UNIVERSITY OF PARDUBICE

INSTITUTE OF ENVIRONMENTAL AND CHEMICAL ENGINEERING,

A STUDY ON HEALTH AND SAFETY PRACTICES AT TEMA OIL REFINERY (TOR) IN GHANA

PhD Dissertation

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Abstract

This is built on three main objectives as follows; examined a symbiotic relationship between occupational health hazards and safety culture, to demystify operational risk and improve safety culture and finally, to examine the modelling effect of health hazards on risk management and safety culture at Tema Oil Refinery (TOR) in Ghana. The study employed both descriptive and explanatory research designs. Convenient sampling technique and structured questionnaires were deployed to elicit information from the study participants. The data were analysed using Statistical Package for Social Sciences (SPSS) and Smart Partial Least Square (PLS). The study discovered that the newly proposed model accurately predicted 92% and 77% respectively for health hazards and risk management on safety culture practices in the oil and gas sector in Ghana. From the model the strongest determinant of safety culture in the oil and gas is health hazard (β=0.66), followed by risk management (β=0.45). Other significant determinants were identified as follows: biological hazards (β=0.26), chemical hazards (β=0.22), mechanical hazards, RM= Risk Management (β=0.27) and Psychological hazards (β=0.27). The study also found insignificant effects of psychological hazards on health hazards; also, health hazards had no significant impact on risk management. The study concludes that the newly integrated be adopted to effectively manage safety culture at TOR. The study recommends that this integrated model is required to comprehensively explain the safety culture at TOR since implementation of occupational health and safety management system (OHS-MS) has been proven inadequate.

Keywords: Ghana, health hazards, oil and gas, safety culture, Tema oil refinery.
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List of Abbreviation

API: Application Programming Interface
BBS: Behavior-Based Safety
CCPS: Centralized Clinical Planetary System
CEFIC: Council of European Chemical Industry
DFI: Department for International Development
DTPB: Decomposed Theory of Planned Behaviour
DMAIC: Data Driven Improvement Circle
DOHS: Directorate of Occupational Health and Safety
DRL: Diagnostic Reference Law
EHS: Environment, Health and Safety
EMCA: Environmental Management and Coordination Act
EPA: Environmental Protection Agency
EPSC: European Planetary Science Council
EU: European Union
FID: Flame Ionization Detector
GDP: Gross Domestic Product
GMA: Ghana medical association
HRM: Human Resource Management
HSE: Health and Safety Executive
ICAO: International Civil Aviation Organization
ILO: International Labour Office
ISMS: Integrated Safety Management Systems
LTIR: Lost Time Incident Rate
LSS: Life Support System
NADOOPOD: Notification of Accidents, Dangerous Occurrence, Occupational Poisoning and Organisational Disease
NEMA: National Emergency Managerial Association
PEAR: People, Environment, Assets and Reputation
PPEs: Personal Protection Equipment
PRA: Physician Recognition Award
OHS: Occupational Health Safety
OHSA: Occupational Safety and Health Administration
SMEs: Small Medium Enterprises
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CHAPTER ONE

1.1. Introduction
This study is aimed at modelling the influence of health hazards on risk management and safety culture at Tema oil refinery (TOR) in Ghana. This chapter presents the background of the study, problem statement, objectives of the study, research questions, justification of the study, scope of the study, limitation of the study and organisation of the study.

1.2. Background of the Study
According to the World Health Organisation (WHO), a substantial part of the general morbidity of the population is related to work. This assertion, though frightening, is not surprising as workers represent half of the global population and contribute greatly to the socio-economic value of contemporary society. Indeed, people spend a significant portion of their lives at work with their jobs often bringing meaning and structure to their lives. Because work is a central part of many people's lives, it generally is recognised that individuals should have a safe and healthy working environment (WHO, 2007; Annan et al., 2015; Asumeng et al., 2015).

According to the WHO Health for all principles and ILO Conventions on Occupational Safety and Health (No. 155) and on Occupational Health Services (No. 161) every worker has the right of access to occupational health and safety services, irrespective of the sector of the economy, size of the company, or type of assignment and occupation. The Rio Declaration on environment and development (1992) also states that, human beings are the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature. Clearly, the ability to enjoy a safe and healthy working environment is an important part of a sustainable future. To date, occupational
health has not attained a high profile in the sustainable development agenda particularly in developing countries where most people are engaged in primary industries such as agriculture, logging and mining.

Adei & Kunfaa (2007) assessed the perceived occupational health hazards exposure and the effectiveness of the policies put in place to ensure the health and safety of workers and reported that the lack of commitment by management to implement OSH policy where it existed, consideration of payment of insurance premium as sufficient protection for their workers, restrictive inspections, education and enforcement by under resourced DFI (which shows extent of government commitment to OSH) and Timber and Wood Workers union inability to project OSH agenda have contributed substantially to neglect of workers health and safety. Adei & Kunfaa (ibid) further asserted that there is also the need for enforcement of health and safety regulations and policies. One of the most common techniques used to reduce at-risk behaviour within the workplace is to introduce stricter rules, increase supervision of the target behaviour or increase the number of reprimands given out for failure to comply with the companies’ policy and procedures.

Similarly, in Kenya, Gaceri (2015) evaluated the factors affecting the implementation of health and safety measures in the supermarkets found in Kenya. Supermarkets in Kenya have made it a habit to hold safety meetings every morning before works start. This means management shows positive attitude towards safety activity. Guidance is one vital variable that is needed to implement health and safety measures in supermarkets hence the formulation of policies safeguard accidents. The implementation of health and safety needs honesty and integrity with much flexibility and acceptance when providing guidance for employees. Leadership at the supermarket is very high because leadership is the cause of safety rules implementation. Leaders at supermarkets do massive
consultation among departmental heads in the implementation of safety measures. Involving employees in the implementation of health and safety facilitate processes. The use of participatory approach, improves health and safety through the sharing of information with employees and by also creating individualized partnership with workers to deliberate on health and safety issues. The supermarkets selected for the study constantly take their employees through training for a minimum of three days and a maximum of one month. Training influences the implementation of health and safety whereas the lack of it affects performance and productivity of the organization.

People worldwide face Occupational Health and Safety (OSH) hazards daily. Over the years, the global occupational hygiene community has worked diligently to develop ways to protect workers in both developed and developing nations, in work places of all types and sizes. Throughout the world, most adults spend much of their waking hours at work. At the same time, workers face a variety of hazards owing to chemicals, biological agents, physical factors, adverse ergonomic conditions, allergens, a complex network of safety risks, and varied psychosocial factors (Meswani, 2008; Osman and Pala, 2009; Asumeng et al., 2015).

As reported by the international labour office (ILO) (2013) the oil and gas industry is no doubt dominated by hazards, accidents and causes major havoc to human life, property and activities when potential hazards are not adequately controlled. The oil and Gas industry is the cash cow for every country that engages in oil exploitation, but the industry is marred with extreme danger and risk of explosions, all forms of pollutions and accidents. With no shred of arguments, the sector posses’ immense, economic, environment and health and safety risks to stakeholders in the industry (the government, private investors and financiers, insurance companies, top management and technicians, employees etc.). The occurrence of
fire outbreaks and other accidents leads to massive environmental problems, economic losses and subsequently affects the health of humans.

Industrial activities and its concomitant accidents influenced researchers like Shrivastava in the 1990s to consider the risk factors of industries during the industrial revolution. According to Shrivastava (1995) production is intricately linked with risk. However, risks are not only associated with technical issues but also societal and environmental profile. The works of Shrivastava illuminated how managements have relegated the issues of health and safety and ecological concerns to the background. Based on this, he proposed two ways the environment can be adequately protected; industrial ecosystems and ecocentric management. An industrial ecosystem deal with the bye-product from industries that affects other variables in the ecosystem and ecocentric management focuses on integrating industrial activities to be in synchrony the natural environment.

Markussen (2003) acknowledges the health and safety implications that the oil and gas industry have on employees and stated that it exposes employees to both physical and chemical risk factors through the drilling of mud, treatment of chemicals, petroleum products and radioactive sources. There is therefore the need to apply quality control systems to manage industrial resources and waste. A study conducted by Verma, Johnson and Maclean (2000) on exposure to benzene and hydrogen in the oil and gas industry and recommended that strict health and safety policies should be adopted by oil exploiting companies to minimize exposure to health and safety risks. The study took 1,547 air samples from the Canadian oil and gas industry in different departments and evaluated it. It was concluded that the limits of all required occupational exposures were exceeded.

The study unearthed certain risks that created awareness for the oil and gas to take precautions against glycol dehydrators and exposure of employees to risks. Also,
monitoring should be done to maintain standards. As oil supply is finite so are other natural and environmental resources. This means that at the peak of oil production, the subsequent stages in oil production is the decline in the quantity produced. Currently, it is estimated that, there is about 1.3 trillion barrels of oil left. The problem associated with this is that, the world’s oil consumption is increasing hence the 1.3 trillion remaining will fall short of the world’s demand. At the global stage, the oil and gas industry have been clustered with much politics and inconsistent information coupled with economic depressions so much that valid information on peak seasons in the oil and gas industry comes with a bit of doubts (Hamid, 2008; ILO, 2013; OSHA, 2015).

The reason for these falsified information regarding oil products is the global power associated with oil. On the global markets, oil prices dictate global economic and financial paradigms. Analysts’ belief that, the peak seasons as predicted is imminent although there are variations in the peak season from 2010 to 2050 and beyond. Due to emerging technologies, the demand for oil products is decreasing with analysts contemplating whether the demand for oil influences the global prices. In the US, oil peaks were predicted as early as 1956 but the actual confirmation was done in 1974 hence, the global politics of oil peak seasons should be avoided. In Ghana, Achaw and Boateng (2012) assessed safety practices in the oil and gas and its adjoining industry using both interview and questionnaires. The study found that there are regulations that are geared towards ensuring occupational health and safety. However, there are no national policy on occupational health and safety sole for the oil and gas. This means that companies that operate in this sector must develop their own safety regulations to guide their operations. Because the quest to operate in a safe is dependent on the company, flaws were found in their operations particularly, health and safety practices. In the light of the above this study was aimed to
demystify operational risk and improve safety culture at Tema Oil Refinery (TOR) in Ghana.

1.3. Objectives of the Study

The main aim of the study is modelling the influence of health hazards on risk management and safety culture at Tema oil refinery (TOR) in Ghana. The specific objectives are

1. To assess the incidence of occupational health hazards and safety culture at TOR in Ghana.
2. To assess demystifying operational risk and improving safety culture in oil and gas industry.
3. To assess the factors that influence health hazards on risk management and safety culture at Tema oil refinery in Ghana.

1.4. Research Question

1. What are the incidence of occupational health hazards and safety culture at TOR?
2. What are the factors that demystify operational risk and safety culture in oil and gas industry?
3. What are the factors that influence health hazards on risk management and safety culture at Tema oil refinery?

