with some level of moderation. 15 of the respondents also gave their agreement in lower levels.

Indeed, regulatory institutions ought to be empowered to carry out their regulatory functions through the provision of resources, logistics and adequate funding. The capacity of personnel in these institutions should also be improved to enable them work effectively. It is also worth mentioning that regulatory authorities are allowed to work in a free, firm and fair environment devoid of any political interferences. “This can go a long way to enhance the health and safety compliance of employees in terms of safety practices and health and safety regulations and requirements.” In addition to the above listed strategies to curb the health and safety challenges, Salguero-Caparrós *et al.* (2020) recommended that oil and gas related firms should adopt proactive strategies that would help them ameliorate some of these challenges and enhance compliance.

Chapter Summary

This chapter presented the results and discussions of the study. The chapter began by explaining the response rate attained from the questionnaire administration and then proceeded with the demographic

characteristics of the respondents. “The empirical results analysed the findings in terms of each objective, focusing on health and safety practices in oil and gas firms, challenges in complying to health and safety regulations and practices and strategies to mitigate some of these challenges. The chapter ended with a summary.



CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter presented the summary of the study, conclusions drawn and the recommendations from the findings. The chapter is presented in four sections. The summary of the whole study is presented in the first section indicating the objectives, scope of the study, and methodology in brief. This is followed by a presentation of the major findings and the conclusions drawn from the major findings is presented next. The recommendations section is the third part of this chapter. This section presents the appropriate recommendations with reference to the major findings, conclusions and implications identified in this study. The final section indicates the suggestions for future studies. It captures gaps and important research issues for future consideration.

Summary of Research

As Ghana's oil and gas hub, the Takoradi Port houses several firms in the oil and gas supply chain. These firms are susceptible to numerous health and safety hazards, both to employees and property. This means that there is the need for the firms to put in place health and safety practices and also comply with occupational health and safety regulations. However, some organisations find it challenging to implement the safety practices and also adhere to those regulations. Thus, the present study examined the health and safety practices, challenges and strategies to mitigate these challenges among oil and gas related firms within the Takoradi Port. The specific objectives were to:

1. assess the health and safety practices in handling oil and gas at the port.
2. examine the challenges faced in ensuring health and safety practices in the industry.
3. assess the strategies adopted in mitigating the challenges in the industry.

Based on the theory of normal accidents, protection motivation theory and the human error theory, the conceptual definitions and reviews were provided before following it up with the empirical review to support the objectives.

The study followed a quantitative approach and employed the exploratory and descriptive research design to analyse the objectives of the study. A questionnaire was developed to solicit data from 200 respondents sampled randomly for the study. The data gathered was analysed using SPSS and Microsoft excel. The findings from the analysis are summarized in the next section.

Summary of Findings

Following the analysis of the data collected, some major findings were made. The findings have been summarised below;

In response to the first objective, the study revealed based on the RII that the health and safety practices among oil and gas firms in the port include the adequate provision of PPE, emergency assembly points, availability of first aid kits and clinical services, availability of alarm systems, dedicated safety officers, safety information communication systems, ignition control measures, visitor safety training and adequate

safety facilities. The results suggest that these safety practices have been implemented at various levels in different firms in the port.

Regarding the second objective, the study observed and found that among other challenges, the most compelling challenges that oil and gas related firms face in the industry include lack of awareness on health and safety measures, poor risk assessment management process, lack of adequate technology to monitor and evaluate health and safety trends and indicators, inadequate training of site workers on health and safety issues, ineffective enforcement agency, lack of legal and regulatory framework and lack of access to materials and PPE. These were highlighted as the challenges that mainly obstruct oil and gas health and safety protocol compliance in the port.

The final objective examined the strategies that can be devised to mitigate some of these health and safety challenges within oil and gas related firms in the port. The results revealed that some strategies that can be devised to mitigate the health and safety compliance challenges in the oil and gas sector include; employing an integrated risk assessment management approach, improving the working conditions of employees, sensitizing and building the knowledge level of workers, effective health and safety regulations and capacity building of the regulatory institutions. The level of consensus at which the respondents agreed to the strategies were evident in the higher relative importance index found for each of the five strategies.

Conclusions

Based on the findings from the analyses, the following conclusions were drawn;

There are some health and safety measures that are common in the port practiced by the oil related firms. These include provision of protective clothing, emergency assembly points, availability of first aid and alarm systems, dedicated safety officers among others. In line with the protection motivation theory, we conclude that such practices are motivated by the need to protect employees from the occupational hazards they are likely to encounter in their line of duty. However, compliance to these health and safety measures is obstructed by some challenges that the firms and employees face in their line of duty. The major challenges faced include lack of awareness on health and safety measures, poor risk assessment management, lack of adequate technology to monitor and evaluate health and safety trends and indicators, and inadequate training of site workers on health and safety issues. Most of these challenges are human related, thereby agreeing with the human error theory that some actions on the part of employees are the likely causes of accidents in the workplace.