1.5. Justification of the Study

The current study is of immense relevance towards awareness creation on the occupational health hazards and safety that occurs in the oil and gas industry in Ghana. The study will reveal the various hazards like noise, which has the potential to impair the hearing of employees, poor illumination, which may have immense negative effect on the sight of
employees particularly those with generic eye problems, chemical hazards and a number of them. The extent of harm caused by these occupational health and safety hazards will inform industry players and stakeholders in the TOR to adopt measures to avert the negative effects that activities are having on employees to ensure employee commitment through satisfaction.

The study will explore best practices that are employed by other oil and gas extraction countries to make appropriate recommendation that will help to promote the welfare of employees at the Tema Oil Refinery (TOR). Employees becoming the focus of Tema Oil Refinery (TOR) would bring a shift from being product centered to human centered. By this, employees are empowered to deliver to their best abilities. The study will further propose safety management measures that can be employed to effectively enhance the operations of TOR.

The study will also contribute to existing literature in the area of occupational health and safety in the oil and gas industry. Aside its contribution to literature, the study will enhance the understanding of the researcher in the area of occupational hazards in the oil and gas industry. The study will serve as a guide for further studies to be conducted and will help students to complete assignments that are related to occupational hazards and safety in the oil and gas industry.

1.6. Scope of the Study

The scope of the study is grouped into two, the conceptual context and the geographical scope. Conceptually, the aim of the study is modeling the influence of health hazards on risk management and safety culture at Tema oil refinery (TOR) in Ghana. Geographically, the study was premised at the Tema oil refinery (TOR) in Ghana.
1.7. Limitation of the Study

The study is limited by time and finance. Time wise, the study is expected to be completed with a limited time frame which means data gathered will be limited to particular time scope and not allowing to undertake a longitudinal study to compare practices in the past and practices that will be employed through the call to comply with sustainability measures. The study could have been a comparative study between Ghana and another country in Africa like Nigeria but the limited nature of resources (time and finance) would not allow such comparative study. This would help to understand occupational health hazard practices that have been implemented by others over the years. The study will also encounter the following challenges; data collection, unwillingness to disclose the true nature of the hazardous situations and the challenges they are confronting in the TOR for the fear of termination of contract.

1.8. Organisation of the Study

The study is organized into five chapters. Chapter one briefly provides background to the study, problem statement, objectives of the study, significance/ justification of the study, scope and others. Chapter two comprise of three main aspects, definition of concepts, empirical evidence and conceptual or theoretical reviews. Chapter three defines the methods and methodology adopted to complete the study and chapter four analyses and discuss the results of the data collected and chapter five summarizes the major findings, conclude on key issues and make appropriate recommendations.

1.9. Summary of Chapter

The chapter provides a brief background on the topic; “modelling the influence of health hazards on risk management and safety culture at Tema oil refinery (TOR) in Ghana”. In addition, the chapter provided the problem statement, objectives of the study, research
questions, justification of the study, scope of the study, limitation of the study and organisation of the study.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction
This chapter presents the review of relevant literature for the study. This study had reviewed literature on safety management, safety management indicators, safety practices in mining sector, safety practices in the oil and gas and safety compliance.

2.2 Safety Management
Job satisfaction is dependent on so many factors and principal among them is the availability and practice of occupational health and safety. Effective investment in the health and safety welfare of employees improves commitment, organizational productivity and the overall output of the company (Sembe and Ayuo, 2017). In Malaysia, Wahab et al. (2014) stated that training employees on safety practices to improve performance is relevant in every organization and industry. However, safety practices cannot wholly lead to satisfaction unless is tied to people related issues. This means safety training practices must be linked to employee interest and organizational performance. There are limited resources to be committed to occupational health and safety course but safety at the workplace should not be ignored. All organizations irrespective of size are very much concerned about employees’ safety. Therefore, ensuring safety at the workplace has been a major challenge and concern for small and medium enterprises. Due to the limited nature of SMEs in terms of resources, adopting an integrated and comprehensive safety practices is quite daunting.
This does not also mean that SMEs should not commit some resources towards the safety of employees (Subramaniam et al., 2016).

Safety culture is the attitude, believes, perception and value that employees share in relation to safety in the workplace, it is part of organizational culture and thus many has described by a phrase “The way we do things around here”

Kheni et al. (2005) examined health and safety management practices in small firms and it was discovered that organizational related illnesses and accidents are prevalent in small businesses. Subcontractors are particularly confronted with difficult tasks in relation to the risks associated with construction works and the nature of the industry makes it difficult to manage health and safety at the workplace. Literature has confirmed that health and safety management influence the activities of SMEs because the construction industry is clustered with varied accidents and downsides. Understanding the causes of accidents helps to know how the variables that causes of accidents interact with each other to cause mayhem. The philosophy of trying to understand the variables that cause accidents in subcontractors’ firms using a comprehensive approach is ideal to develop ways to avert the occurrence of accidents. There are growing numbers of specialists in the field of occupational health and safety and they have put the concept into perspective, which has made major contributions to policies targeted at health and safety practices in companies, which were usually a concern for psychologists and sociologists in academia (Zanko and Dawson, 2012).

Organizational researches conducted on occupational health and safety has two main approaches; the pragmatic approach and the theoretical approach. The pragmatic approach specializes in proposing approaches organizations can use to deploy occupational health and safety management practices in order to effectively deal with OHS problems while the theoretical approach base its analyses on previous literatures from psychology and
sociology. In theory, the psychological perspectives argues that measures should be deployed by companies device means to solve individual problems and the sociologists placed emphasis on management and social control systems. Attention is shifting from the use of pragmatic ways in OHS to the use of theory by depending on empirical data to assess occupational health and safety at the workplace to effectively manage and control practices that makes the organization prone to injuries as a way of fulfilling their legal mandate. Also, in the areas of pragmatic research, researchers are focusing on handling of tools and techniques in solving problems and adopting best practices as guide for employees. Research has covered a wide range of literature in relation to OHS management practices which are fragmented in nature. This needs to be addressed from the context of management and Human Resource Management (HRM).

SMEs acts as the anchor of many economies contributing more in terms of employment, innovation and creativity, GDP and among others. The sector is also bedeviled with several challenges like inadequate capital to purchase new machinery leading to the occurrence of minor accidents and ergonomics problems. These problems have necessitated the implementation of health and safety management strategies to stabilize the operation of SMEs. Developing a healthy working environment create the condition for positive economic and social improvements. In India, the levels of risks in small and medium enterprises are high hence the need for strategic health and safety policies to be implemented to combat these lapses that causes accidents. Safety management practices are very limited in many SME companies and in the context of this, Unnikrishnan et al. (2014) found that market competitiveness, stringent laws, less risks and better efficiency are the variables that compel SMEs to adopt health and safety management practices and policies while the factors that militate against these include financial constraints, resistance to
change, lack of training for employees and lack of awareness were stated as the factors that
hinders the implementation of health and safety measures. Within the duration of the study,
some propositions were made to allow SMEs to prevent an accident that does not need
capital such as housekeeping, use of PPE, better layouts, and others (Unnikrishnan et al.,
2014).

Keng and Razak (2014) explored current health and safety practices at construction sites
and to identify the problems related to safety practices and the practical strategies that can
be used to address these problems. Construction sites have health and safety measures in
place like the head protectors, boat and reflectors. The measures that have been
implemented at the constructions sites include safety policies, inspecting safety practices,
safety meetings, supplying personal protective equipment, education and training, safety
audition, sate safety organization, emergency support and safety devices, safety promotions
and safety protection systems against falling from heights. There are however some factors
that also prevents the full implementation of these safety measures and these are; lack of
financial allocation for safety management, language barriers, ignorance of workers to
safety processes, lack of awareness among workers and others. Suggestions such as
effective budgeting, effective safety trainings, and commitment and language variations
among employees have been a challenge to understanding safety measures.

Subramaniam et al. (2017) examined the perception of employees towards safety and how it
affects safety behaviours at the workplace. Management safety practices are the pre-bases
for safety compliance, which is proceeded by co-worker safety and job safety. Supervisors
may influence employees on safety measures but the act of supervisor being health and
safety conscious himself has no effect on employees’ health and safety practices. It must be
noted that different working environments demands different health and safety practices to
promote OHS standards at the work premises. In the telecommunication industry, the hazards and risks in that areas differ compared to those in construction or any other sector. In a field where employees are exposed to electrical appliances like nicked wires, employees will be exposed to high voltages, which cause danger to lives. The danger in these works calls for management attention to safety measures to protect their employees. This takes the form of creating awareness through daily briefings, inspecting safety practices, safety meetings, supplying personal protective equipment, education and training, safety audition and among others.

Kaynak et al. (2016) investigated occupational health and safety using five dimensions including safety and health rules, occupational accident prevention, safety procedures and risk management, organizational safety support and first aid support and training. In effect, safety and health rules, occupational accident prevention, safety procedures and risk management, organizational safety support and first aid support and training have a positive effect on commitment from employees. The major problems in organizations in relation to health and safety is non-compliance to health and safety rules and this can be avoided through developing safety and healthy rules and organizational safety support. On the contrary, first aid support and training of employees leads to alienation of health and safety issues. Moreover, safety procedures and risk management, organizational safety support and safety and healthy rules improve work performance. Safety is a basic human right that should be provided to all humans under the geographical jurisdiction of a democratic government. It takes commitment from organizations to invest in the safety and health needs of workers. Occupational health and safety have a positive influence on the attitude and behaviour of employees. The influence on employee’s attitudes and behaviours also has a
positive impact on organizational commitment, job satisfaction and this leads to job performance.

The adoption of health and safety is a way of retaining highly qualified employees who principally promotes and improves productivity and helps the organization to gain a competitive edge over its competitor. In today’s competitive business environment, companies are competing for a limited number of customers hence effectiveness in all aspects particularly, taking care of the health and safety needs of employees are an added advantage for the organization. Kim et al. (2016) tool a realistic look at how safety culture can be changed from theory to practical terms in the at the work environment and assess the role of the national safety culture and its impact on organizations. Currently, health and safety has changed through the emergence of technology that has brought transformation to health and safety management systems and improved the culture of workplace safety. Compliance has increased in the expense of technology, labour inspection and others that have reduced risks and hazards at the workplace. Systematic change in culture is very much critical for positive cultural change in relation to health and safety at the workplace to further reduce risks and accidents. Also, having national guidelines on health and safety practices in organizations serves as the mother icon where institutions deduce their safety policies. In conclusion, actions are needed towards health and safety to completely eradicate risks at the workplace. The workplace needs advancement in technology to ensure engineering controls, introduction of OHS management systems and compliance which will cause positive cultural change through managed cultural change (Kim et al., 2016).

In addition, Yankson (2012) evaluated the effect of health and safety standards on the productivity level of employees. Productivity is influenced by management’s commitment to safety practices and programmes, the attitudes of management towards health and safety,
finding out the cause of accidents, training of employees and supervisors’ safety, which are practiced in the organization. When health and safety standards are effectively managed, it has positive impact on productivity. Within the Ghana Rubber Estates company, health and safety practices are not the best. This is because, proper segregation of responsibilities is not clear between employees and management in relation to safety and health practices. Employees lack education on how to protect themselves against risks and accidents in relation to their basic works. Occupational health and safety have an increasing impact on the effective functioning of organizations, which also affects the economic growth of the country. The safety of employees is integral at the workplace whether the company is a manufacturing company, construction firm, educational institutions, utility companies or hospitals (Yankson, 2012).

The benefits of safety practices at the workplace are vivid and cannot be over emphasized. Labour productivity measures the effective usage of labour to achieve results. The extent of employee’s health and safety determines their motivation towards productive works. Failure of organizations to invest in the competence of its labour, standardize operational health facilities and others affects employee efficiency. Adopting safety policies, procedures and measures does not only protect employees from harm but also improve their commitment towards the company. The study found that due to the poor commitment of management towards employees, the productivity at the Ghana Rubber Estate Limited has been negatively affected due to lack of commitment towards works which has emanated from poor health and safety commitment from management (Yankson, 2012).

In Saudi Arabia, Ateekh-ur-Rehman (2012) examined the health and safety departments in manufacturing companies and measures that have been set to improve accident prevention systems. The study found that the flaws and happenings of risks and accidents in
manufacturing companies were a combination of management and employee factors like; lack of regards for safety regulations, lack of concentration at the workplace and the multicultural background of employees and the wrongful handling of tools materials. During a visual observation, it was discovered that there was negligence in the management and maintenance of facilities and utilities, exhibiting lukewarm attitude towards the storage of materials and tools and negligence on the part of management in educating employees on safety rules. In respect to that, Ismail et al. (2012) identified the influential factors of safety that governs the success of safety management systems in the management of construction sites and among the success factors included personal factors followed by the lack of safety awareness. Employees desire to have management show concern and commitment towards health and safety issues and the lack of it affects employee’s loyalty and commitment. The use of better equipment that is equipped to be personal protective equipment to undertake construction works.

Umoh and Torbira (2013) identified the relationship between safety practices and employee productivity in manufacturing companies. There is a bearing between commitments to providing safety equipments and employee output. Also, developing safety policies have effect on productivity. Management commitment to compliance improves the productive hours that employees work at the workplace. In view of this, Umoh and Torbira (2013) beliefs that employing highly qualified safety officers are imperative in addressing the challenges related to safety and health management issues at the workplace. A study conducted by Brascoupe (2009) stated that the concept of cultural safety has extended across many global businesses. Safety culture resonates with the culture of a particular group of people around the world since people are exposed to peculiar economic or natural activities that lead to income and these come with their own challenges that the local or
indigenous people adopt traditional ways to address the problem. The study was a comparative study in New Zealand, Australia and Canada. Indigenous people may be affected or disadvantaged in the areas of education, economic and criminal justice policies but through time, measures were put in place to check wrongful behaviours.

2.3 Safety Management Indicators

The indispensable nature of occupational health and safety makes it important to use indicators in measuring against other companies to know how companies are performing. The most prioritized indicator used in organizations is compliance requirements. Also, the number of accidents recorded at the workplace was noted, working in an exposed hazardous condition, which is used by more than 70% of the companies researched. It is important that indicators are line with the requirements of law which may contribute to national data and useful for insurance (Pawlowska, 2015). Another indicator that was identified was the number of employees involved in health and safety courses, which is linked directly to compliance. Although the indicators do not directly relate to compliance as stated in law, their bases are tied to occupational health and safety that is managed to achieve stable OHS. Companies mostly adopt measures to comply with standards that have been set by law and the company itself. Monitoring of indicators helps to evaluate performance, which ensures that responses are gathered, and changes made when the need arises. Some companies may have indicators but may not monitor whether the indicators are being met. The number of accidents at the workplace is always monitored and this account for over 80% of companies which uses the number of death indicator. About 20% of the organizations use training on safety indicator as a means of measuring OHS practices.

Process safety indicators are the indicators that are selected to measure performance while companies implement safety rules and policies. Companies either consider their process
safety indicators as leading or lagging but according to Hopkins (2007), these two terms are similar but there are others that use it to explain two different concepts. Achieving enviable results through monitoring safety performance indicators plays a pivotal role in safety performance. Safety performance is a culture that is developed through conscious effort over time. Tomlinson et al. (2011) through this developed a model that can be employed by mariners to contribute significantly to safety practices in cargo-carrying as a commercial activity. It was proposed that incentives should be instituted into the safety process indicators to which will promote compliance among departments within the company. Management support is integral in the advancement of health and safety practices in an organization. Deploying stringent requirement and guidelines towards OHS contributes to continuous planning and monitoring to improve OHS practices. Evidence shows that companies that have record less accident have multiple risk prevention indicators that aid in their splendid performance.

Jalonen and Salmi (2009) evaluated the methods used in safety management by focusing on the indicators that influence safety management practices in companies. In comparing safety indicators among transport modes, it was affirmed that it is very much easy to modify the indicators used in one sector to suit the other. The vital compliment of an indicator is its ability to engineer changes and influence safety in a positive direction. In the transport sector, safety indicators can be considered from the perspective of traffic intensity where the extent of port calls being the measure of indicator. Also, the quantum of passengers and the fleet of cargos on board have some level of effect on safety. The standard of ships may also be considered an indicator to measure safety parameters. The history of health and safety at the workplace shows that accidents are recurrent and the cause agents are always the same hence they permanent solutions can be developed when proper analyses of the risks are
done. The use of technology and technical equipment facilitate the ability curb and combat accidents at the workplace. Being proactive in identifying safety threats plays a significant role in the quest to reduce accidents and risks in companies. The aviation industry in view of this instituted measures to stabilize their system by establishing well-organized pattern to reduce accidents.

Reiman and Pietikainen (2010) explored effective safety performance indicators in the domain of nuclear activities and the study found that there is difference between safety performance and safety culture. Safety tools are very effective in managing safety. There are safety management practices like focusing on lagging indicators, technical, human conditions, organizations and other leading conditions enhances the safety indicators to driving safety measures to success. Chosen indicators are those that are of priority to the organization and have been selected to ensure organizational safety. They usually depend on safety models, safety activities and policies, which accelerates the sociotechnical systems (change, maintain, reinforcement and or reduce something). Monitoring provides the dynamism as far as the systems put in place are concerned which captures the ability, the skills and motives of the employees, employers, society and their idea about safety practices. In this case, efficacy has to be monitored using the sociotechnical tools and parameters to assess the progress of safety management practices. The common safety performance indicators used include the lagging indicators. Feedback indicators, monitoring indicators, driver’s indicators and among others are used to achieve safety management success. In the process of selecting indicators, it is important to determine which measures to monitor which collectively help to achieve organizational goals.

More so, there is the need to use PRA in identifying important issues regarding monitoring. The use of safety indicators from the point of selection to the point of implementation
depend on the understanding of the principal actors on the sociotechnical systems and the overall safety benefits to the company. Safety models explain how the company perceive the risk at hand therefore, the safety models are better explained using indicators and to measure the level of performance. Within the nuclear power industry, the critical question to ask is the selection and utilization of safety standards and the needed material, facilities and information to achieve set goals and objectives. The indicators are supposed to give information on whether the target of the company has been met or not and through that, the organization may put in more effort to perform better in their fight to combat accidents.

Panagopoulos et al. (2017) formulated a conceptual framework that can improve safety practices in the aviation industry in relation to the safety measures in the aviation industry. There is the need to setup a strong methodology within the aviation industry to proactively monitor and measure systems SP and its variations.

Panagopoulos et al. (2017) integrated and conceptualized a framework that measures the SP systems of the aviation industry that elaborate on the fundamentals of LSS methodology. There were two blocks that were identified, and these are safety-PILS models and DMAIC continues to improve the practices of the aviation industry. Lobianco and Correia (2013) applied a methodology indicator at airports and made an accompanying recommendation for ICAO. The method applied proved that the tools used are consistent and coherent. Safety should be used at airports to evaluate risks, assess and identify urgent actions that can be used to mitigate hazards and savage the resources and time of air transport industry. In Sao Paulo, safety indicators are growing at airports and this has reflected in the management of safety needs. The main motive of safety is to reduce damages and injuries to people, which have achieved a 72% performance rate. Focusing on direct and indirect costs has serious effect on the process of combating accidents.
The researcher deployed a process safety performance for over a 50 years period using Lost Time Incident Rate (LTIR). For the 50 years duration that was studied, it was observed that attitudes towards accidents have changed from retrospective to proactive attitudes. Safety management was introduced in the 90s, which was founded on the Deming cycle Plan which is explained to mean Do, Check, Act and rechecking. The concept of LTIR related to solving personal problems than being just process safety. After the BP Texas city refinery explosion in 2005, the awareness of difference broke through and process were adopted towards salvaging the incidence of accidents. In 2012, an international conference was held in Brussels and it was facilitated by EPSC and CEFIC (Pasman, 2012). One key element that is indispensable in monitoring is the indicators that ensure plant safety. The indicators of lagging are based on incidents. Standardization is imperative when selecting leading indicators.

Safety Performance Indicators (SPIs) are the variables that reflect the operational conditions of the facility or the workplace condition. Developing a broad SPI has gained popularity in the European countries. In estimating the safety status on roads, it is good to monitor all aspects of the road and monitor the traffic systems through safety interventions. In considering the safety net project, Safety Performance Indicators (SPIs) were implemented on seven roads to check the incidence of alcohol and drugs, speed, daytime running lights, trauma management, protective systems, vehicle standards and among others. The main objectives of the practical selection of seven roads were to create meaningful SPIs and develop a database that can be used to analyse risks and accidents across the EU countries both currently and in the near future. The undertakings of the project proved difficult but massive consultations went on and the difficult and insurmountable complexities were unravelled. Currently, in areas like protective systems and DRL usage, a reliable data has
been provided and can be accessed across Europe to identify lapses and flaws. Across Europe, the protective SPIs system standards have been agreed upon. With the value pertaining to measuring DRL and SPIs, there are reservations on it hence there are no common grounds (Gitelman et al., 2014).

Due to no parameters among the European countries, the use of alcohol, speed behaviour and drug usage have limited data. Instead, countries have resulted to the use of roods side survey in relation to crashes to deduce data for the estimation of SPIs. These systems of developing data have proven to be insufficient and the quality of data is very low (Gravio et al., 2014; Gitelman et al., 2014). Bellamy et al. (2012) conducted a study on safety performance indicators in controlling major hazards. Safety performance indicators are mainly measures that ensure risk control and assure employees of protection from dangers. Benchmarking in relation to safety performance indicators is ideal especially when lagging indicators are deployed. Some working environments need special indicators based on status of the company. The assertion “smaller incidents leads to bigger incidents” has been accepted and also critiqued by analysts. This is because unchecked incidents actually degenerate into larger problems. This situation is made possible based on the focus of management on other aspects of the company other than addressing small leaks that leads to bigger risks. This simply reflects the weakness in safety management practices in a company.