To curb these challenges, employees agreed to some strategies that were suggested that can be adopted to help mitigate the challenges key among these strategies include taking an integrated approach towards risk assessment and management, enhancing the working conditions of employees, sensitizing and building the knowledge level of workers, effective health and safety regulations and capacity building of the regulatory institutions. This study therefore concludes that health and safety

issues be tackled wholistically to ameliorate any adverse happenings in the port.

Recommendations

Based on the findings and conclusions, the following recommendations are made;

Management should see to the regular and constant supply of PPEs for staff members to aid them discharge their duties in protective clothing. Employees must also be encouraged to keep personal PPEs in addition to those provided by the organisation and practice good maintenance culture to prolong the life of the PPEs. It is also recommended that health and safety communication should be well articulated and consistent so as to keep employees abreast and alert on a regular basis.

The study correspondingly recommends that regulation and enforcement of the safety protocols be implemented effectively and rigorously. Oil and gas firms should be encouraged to practice self-regulation, where they are their own watchdogs in terms of ensuring that safety regulations are complied with. Due to the constraints small enterprises face in terms of finance, personnel, resources and technical know-how, it is recommended that regulators also make the regulatory and compliance process less cumbersome so as to improve compliance by smaller firms as well.

Suggestions for future study

Future studies can look at the impact of health and safety practices, compliance and challenges on performance of employees in the oil and gas

industry. Other studies can also focus on the health and safety and performance of the oil and gas firms in the port.



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APPENDIX

UNIVERSITY OF CAPE COAST
COLLEGE OF HUMANITIES AND LEGAL STUDIES
(INSTITUTE OF OIL AND GAS STUDIES)
MBA OIL AND GAS MANAGEMENT

Questionnaire on Health and Safety Practices, Challenges and Strategies in Handling Oil and Gas at Takoradi Port

Dear respondent, this questionnaire is designed to measure the health and safety practices in handling oil and gas issues in the Takoradi Port. Your views would be highly valuable for the success of this study. The questionnaire has been designed with strict adherence to the code of ethics of research at the University of Cape Coast. Please be assured that the data collected is purely for academic purposes and that your anonymity and confidentiality are therefore assured.

Section A: Respondents Demographics

Please complete this form. **Tick your choices.**

1. Age of respondents (years):
18 – 25 [] 26 – 35 [] 36 – 45 [] Above 45 []
2. Sex of respondents: Male [] Female []
3. Educational background:
 - a. Basic /Middle School []
 - b. Senior High/Secondary School []
 - c. Tertiary []
4. Type of company you work with
 - a. Foreign company []
 - b. Ghanaian private owned []
 - c. State owned []
5. For how long have you been working with this firm?
 - a. 1 day – 6 months []
 - b. 6 months – 1 year []
 - c. 1 year – 2 years []
 - d. Above 2 years []

Section B:

Part 1: Health and Safety Practices

Please score the following prevailing health and safety management practices at your work place with 1 being the least and 5 being the strongest agreement

Variable	1	2	3	4	5
Adequate provision and use of PPE					
Availability of Alarm Systems					
Visitor safety training					
Availability of first aid kits and clinical services					
Dedicated Safety Officers					
Safety information communication system					
Adequate safety facilities					
Ignition control measures					
Emergency assembly points					

Section C: Occupational Health and Safety Challenges

Please indicate your level of agreement on the following issues on a scale of 1 to 5, with 1 being the least and 5 the highest.

Variable	1	2	3	4	5
(a) Lack of a legal and regulatory framework					
(b) Ineffective enforcement agency					
(c) Inadequate training of site workers on HS&E issues					
(d) Lack of adequate technology to monitor and evaluate HS&E trends and indicators					
(e) Lack of access to materials and PPE					
(f) Poor risk assessment management process					
(g) Lack of awareness on health and safety measures					

Section D: Strategies to Mitigate Challenges in HS & E issues

As a stakeholder in the industry, rate how you think the following strategies can help mitigate the health and safety challenges in the industry

Variable	1	2	3	4	5
(a) Effective regulation can lead to better health and safety outcomes					
(b) Capacity building among regulatory institutions.					
(c) Knowledge building and sensitization of workers on HS&E issues					
(d) Improved working conditions					
(e) An integrated risk assessment management process					

Are there any other comments or suggestions that have not been captured in this study which you will like this research to address?

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Thank you very much for participating in this survey.