Risk control has a multiple dimensional link with sociotechnical systems in the company, human interactions and understanding relationships. Using a substantial amount of indicators makes it easy to measure performance over time monthly, quarterly or yearly. Tolerance is a tool that plays an integral role merging management views and employees’ needs. SPI must be enshrined in the goals of the company to ensure its implementation,
which will be consistent with the culture of the organization. The purpose of safety systems in an organization is to identify and mitigate risks and hazards, which are related to a company’s operations by maintaining a functional system. The increasing levels of technology and software have contributed immensely towards the functionality of today’s systems. The increased use of software has also lead to complexities and how systems can be evaluated within systems. The initial stages of risks may not be known but using safety measures provides an early insight to identifying potential risks and dangers and to find appropriate solution to it. Experience is gained through exposure to safety engineering works. It has been argued that software safety cannot determine the safety of a system but can be used to measure indicators and their role in mitigating risks and problems at the workplace (Basili et al., 2008).

The study of Delatour et al. (2014) conducted an in-depth review literature by focusing on models used to design indicators, objectives of interpretation, actors affected by the outcome, objects of study, terms of implementation and revision and operational feasibility and adopting terms validate scientific relevance. The use of improved tools improves monitoring of safety devices and safety indicators. Indicators have been both deliberated on in theory and in practical terms. Measuring safety performance indicators is essential in managing industrial risks. Nonetheless, risks and accidents at the workplace have become complex and a dynamic phenomenon. Trying to understand these complexities through indicators are challenging. There have been emerging tools due to varied forms of accidents in recent years. In order to be effective in delivering safety assurance, tools for measurement must be complemented with critical space with counter balance from different perspectives. This study aims to provide the blueprint for companies in Ghana adopt safety and health practices that will minimize accidents, improve performance and enhance productivity of
companies. The scope of the study was limited to predictive factors that influence the occurrence of accidents both major and mild in the oil and gas industry. In effect, there are other variables that were considered based on the assumption of predictive elements.

In Ghana, Horbah et al. (2017) assessed the current safety climate that influences accidents and risks at the oil and gas industry. Prioritizing safety practices is the best supportive initiative that helps to mitigate risks and accidents. Also, supervising safety, equipment maintenance, management of change and commitment to risks indicators leads to the avoidance of accidents and risks. Safety climates are a president that averts major accidents and risks. The link between safety measures at the workplace and accidents have received little attention in Ghana with regards to the causatives of accidents at our workplaces. Developing adequate safety climate indicators is a valuable contributing factor to reducing accidents and risks. Channelling of managements’ attention to supervising safety, equipment maintenance, management of change and commitment to risks indicators leads to the avoidance of accidents and risks. This means that management should prioritize safety issues and improve the culture of organizational environment. Companies have to improve on supervision and monitoring activities at the workplace, implement effective work processes, service equipment based on employee’s demand and there should be commitment on the side of management.

Niu et al. (2016) examined the safety cultural model construct in the construction industry and found that the constructs of behaviour have a direct link with safety performance. Researchers have extensively researched the relationship between behavioural construct and safety climate and its benefits. Companies select different indicators, which are used to validate results but these results, differ based on the indicators selected. The constructs within the environment are regarded as safety management, which incorporates the physical
structures of the workplace. There is been a great discourse on the formation of safety climate through safety management, but this has not been effectively validated through quantitative means. The physical structures of working construct have been relegated to the background without the necessary attention. In this construct, there are two types of gaps; the conceptual gap and theoretical gap. The theoretical gap explains the misalignment of concepts due to inconsistencies within the constructs at the workplace. For instance, there is a vast misalignment between safety climate and safety behaviour. The misconceptions to leading indicators and lagging indicators have created the existing gap between behavioural construct and safety climate and outcomes.

The history of health and safety at the workplace shows that accidents are recurrent and the cause agents are always the same hence they permanent solutions can be developed when proper analyses of the risks are done. The use of technology and technical equipment facilitate the ability curb and combat accidents at the workplace. Being proactive in identifying safety threats plays a significant role in the quest to reduce accidents and risks in companies. The successful implementation of safety practices needs a leader who is conscious of safety factors and committed to managing safety at the workplace. The other gap is the misalignment in the scope of definition, which is within the construct of scientific realm.

2.4 Safety Practices in Mining Sector

In South Africa, Hermanus (2007) examined occupational health and safety in the mining sector of South Africa. Mining reached its full extraction in the 19th century in South Africa which exposed workers to much health and safety challenges. Although safety practices in South Africa mines have improved, their level of improvement cannot be compared with
Australia, USA and Canada. In a whole, a total of 4% of South Africa’s population and they contribute to 15% of occupational deaths in the country of South Africa. In the global community, data on occupational disease and deaths are scarce, fragmented and dispersed making it difficult to make reliable assessments and possible predictions. Data in South Africa indicates that there is high rate of death recorded among formers and miners. Systems thinking have over the years influenced formulation of legislation, approaches to managing risks, investigating accidents and involving workers in health and safety. The approaches enumerated above have been stipulated in the Mines Health and Safety Act, which are yet to be put into effective practice.

There are some activities that hinder the implementation and improvement of the occupational health and safety measures and these are: the lack of guidance and resources to meet the needs of workers, junior, small and artisan miners, lack of improved engagement between managers, workers and supervisors, there is also the lack of holistic approaches to addressing risks in relation to women, ergonomics and human factor and there is also the lack of training and consistency in risk management practices. The course to fully improve health practices to enhance performance in the mining sector is not yet at its full rigor. Currently, health priorities have tried to let health workers to be cautious of TB and HIV/AIDS. During the tripartite system, stakeholders agree on the Mine Health and Safety Summit of 2003, which is aimed at addressing the health and safety concerns.

The vital step in risk management is identifying the hazard and how they can be mitigated. The construction industry, which is one of the largest, has a short fall when it comes to the implementation of health and safety requirements. There is limited research in the area of ways to identify hazards in order to provide effective solutions to these problems. The study used 21 sites that have been previewed to varied forms of hazards to help propose ways to
identify hazards in order to effectively improve employees’ welfare (Albert et al., 2014). Prior to going to the field, experts were consulted to come into consensus on tools and mechanisms to deploy in identifying hazards and from the study, it was known that examining safety tools is the first core to consider. The researcher recongizes that the findings of the study can be used as a measure to construct safety and management practices in construction and mining companies. The study acknowledges some limitations as the study being restricted to one geographic region because there are differences in resources, operations management techniques, the culture of a place pertaining to safety, the number of projects taking place at a time and other factors.

Rose et al. (2015) focused on the leadership aspect in mining sectors. Every decision taken by a leader at the mining sector has its own effects. Identifying antecedents is a predominant step in leadership at mining sectors, which acts as an effective way to monitor and improve support for safety and health behaviours. These have effect on organizational practices, which is made effective through the leadership style in place. After analysing the results of the study, it was found that commuters happen to be in far more danger of serious and fatal accident and they are more obvious than working hour’s accidents. In effect, accidents suffered at the workplace are less than accidents that occur during commuting. Accidents suffered at the workplace outside normal working hours was 2.2%, those that occurred during working hours were 0.8% and those that happen in the course of travelling during working hours was 1.9%. Based on this evidence, it is imperative to collectively look at all forms of road accidents and deduce means to address them. The fatalities of accidents were higher on roads as always.

In Ghana, Asumeng et al. (2015) resulted to finding patterns to manage the many hazards at the workplace to make the workplace safer for employees. Effectively managing
occupational health and safety is a collective effort, which involves employees, employers, the government and the management of the organization. Nations should be seriously involved in handling health and safety at working environments to ensure that the environment is free from harm. The management of organizations and employees should be adequately involved to ensure commitment to decent working environment. Employees are personally responsible for their safety and health by adhering to health and safety guides. The inability to put measures in place to handle safety and health problems are more expensive than having those measures in place to avoid them. The researcher is of the opinion that health and safety measures should be enforced to force members to comply in order to ensure adherence. Supervisors who have the support of their management must ensure that those under them adhere to safety practices. Also, training and education programmes should be organized for employees to create the awareness of health and safety among employees.

Moreover, in Ghana, Puplampu and Quartey (2012) unearthed the key issues in relation to occupational health and safety practices in Ghana. Tackling occupational health and safety without a national comprehensive plan targeted towards dealing with the issue will make it difficult for effective achievement of the Millennium Development Goals which are intricately linked to the development policies of the country. Research must be conducted to various forms of occupational health and safety measures to reduce hazards and casualties at the workplace. Being able to do this will influence the decision of multinational companies to invest in the country because they take safety and health issues seriously which means their investment will not go wasted when they invest in the country. It must be noted that progressive development is tied to human right and dignity, which accelerates socioeconomic development. For improvement in socioeconomic development, there is the
need for human rights as well as occupational health and safety. That is, every citizen of a country has the right to health and safety, which is a basic human right in legal context, social and moral considerations.

The field of occupational health and safety is an emerging research field in Ghana. However, there is no right to deny individuals of their human rights based on ignorance and apathy. The study aimed at eliminating occupational health and safety risks, diseases and hazards in small, large, manufacturing, shipping, agriculture or mining and among others. In Ghana, occupational health and safety has no political will, which is why companies have lacked these safety and health measures till now. This has been demonstrated in many facets of the country’s manufacturing sector. There are recipes of occupational health and safety conventions that are deduced from that of International Labour Organization in Ghana which lacks comprehensive national occupational health and safety policy framework, inadequate resources, ineffective occupational health and safety inspection and occupational health and safety capacity building and monitoring. These institutional barriers need expert management with the touch of local culture to make it home grown strategies to manage occupational health and safety from both district and national levels. There should also be public and private partnership to take up action oriented OHS activities.

Jansen and Brent (2005) explored safety management systems (SMS) within the context of behaviour-based safety (BBS) and the study conducted a SWOT analyses on the performance of safety management systems and behaviour-based safety, which was linked to an integrated safety management systems (ISMS). Creating a healthy and safety lifestyle has become very challenging in the mining industry. Organizational culture plays an integral role in promoting safety behaviour within organizations. Employees have high level of commitment when they are satisfied with their job descriptions and also when they
perceive supervisors to be supportive and considerate and also treated fairly by the company. Leaders with emotional intelligence have the charisma to inspire their followers and instil confidence in them so much that they feel proud of being part of the organization.

In order to fully establish this, there is the need to incorporate multifaceted management challenges into the planning stage and also factor the skills and resources that the organization have as well as support processes. There is also, the risk-task behaviour which leads to accidents. Which means businesses should not focus on safety behaviours alone, but they should consider management systems to control risks. Effective risk management strategies are those measures that eliminate the hazard other than using measures to reduce risk. Relying on procedures, PPEs and warnings for risk management is not all that effective.

In Ghana, Amponsah-Tawiah and Dartey-Baah (n.d) examined occupational health and safety in Ghana and found that companies and organizations lack a comprehensive policy, insufficient and qualified health and safety practitioners, lack of funding and infrastructure and inadequate information in relation to health and safety. Practicing occupational health and the well-being of people are prerequisite to improvement in productivity and to promote socio-economic and sustainable development. A healthy working environment enhances healthy work behaviour among employees which is a valuable asset to organizations, communities and countries in terms of preventing absenteeism and increasing productivity through commitment. Hence, occupational health is a strategic measure that does not only improve employee’s health but also strengthens quality working habit, quality production, motivate workers, promote job satisfaction and improves overall quality of life and the society at large. In spite of the benefits listed above, many organizations in Ghana have poor
health and safety practice policies with others not having at all which constantly affect productivity and have severe negative effect on the life span of employees.

In reality, the health complications that occur at the work can be avoided through planned modern health practices, but the incidence of health and safety measures are not diagnosed but most organizations prefer to cure the problem than to prevent the health problem from coming. Organizational health and safety issues are very common in developing countries including Ghana due to the fact that employers are very much concerned about making profit other ensuring sustainable practices. There is also the lack of government policy on health and safety, lack of legislation and inspection on health and safety, lack of proper infrastructure for monitoring OHS activities. The OHS practices are worse in sectors and industries that deal with primary activities like agriculture, informal businesses and other businesses.

The AngloGold Ashanti is a leading mining company in Ghana. Yeboah (2008) assessed the effect of mining practices by AngloGold Ashanti on the environmental and health issues in the Obuasi municipality. Mining has contributed greatly to the development of Ghana, but it has also negatively impacted the environment and the health of employees and community members. The activities of mining have led to land degradation and the destruction to arable farmlands that were meant for agriculture. Evidently, mining activities by the AngloGold Ashanti Company has polluted the air, water and has created noise pollution as well which has affected resources in the Obuasi community including drinking water and fresh air. Water bodies like Kwabrafo, Akwapori, Pompo, Kunka, Nyam and Wheaseammo have been polluted through mining activities. The extent of pollution in conjunction with other poor company initiatives has created the vacuum for diseases like malaria, skin and respiratory infections. Diseases like anaemia, hypertension and malnutrition have increased
in the areas which have been attributed to poor agricultural lands in the community due to mining.

These problems have led to increased number of deaths in the area hence the researcher recommended that the Environmental Management Department of AngloGold Ashanti Company Limited should be thoroughly reviewed to ensure sustainable practices geared towards protecting the environment. The AngloGold Ashanti Company Limited has been involved with re-afforestation programmes, providing alternative sources of water, resettlement of residence, amending operational methods and others to mend for their negative impact on the community. Lan and Zhou (2014) applied Gray Markov SCGM (I,I) to predict accidents and deaths in coal mining companies and the study found that the Gray Markov SCGM (I,I)c provided a value similar to the actual value with a smaller error which can be used to predict the relationship between safety and deaths in the coal mining industry. This mean the Gray Markov SCGM (I,I)c is reliable. In the country of Polish, Niczyporuk (1996) explored the hazards that occur at the mining sector in Poland. The study resolved that the coal industry should use multiple approaches to address the problem of safety in the coal industry. Discussions and consultations should take place to know the standards of safety in companies and based on that appropriate measures can be used to reverse its negative effect on employees and the company.

This will guard against the company engaging in unwarranted activities. Assessing company’s loss through poor health and safety practices will create the awareness of what they are losing without implementing safety measures. A fair estimation is done after events have taken place while the prediction of risks is the anticipation of reoccurrence. These assumptions become accurate when the cause of the accident is not dealt with and may
create a similar condition in the future. Working conditions that are difficult and stressful exposes individuals to much risks and accidents which indirectly explains that safety conditions are very complex and would have to incorporate a lot of things before achieving results. This is what has led to the Total Quality Management philosophy. In Nairobi, Kemei and Nyerere (2016) investigated the Directorate of Occupational Health and Safety (DOHS) using data collected from 2010 to 2014. The study found that about 65% of the accidents that occur, happens to employees that are below 37 years and using happen when there were tea breaks around 10am, launch at 1pm and after launch at 3pm and this occurs during the month of June and July.

At construction sites, the dominant accidents that occur are people falling from heights which account for 37% and objects hitting employees from heights was 28% and 20% happens by using particular equipment. The common hazards that were identified were reluctance to provide resources for safety, lack of safety policy, poor safety consciousness among workers, lack of strict operational procedure and lack of stuff training and enforcement of safety regulations. Incorporating health and safety into a company’s goals and objective is an ideal way to have a perfect direct for the company towards achieving safety policies. Companies in the construction industry should provide employees with Personal Protection Equipment (PPE) like safety belts, safety ropes, safety harness and catch nets and retaining belts to endure that workers are protected from falling materials and falling from heights. Jayasudha and Chandrasekar (2009) conducted a review of literatures to ascertain the causes of accidents like mining techniques, tools, search of engines and applications. These were measured against standards to determine how they cause accidents. The study considered variations in crush, faulty tools and equipment etc.
Sensogut (2007) assessed the source and level of noise in mines and its effect on risks in Turkey mining companies. This study was conducted to help recommend ways to remedy the cause of excessive noise. Reduction in occupational noise has the capacity to increase productivity and working condition. These measures have been grouped into administrative and engineering noise and the ways to solve these noise issues have been provided below; in relation to administrative solution, they should provide 87 DBAs with earplugs, muffs, helmets and semi-insert plugs and others. Also, they should supply employees with reduced hours of work with excessive noise, rotate employees, training employees to use protectors and organizing medical check-ups on a routine basis. In relation to engineering solutions; machines with low sounds should be selected, plants should be placed at a distance to reduce noise, enclose the source of noise and prevent noise from moving from one place to another, secluding of machines and operator’s cub. Instituting measures to protect or prevent noise are hampered by non-compliance in order to effectively communicate with others, attitude of individuals, the perception of looking awkward in the sight of those who do not use the noise protection equipment, comfort related reason also lead to non-compliance.

Masia and Pienaar (2011) investigated the relationship of work related stress, job security, satisfaction and commitment to safety compliance. The stress from work as well as job insecurity negative effect on employee safety compliance. The study found job satisfaction to be related to safety of employees at the workplace such that employees that are satisfied with their jobs comply with safety standards. Therefore, increased level of job satisfaction leads to compliance to safety measures. In relation to this, Amankwah and Anim-Sackey (2003) proposed some measures that can be used by both small gold and diamond mining companies to achieve sustainable development and they included; the use of funding that
has been received from local and international sources to boost the operations of small mining companies and this has been made possible through the Small-Scale Mining Laws in 1989. Also, in as much as small scale mining companies are helping the country to achieve sufficient foreign exchange, their operational activities should not have severe negative effect on the community which they operate in, and sustainable environmental practices should be adopted to foster environmentally friendly operations.

Moreover, educational programmes should be embraced by the minerals commission to educate small scale mining companies on effective ways of operations in the country. Moreover, associations can be formed by small mining companies in the gold and diamond sectors to share ideas on how to deploy environmentally friendly. The provision of support system in terms of finances to small scale miners in Ghana is another way these companies can implement sustainable operations in the mining sector. Literature has proposed diverse ways the concept of sustainability can be implemented. The current study focused only on small scale mining companies in Ghana. Perspectives such as environmental issues, human conditions, product improvement through education and skills and the socio-economic factors that prevail in the mining communities were comprehensively discussed. Indeed, the study found that the operations of small mining companies have affected the economic fabrics of the community and the social base of the community is also influenced and this transcends to families and individuals.

2.5 Safety Practices in the Oil and Gas Industry

The oil and gas industry is no doubt dominated by hazards, accidents and causes major havoc to human life, property and activities when potential hazards are not adequately controlled. In Ghana, Achaw and Boateng (2012) assessed safety practices in the oil and gas
and its adjoining industry using both interview and questionnaires. The study found that there are regulations that are geared towards ensuring occupational health and safety. However, there are no national policy on occupational health and safety sole for the oil and gas. This means that companies that operate in this sector must develop their own safety regulations to guide their operations. Because the quest to operate in a safe is dependent on the company, flaws were found in their operations particularly, health and safety practices. In addition to this, the Factories Inspectorate Department that is in charge of monitoring whether companies are practicing the right health and safety initiatives, but they are also under resourced to carry out their inspection activities. The oil and gas industry is underperforming with regards to health and safety practice which put employees, investments and properties at risk which is very eminent. The thermal power company has full safety measures hence it’s observed that until the FID of Ghana is resourced, the FID’s mandate to monitor and enforce health and safety in the oil and gas industry will remain dormant and inactive.

In Nigeria, Nnadi et al. (n.d) examined the recurring accidents that relate to pipelines in Nigeria by comparing the safety management practices of Nigeria against the world’s standards. The image of the Nigerian oil industry has been marred over the years due to recurring pipeline explosions that has led to loss of human lives as well as valuable properties. The repetitive occurrence of the pipe explosions in Nigeria shows that industry players like government and the oil and gas companies have failed to learn from their mistakes. In other words, there is lack of operational safety management practices within the oil and gas industry. There are internal health and safety standards like API that are used
by oil and gas industries around the world comply with in order to protect their employees, investment and properties.

The AIP standards incorporate the analyses of highly hazardous risks, areas that are susceptible to damages and other third parties such as vandalism, theft, terror attack and illegal bunkering. Following these standards duly ensures the safety of people and the environment. The pipeline explosions that occur in Nigeria have cultural, operational and human factors hence the need to use a multifaceted approach in solving the problems related to pipeline explosions. The government of Nigeria needs to adopt concrete measures to mend the explosion problem at hand and the measures should be routinely assessed against the world’s standards. A comprehensive regulation implementation and a structured framework is important for effective enforcement and monitoring of proper safety management systems in Nigeria.

The adoption of sustainable supply chain model in the utilization of resources, maximize profit and ensure continuity is imperative in the oil and gas industry. Research has found that one factor that promotes sustainability is the desire to conserve energy, the quest to be competitive and increase its market shares. Legal and regulatory policies are mostly inactive in terms of sustainability. Factors that militate against sustainability include; infrastructural facilities, limited information on sustainability, lack of environmental awareness among employees and higher take-up costs. There are varied approaches adopted to enrol sustainability into the oil and gas industry. Adopting these sustainability approaches into the supply chain system of the oil and gas leads to improved performance both economic wise and environmental wise which impacts on the organization positively (Abubakar, 2014). Similarly, Asikhia and Emenike (2013) examined occupational health and safety in the oil and gas industry in Nigeria and from their study, employees are exposed to immense health
and safety issues at the oil and gas industry in Nigeria. In that direction, Asikhia and Emekhe (2013) proposed that, there should be the provision of appropriate health facilities, the supply of fire extinguishers, there should be free medical check-ups for their employees, enforcing existing legislation and policies that are meant to check and mitigate hazards.

Risk management is important to understand how risks impede the performance of a company and how dealing with them increases the value of the company and improves their financial status. In the study of Osabutey et al. (2013), they discovered the most pressing risk that refineries are exposed to is the foreign exchange which leaves them in huge debts. The Tema Oil Refinery (TOR) in Ghana has instituted risk management practices into its operations by delivering risk management trainings to their employees and control measures to guide their activities. One challenge that TOR is facing is the lack of corporation from employees in implementing the risk management strategies adopted by management. The risks confronting the TOR are in two folds; external and internal risks where the external risks are those controlled by the government but direct influence on the activities of TOR in reducing risks. In the midst of all these challenges, employees have expressed satisfaction with how management handles and control the risk factors in their working environment. In terms of risks associated with finance, it was proposed that the TOR can result to derivatives like future, forward, options and swaps to mitigate financial risks (Osabutey et al., 2013).

These methods have been duplicated in places like United States and other places to reduce risks. Swapping of currency can be used to withstand undue and unexpected fluctuations in exchange rate which may have serious repercussions on the funding of the company. In addition, currency risks compel suppliers of credit of crude oil to supply more based on their ability to avert all financial risk problems. As the financial management strategies of the oil
company becomes solid, so does their transaction position increases. For instance, adopting proper risk management practices may extend credit days from 90 to 120 days when receiving from Nigeria. Both casual and permanent employees should be taken through serious risk management practices to reduce risks at the workplace. Many companies in the refinery industry record most of their accidents from the carelessness of their casual workers which means they need more risk management training to ensure quality health and safety practices at the TOR. This involves intensifying educational programmes to create awareness and emphasize how risks have been causing the company and also risk management policies should be enforced by management and together, the bad attitude of employees towards risk management will be reduced (Osabutey et al., 2013).

Well-structured guidelines should be deployed, and punishments should be applied where the need arises to deter others from repeating the same attitude. The role of government as the overall supervisor should be played devoid of any conflict of interest. Credit repayment structure should be enrolled by the TOR to clear all possible debts. TOR should ensure that their customers that have high risks be given products secured with assets while and others with poor credit repayment should be dealt with on cash transactions. Using this strategy will reduce TOR’s debts and autonomy should be given to TOR to manage their own finances free from government interferences. The audit unit within TOR should be resourced to deliver as expected of them. Some analysts have proposed public-private partnership as the ideal solution to TOR’s financial mismanagement problem. Equipment used in the refinery activities should constantly be changed to avoid breakdowns. Operational risks could be reduced when modern equipment is used. Crude shortage has been one risk facing the TOR, which can lead to the collapse of the refinery. TOR should
engage in signing long term contracts other than short term to ensure constant supply even in periods where there are shortages (Osabutey et al., 2013).

The contribution of the oil and gas industry to the world’s economy cannot be overlooked but the sector has negatively affected the environment more than any other sector hence sustainable management operations are needed to protect the environment in which they operate. Schneider et al. (2013) evaluated the oil and gas industry towards the maturity of the environment, health and safety (EHS) towards the sustainability of the natural ecosystem. The study analysed ten oil and gas companies around the world and the results showed that these companies have made progress in the area of environment, health and safety. Policies of oil and gas companies have captured laws to mitigating environmental and health and safety issues but there are still rooms for more improvement. The policies on EHS targeted areas of emission, protection of the environment, sustainability, safety measures and ensuring employees’ welfare. There are some oil and gas companies that violate some of the EHS laws which are eminent among oil and gas companies in the US and other countries. The violations were related to process safety management and the clean air act. In order to fulfil the EHS regulations, companies have tried to implement control measures in different ways by substituting, administrative, eliminating, employee protection and engineering works.

In Ghana, Abdulai (2013) examined ways by which Ghana can achieve sustainable development in its oil and gas industry. It was proposed that oil and gas is exhaustible hence the need for the industry to focus on the development of infrastructures such as quality education, healthcare and create jobs for the unemployed. The oil and gas industry benefits should be well integrated to ensure that the future generations also have access to the same benefit. In a study by Hoiyik et al. (2009), 31 employees were interviewed including leaders
in a Norwegian petroleum company and the study found that the concept of health, safety and environment are known to be new concepts hence the study wants to know how employees conceptualize the HSE culture and the difference among the variables. The HSE concept means different thing to individuals, companies, communities and nations. The health, safety and the environment are a concept that looks at mediating and averting all negative occurrences that occurs on and off shore. Because of the diversified meanings attached to the HSE concept, a unilateral pattern to have a single approach towards SHE is lacking and makes setting standards difficult to measures.

The concept of HSE must be defined in order to have one standardized measure for all organizations. This will set the ground for all organizations to develop their goals to improve the HSE in their industry. Employees as well as managers will have the same theme where management, employee behaviour, procedures, physical conditions, competence and collaboration will have common grounds with shared rules to achieve HSE culture. In this regard, the sub-cultures within the organization will be aligned to the HSE culture to achieve overall sustainability. This will help to integrate occupational health, the environment, the working environment and security, which are related to safety measures.

Interpreting HSE has influence on how employees, management and others define the concept. Sustainability also fosters financial management, productivity and other socially responsible ways.

Wang et al. (2012) stated that, through the upheavals of societies, global agents who focus on protection of the environment and others have led to major transformations in oil and gas companies implementing safety and hazard measures to protect their employees and the environment. At the site of oil and gas refinery, improvements have been seen in ways to eliminate practices and devices that leads to accidents. These are made possible through the
supervision of effective management practices. There are also routine inspections to ensure that machines and other equipment are in order and are operating as expected.

Similarly, Khadair et al. (2011) discussed two main factors that have impacted on safety performance in the oil and gas industry. Organizational factors have effect on safety performance at the oil and gas workplace. Managerial practices have a stake towards fighting the workplace injuries and these include rewards, trainings and commitment are the ways through which accidents can be averted. Also, leadership style is another influence management has on the workplace environment which influences safety performance. Effective feedback system is created when the leadership style welcomes suggestions and opinions, which help to transform delivery. The two most important factors that promote safety performance are management practices and human factors. The adequate integration of the two basic management concepts in the organization improves safety performance in the organization.

Occupational fatalities and injuries and intricately part of the oil and gas industry causing various degrees of fatal injuries to the worse scenario, which is death. As the oil and gas industry increases, so are its accompanying fatalities and accidents. This calls for a collaborative effort between the government and industry players to work collectively to achieve adequate health and safety practices (Witter et al., 2014). In addressing the issue of occupational health and safety, areas like social support factors, safety and affordability, family and health and job stability, mental health drug and absence and other future considerations. In Ghana, Amorin and Broni-Bediako (2013) identified the challenges confronting the oil and gas industry in the country. The complete avoidance of the impact of oil and gas operations cannot be achieved but the country should not overlook the negatives at the expense of the revenues accrued from the sector. As the mistakes are being identified,
proper measures should be used to address the challenges as they unfold. The government of Ghana has accepted the Petroleum Management Framework Bill which is due to be passed and its main objective is to manage the oil and gas sector and to ensure that the sector is transparent and accountable to Ghanaians. Institutions such as the EPA, GNPC and GMA have been empowered to monitor the affairs of the oil and gas sector.

Kashwani and Nielsen (2017) explored risk assessment in relation to protecting the four cardinal elements in the oil and gas industry which are People, Environment, Assets and Reputation (PEAR). There is a vast gap between management and end users in the oil and gas industry. These gaps are made profound in the context of behavioural safety. Behavioural safety is very vital due to the fact that alienating behavioural safety and analysing the challenges faced in the industry is a waste of time and resource. Hence, it is imperative to analyze the human factors at every stage of risks. Risk assessments have focused on safety engineering systems, procedures, technical variations, behavioural features, risk assessment tools and others. Ideally, these assessments should be done with the human factor being at the center whether the assessment is in the area of processes, technical or behaviour. Culture also plays a key role in dealing with risks and in an environment where employees are involved in decision making leads to compliance and the opposite leads to non-compliance.

Fatalities in the oil and gas can be reduced through collective training aimed at protecting workers from hazards. Training of employees is very vital to exposing employees to understand ways to prevent harm from happening at the workplace. Work specific trainings should be organized so that employees will have knowledge on their operational field other than offering general training skills. Information is also important in this stance and this
should be in relation to the tools being used, PPEs and other protective devices and the
dangers of being exposed to chemicals. Increasingly, workers are being employed into the
oil and gas industry hence the need to educate new employees on the usage of the
equipment used in the oil and gas sector. Regular training should also be offered for old
employees to ensure they don’t become complacent or develop lukewarm attitudes towards
health and safety standards. Employing highly qualified employees and training them to
handle equipment with care at the worksite create a more conducive and safe working
environment (Stromme, 2013).

Sustainable operations and safety management practices has been researched in relation to
offshore oil and gas exploitation. Several models have been designed to address the problem
of health and safety in the oil and gas industry and one of such models is the four (4) blocks
that have been proposed by the CCPS Management System which include; commitment to
process safety, evaluation of risks and understanding hazards, managing risks and learning
from experience. Apportioning greater emphasis to the four blocks commitment to process
safety, evaluation of risks and understanding hazards, managing risks and learning from
experience helps to predict what may occur in the future and address them immediately
(Gimenes et al., 2015). The risk management puts safeguard into perspective by using
preventive measures (procedures, asset integrity and reliability, training and performance
assessment, operational readiness conduct of operations, safe work practices, and contractor
management and mitigation factors). Developing a safe working environment has no control
over petrobras’ HSE management patterns because it’s an operational process that covers
the permit of work processes which are obligatory to every task that involves risk (Gimenes
et al., 2015).
The International Labour Organization Act 174 contains no traces of managing changes and safety work practices. Also, the International Labour Organization Act 174 does not include anything in relation to Seveso III or API RP 750. However, Seveso III have incorporated training and performance assurances in their write-ups where operational readiness is not found in any part unless in the CCPS proposal. Reliability is always binding with safety systems within the operations environment. Policies of oil and gas companies have captured laws to mitigating environmental and health and safety issues but there are still rooms for more improvement. The policies on EHS targeted areas of emission, protection of the environment, sustainability, safety measures and ensuring employees’ welfare. There are some oil and gas companies that violate some of the EHS laws which are eminent among oil and gas companies in the US and other countries. The violations were related to process safety management and the clean air act. In order to fulfill the EHS regulations, companies have tried to implement control measures in different ways by substituting, administrative, eliminating, employee protection and engineering works (Gimenes et al., 2015).

### 2.6 Safety Compliance

Communication and occupational health and safety training is regarded as the two main variables that have positive influence on company’s compliance with OSH legislation. Effective occupational health and safety training coupled with communication have a significant 76.1% influence on compliance and there are other factors that also influences compliance aside communication and OSH training. However, training contributes significantly to compliance compared to communication. The most dominant accident that occurs at construction sites are falling from heights and this can be dealt with by raising awareness. Falling from height happens among employees of different ages, education and
among people with no safety briefings. Combating the occurrence of accidents demands serious commitment from employees and most importantly, employers who need to ensure that the necessary safety processes are duly followed by their employees. Having regular and routine meeting before work commences is important to curb the incidence of accidents and hazards experienced at the workplace. The use of safety signage is also vital to ensure staff and visitors safety by preventing them from approaching places that have been dubbed danger zones (Nawi et al., 2016; Wambilianga and Waiganjo, 2013).

Similarly, in Kenya, Gaceri (2015) evaluated the factors affecting the implementation of health and safety measures in the supermarkets found in Kenya. Supermarkets in Kenya have made it a habit to hold safety meetings every morning before works start. This means management shows positive attitude towards safety activity. Guidance is one vital variable that is needed to implement health and safety measures in supermarkets hence the formulation of policies safeguard accidents. The implementation of health and safety needs honesty and integrity with much flexibility and acceptance when providing guidance for employees. Leadership at the supermarket is very high because leadership is the cause of safety rules implementation. Leaders at supermarkets do massive consultation among departmental heads in the implementation of safety measures. Involving employees in the implementation of health and safety facilitate processes. The use of participatory approach, improves health and safety through the sharing of information with employees and by also creating individualized partnership with workers to deliberate on health and safety issues. The supermarkets selected for the study constantly take their employees through training for a minimum of three days and a maximum of one month. Training influences the implementation of health and safety whereas the lack of it affects performance and productivity of the organization.
However, the trainings are known to be insufficient considering the duration of the training period. Hence the need to increase the resource base aimed to enhance health and safety measures at supermarkets. Among the supermarkets selected for examination, some involved their stakeholders while others do not involve stakeholders in the implementation of health and safety measures. The implementations of health and safety have reduced accident by 70% in major supermarkets. Employees desire to have some policies measures on health and safety policies in order to implement them. Equipment like fire extinguishers were identified at vantage locations to avert possible fire outbreaks. In a study, Zin and Ismail (2011) found that compliance in terms of safety includes commitment from management which is followed by organizational commitment, effective safety training programmes, safety communication, safety motivation, safety rules and regulations, safety leadership safety management systems, safety and health officers and protection of personnel by supplying them with the necessary gadgets. Employers’ behaviours contribute immensely to encouraging employees’ behaviour in relation to occupational health and safety compliance in their industry.

Arewa and Farrell (2012) reviewed literature on HSE using information from 2007-2011. The knowledge bases of small businesses on health and safety programs are very less. They simply don’t understand the need to invest in safety and health practices. Small and medium enterprises do not regard health and safety measures as a formal compliance initiative. There is the need for the government to set up bodies to check for companies that violate health and safety practices. In this respect, specific advice and guidance are needed to create awareness among SMEs to understand the importance of investing in safety, setting performance targets and assessing the commitment of the company regularly to check their level of compliance to health and safety regulation and rules. The policies that will be used
to target small businesses must oblige them to develop their own health and safety compliance management systems that should be deduced from national policy. Evidence indicates that there are much risks in occupational accidents compared to its economic benefits and performance. Safety management and practices enhances other aspects of management practices, promotes work plan and create the avenue for motivating employees. These further bring about effectiveness, efficiency and ensure that productivity is high. Companies that practices adequate safety and health initiatives are valued by customers and they become the preferred company to do business with comparative to others in the same industry.

Money that has been spent on safety management practices coupled with capital that have been invested in simile sensitive projects that advances the course of quality practices is considered money well invested and this reflects on the profitability of the company. Returns on investment are mostly intangible and difficult to measure especially where the cash flow system of the SME is not structured. Nee et al. (2011) discussed the current situation of health and safety practices in the logistics industry. The discussion was tied around OHS regulations, Notification of Accidents, Dangerous Occurrence, Occupational Poisoning and Occupational disease (NADOOPOD) which were enacted in 2004. Since 2004, no other regulations have been designed to deal with health and safety systems in small companies. The key factor that was considered was the safety of the aged and other health and welfare regulations. The transportation sector has been one of the sectors that received attention on health and safety as well as ways of protecting the natural vegetation in Malaysia. The formulation of new regulations on Global Harmonized System to control hazardous substance as well as the transportation of goods and metabolic syndromes was strengthened to promote safety on roads.
Indicators must be evaluated for effectiveness as far as occupational health and safety is concerned. The adequate protections for employees have become difficult and have evolved into a national issue. This demands participatory efforts from both employers and workers. Upgrading legal requirements enhances safety and health practices. In cases where there are training sections organized for employees, it leads to participatory efforts. Organizing medical check-ups and free screening helps in early detection of health complications and facilitate the effective treatment dynamic and complex health conditions. Safety management is complex and dynamic and requires extensive attention from the aspect of humans, budgeting and technical variables. In every system, there are factors that promote the successful operationalization and implementation of safety policies and initiatives. Studies on organizational psychology have been adopted to test the acceptance of technology. Safety climate have also been studied in varied settings with few studies conducted in the field of logistics and manufacturing sector. The Decomposed Theory of Planned Behaviour (DTPB) has been experimented by looking at the challenges, injuries and fatalities in the logistics sector. The theory discovered some subjective norms, motivations and perceived behaviours which contribute to safety behaviour.

In Nairobi, Kenya, Mputhia et al. (2012) examined the awareness of environmental regulations in determining compliance among micro and small businesses in the manufacturing sector of Kenya. Awareness about the Environmental Management and Coordination Act (EMCA) was significant among micro, small and medium enterprises. Awareness was in varied degree among groups like leather workers, footwear, tobacco and beverage products and rubbers and plastics. It was found that some of the SMEs were aware of environmental regulations but small business not were aware as well as those that were unable to comply with the environmental regulations are destructive to the
environment. NEMA has not yet fully covered manufacturing companies in the chemical and allied sector. Inadequacies were discovered in the sharing of information on regulations of the environment in order to perform environmental roles adequately. This indicates that institutions have a role to play in dissemination of environmental regulatory procedures. This means that institutions that disseminate environmental regulation information needs to be adequately resourced to carry out their activities.

Idirimanna and Jayawardena (2011) conducted a study to analyse factors that affect health and safety behaviours of fruit and vegetable processors in ensuring occupational health and safety. Again, Idirimanna and Jayawardena (2011) reiterated that occupational health and safety is a joint initiative between employees and employers. The interest of both parties differ but they jointly leads to successful and a more concrete health and safety practices among companies. It must be agreed that several challenges are faced by employees and employers in the implementation of health and safety practices. The concerns from both parties are mostly sourced from the workplace health and safety, the focus of the stuffs, the focus of the company and the reactions of employees towards their safety, job description and requirements and among others. There are three levels of staffs; the supervisory and clerical staffs, the industrial staffs and executive staffs and the influence of the executive staff means a lot in safety and health practices. There are varied safety measures in the working environment and that is, works that require longer hours of work eventually reduces employee contribution to ensuring health and safety practices. Ergonomic hazards are the most recurring hazards in manufacturing companies. The automation of works has ripped off the use of manual works which makes postures awkward at the workplace.

Supervisors however have moderate influence and co-workers have less influence over their colleagues. The behaviours of industrial staffs depend on many factors and among those that
highly influence employees are executives and the management of the company. The stress levels of employees, working sections, previous incidents, personal attitude towards health and safety are known to be imperative for safety practices. Factors like the education of employees, working experience, age, marital status and gender and among others does not have much influence health and safety. The attention of employees at work very minimal and this account for most health and safety issues at the workplace. Companies that are into construction must implement health and safety practices and the responsibility must be a shared responsibility between employees and employers. The most ideal way to plan health and safety in developing companies is by incorporating the two most important stakeholders which are the employees and the employers. Stress was noted to have evolved from huge workloads, less opportunity to improve career and uncomfortable working environment. The repetitive nature of incidents jeopardizes the behaviour of employees which contributes negatively to safety issues.

In Nigeria, Umeokafor et al. (2014) assessed compliance with occupational health and safety regulatory entity. Most companies falter in compliance with health and safety regulations in Nigeria. In an interview, it was revealed that employees are mostly not given personal protective equipment (PPE) which are tools used to minimize the extent of injuries in case accidents should occur. Also, screens that are used to display safety practices by displaying how PPE are used were inadequate hence have failed to convey safety messages at the workplace. This is in direct violation of the Factory Act F1 LFN 2004 in Nigeria. Employees have the right to report any violations at the workplace to the director in charge according to the Factory Act 2004. It therefore becomes the obligation of the director to handle and manage the situation at the workplace to prevent any casualties. Hammer et al. (2016) examined the effect of work-family interventions in relation to the compliance to
safety and organizational behaviour. The combination of family or allowing the influence of family contribution in the management of workplace activities brings harmony in issues like wages and working hours.

In South Africa, Windapo (n.d) investigated the level of contractors’ compliance to health and safety legislations. The study proposed measures that can be adopted by companies in the construction industry to ensure effective compliance to health and safety practices at the workplace. The question of compliance or non-compliance to health and safety management practices as stated by legislation is influenced by two main factors; the site where the construction is going on and the attitude of the site manager. In a series of meticulous data collected at the Western Cape Province of South Africa found a direct effect of the building sites and site manager’s attitude on compliance to health and safety legislation. Compliance is also dependent on the knowledge of the site manager with regards to health and safety legislation compliance and how the site manager is committed to complying with these safety practices. Recommendations have been made that site managers should be committed to safety legislations due to the involvement of human lives couple with the fact that, reducing injuries, accidents and levels of fatalities increases work output through the elimination of absenteeism in inculcates the sense of pride into employees. This happens when employees believe the company care about their welfare hence deepening the cords of employee loyalty.

In Kenya, Wazir (2013) explored the challenges confronted by the Kenyan Airways in the implementation of health and safety systems. The Kenyan Airline industry has a concrete evidence of written formal policy on health and safety which are used as a guiding principle in their industry. Irrespective of the colourfully drafted documents on health and safety, employees have been graced with ignorance of these policies and a major contributing
factor to this is the focus of safety managers to flight other than incorporating other compartments within the aviation industry. This hampers the collective effort to control, manage and combat the occurrence of accidents, injuries and casualties. To make conditions worse, there are no training programmes scheduled to equip employees. Nonetheless, orientations are done to create the awareness to health and safety but the effect it has on improving health and safety is negligible. Cognizance is not given to health and safety unless an accident occurs. Employees and unit heads have less involvement in identifying risks and hazards. Passivity was the activeness of line managers in health and safety planning and execution but everything concerning health and safety are left in the hands of the health and safety manager who plans everything without consulting line managers who are on the field and know the challenges and complexities of the undertaken. Employees show much concern when there are no structured measures to deal with the physical and mental wellbeing of workers. Wazir (2013) discovered that there were medical and health relief packages that were offered to employees in cases of accidents and other calamities. It was further found that protective clothes are given to employees, but they scarcely use them. This exposes workers to risks and dangers and other hazards.

In a related work, Salihu et al. (2016) explored the factors affecting facilities compliance to the regulations of the environment. As part of the study, the knowledge and understanding of environmental legislations compliance were considered. There was myriad of challenges that were noted to have been affecting compliance to environmental regulations and this includes; the relationship between operators and regulatory agencies. Another factor that hinders compliance is basically the lack of awareness on regulations that binds the operational activities a company. There is also the lack of technical skills and expertise that contributes to non-compliance. Engaging in collective consultation and deliberations prior
to the development of new environmental laws are noted to be helpful enhancing compliance. Embarking on sensitization programs to enlighten the industry stakeholders reduces the challenge of non-compliance. Creating awareness is undoubtedly the most ideal way of increasing compliance by reducing non-compliance, which might have either positive or negative impact on the environment or its concomitant impact on human health.

Healthcare in relation to health and safety is an anchor that encourages quality work performance. Attention was given to safety climate, work related illnesses and injuries (e.g., musculoskeletal disorders and cut injuries), stress and burnouts and factors that enhances employee performance such as staffing ratio, quality improvement process and teamwork (Lundstrom et al., 2002).

Jambwa and Chitongo (2013) carried out a study to investigate the extent of OHS among workers at the water and sewage, Morondera Municipality. The study found that the municipality has performed abysmally in protecting their workers against accidents and diseases. It is of no surprise that the spread of infections and accidents were on the ascendency. Employees have less protective guides because they lack inspection from health and safety officers. In the light of this, Jambwa and Chitongo (2013) concluded that negligence and the habit of familiarity have caused more accidents and injuries than natural cause of accidents. The old employees demonstrate more act of negligence compared to new employees. Occupational health and safety have been given less audience in the Morondera Municipality. In addition to that, employees are excluded from deliberating on the occupational health and safety issues. When employees show their displeasure, management sees the employees as troublesome. Labour inspectors have scarcely visited the facility since time immemorial. Hence, there is the need to ensure that the ministry under the local government in charge of labour laws must be active and vibrant in carrying out their duties.
In short, the causes of accidents were grouped into poor working conditions, human errors and the lack of protective clothing.

2.7 Summary of Chapter

This chapter presented literature review under the following headings; safety management, safety management indicators, safety practices in mining sector, safety practices in the oil and gas and safety compliance. The oil and gas industry are no doubt dominated by hazards, accidents and causes major havoc to human life, property and activities when potential hazards are not adequately controlled. In Ghana, Achaw and Boateng (2012) assessed safety practices in the oil and gas and its adjoining industry using both interview and questionnaires. The study found that there are regulations that are geared towards ensuring occupational health and safety. However, there are no national policy on occupational health and safety sole for the oil and gas. In Ghana, Horbah et al. (2017) assessed the current safety climate that influences accidents and risks at the oil and gas industry in Ghana. Prioritizing safety practices is the best supportive initiative that helps to mitigate risks and accidents. Also, supervising safety, equipment maintenance, management of change and commitment to risks indicators leads to the avoidance of accidents and risks. Safety climates are a president that averts major accidents and risks.
CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This chapter will present the research methodology employed. The research methods are particularly discussed in detail under the research design, population, sampling and sample size, data collection instrument, data analysis and ethical consideration.

3.2 Research Design

Generally, research design is a plan or a framework for guiding a study. Research purposes are fall under three main categories. These are; the exploratory, descriptive and explanatory (Creswell, 2009). The research designs used are both explanatory and descriptive. The descriptive design focus on what exist. It describes the characteristics of the variables in general. The explanatory design was used to explain the relationships between the variables. These relationships were between the independent variables and the dependent variable. Neuman (2000) also indicates that survey is a process of asking many people the same questions and examining their answers. The positivist’s assumption was adopted for the study. This means a quantitative design was used specifically; a descriptive design was adopted for the study. The study utilized positivism assumption (quantitative design) by empirically observing facts. Descriptive design was the main research design adopted in this study.

3.3 Population

A population refers to a group of people or objects which form the subject of study. In simple terms it consists of all elements or individuals, items or objects whose characteristics are being studied Saunders et al (2007). Population is the entire number of people or element available for a study. Responses were gathered from the perspective of management and
employees of TOR on safety culture. Respondents that constituted the study population included fulltime workers, contract workers and casual workers.

3.4 Sampling and Sample Size
According to Strydom (2005) sampling means taking any portion of a population or universe as representative of that population. If the population itself is relatively small, the sample should comprise a reasonably larger percentage of the population. Large samples enable researchers to draw more representativeness and accurate conclusions and to make more accurate predictions than in smaller samples. Neuman and Neuman (2003) argued that 30% of a given population is adequate sample size for any meaningful study. An estimated 350 sample size was envisaged for the study employing Cooper and Schindler (2006) statistical formulae at 95% confidence interval. However, 186 useable questionnaires were returned recording 53.1% response rate. The study drew responses from the perspectives of employees and management of TOR with regards to safety culture. Target population consisted of fulltime, contracts and casual staff of the company.

3.5 Data Collection Instrument
Both primary and secondary sources of data were used. With the help of structured questionnaires, convenient sampling approach was employed to elicit for data from 186 respondents. The instruments used for the study were adopted and modified from Osabutey (2013). In all, there were 23 questions on operational risks, safety policy and safety procedures for employees and management of TOR. The instruments were measured using 5-point Likert Scale (where 5=critical and 1=very low). Secondary data was deduced from scientific database like Impact factor, Ulrich, Cite Seerx, BASE and Index Copernicus and among others.
3.6 Data Analysis:
Statistical Package for Social Sciences (SPSS) Version 23 was used to analyse the data gathered from the field. The data was validated to ensure there were no wrong entries, omissions, non-response, double entry and among other to enhance the reliability, the completeness, validity and consistency of the data. As a result of the objectives, both descriptive and inferential statistics were deployed. Specifically, Paired T-test, Means, Standard Deviations and percentages were the main analyses conducted in this study.

3.7 Ethical Consideration:
Data analysis is concerned with examining, categorizing, and tabulating sources of evidence to address the initial proposition of the study. Analysing data is an essential component of case study research, but it is often difficult because the strategies and techniques for coding and testing this evidence are the least defined. Before analysing the data, the data were cleaned up to remove possible errors to ensure accuracy and consistency. Since the study would take place in corporate context the researchers adhered to pertinent corporate ethics such as informed consent, respect for human right, protection from harm and professional integrity. In view of this the consent letter was sent to TOR authority for review and approval before conducting the survey. Subsequently, data was collected from both employees and management.

3.8 Summary of Chapter
This chapter highlighted the methods and methodology that was adopted by the researcher to explain the processes that was employed by the current study. The research methods and the methodology were discussed in detail under the research design, population, sampling and sample size, data collection instrument, data analysis and ethical consideration.
4.0 RESULTS, ANALYSIS AND DISCUSSIONS

4.1 Introduction

Chapter four provides the data analyses and discussion of the study. The analyses was grouped according to major heading like the Socio-Demographic Characteristics, Descriptive Statistics on Physical Health Hazards, Descriptive Statistics on Mechanical/Ergonomic Health Hazards, Descriptive Statistics on Psychosocial Health Hazards, Descriptive Statistics on Biological Health Hazards, Descriptive Statistics on Precautionary Measure, T-Test Results on Operational Risk and Safety Culture at TOR, Descriptive Statistics Results on Safety Management Procedure, Descriptive Statistics on Operational Risk and Safety Culture and structural model.

4.2 Socio-Demographic Characteristics

The table 1 presents result on demographic information about the respondent. From the survey, 29% of the respondents were between the ages of 32-40 years, 24.2% were 41-50 years and 46.8% were above 50 years. This implies that majority of the respondents are fully matured. Furthermore, the survey revealed that, 76.3% of the respondents were males and 23.7% were females. This implies that the number of male respondent is dominant over the female. Moving on, the study showed that, 14% of the respondents belonged to Islamic religion, 76.3% belonged to Christianity religion and 9.7% belonged to other religions. From the survey it’s a fair judgment that about 80% of the respondents are Christians. Moreover, the research revealed that, 9.1% of the respondent had their educational level to be primary, 14.5% had a degree, 47.8% had their masters, and 28.5% had other forms of
educational background. This result is an indication that majority (47%) of the respondent have acquired a higher level of education and are highly intellectuals.

**Table 1: Socio-Demographic Characteristics of Respondents  (n=186)**

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<th>Demographics</th>
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</tr>
<tr>
<td>Primary</td>
<td>17</td>
<td>9.1</td>
</tr>
<tr>
<td>Degree</td>
<td>27</td>
<td>14.5</td>
</tr>
<tr>
<td>Masters</td>
<td>89</td>
<td>47.8</td>
</tr>
<tr>
<td>Others</td>
<td>53</td>
<td>28.5</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>152</td>
<td>81.7</td>
</tr>
<tr>
<td>Divorce</td>
<td>17</td>
<td>9.1</td>
</tr>
<tr>
<td>Widow/er</td>
<td>17</td>
<td>9.1</td>
</tr>
<tr>
<td><strong>Years of working in TOR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-9</td>
<td>18</td>
<td>9.7</td>
</tr>
<tr>
<td>10-14</td>
<td>36</td>
<td>19.4</td>
</tr>
<tr>
<td>15&gt;</td>
<td>132</td>
<td>71.0</td>
</tr>
<tr>
<td><strong>Nature of employment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Backup</td>
<td>18</td>
<td>9.7</td>
</tr>
<tr>
<td>Full Time</td>
<td>125</td>
<td>67.2</td>
</tr>
<tr>
<td>Contractor</td>
<td>17</td>
<td>9.1</td>
</tr>
<tr>
<td>Casual</td>
<td>26</td>
<td>14.0</td>
</tr>
<tr>
<td><strong>Running of shift</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>160</td>
<td>86.0</td>
</tr>
<tr>
<td>No</td>
<td>26</td>
<td>14.0</td>
</tr>
</tbody>
</table>

*Source: Field Survey, 2016*

Again, the study revealed that slightly below 82% were married and 9.1% were divorced.

Lastly, 9.1% of the respondents were widows. This implies that, a reasonable number of the respondents are couples. Furtherance, the research showed that, 9% of the respondents had 5-9 years working experience, 19.4% had 10-114 years working experience and 71% had
working experience. This result is an indication that, 71% of the respondents have the most intensive knowledge of the work.

In addition, the survey revealed that, 9.7% had a backup nature of employment, 67.2% had full time nature of employment, 9.1% had contractor nature of employment and 14% had casual nature of employment. This implies that most of the respondents have a full-time profession. Also, the study revealed that, 86% of the respondents run shifts and 14% do no run shifts. The results point out that majority (86%) of the respondents move from one place to another and therefore are dominant over the 14% who do not run shifts.

4.3 Descriptive Statistics on Physical Health Hazards

Table 2 presented the results of physical health hazards at the work environment. The study revealed that a greater number of employees (M=3.47 & SD=0.79) agreed that noise is relatively high at their workplace, a larger proportion (M=3.61 & SD=0.47) agreed that they could lose their hearing due to the exposure to loud noise at the workplace, majority (M=1.33 & SD=0.47) disagreed that their job function deals with handling of tools, objects, equipment, machines, chemicals etc. that have high temperatures. Again, a greater proportion (M=1.63 & SD=0.69) strongly disagreed that extreme heat could cause body cramps, most of the respondents (M=2.89 & SD=0.87) disagreed that their workplace shakes owing to vibrations from machines and equipment, equally, a reasonable number (M=2.34 & SD=0.78) of workers disagreed that vibrations could cause disorders in their spines and cause fatigue. Similarly, a greater proportion (M=2.34 & SD=1.29) of workers disagreed they have adequate lighting system, however majority (M=2.19 & SD=0.79) disagreed that inadequate illumination could affect their eye sight and a greater portion (M=1.80 & SD=0.85) strongly disagreed that radiations from welding and radioactive substances could be emitted as they perform their job functions. Lastly, majority (M=2.09
and SD=0.81) of the employees disagreed that radiations could cause cancers and premature skin aging.

### Table 2: Physical Health Hazards

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean ± SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>The noise level in my workplace is relatively high</td>
<td>3.47 ± 0.79</td>
<td>-1.63</td>
<td>2.24</td>
<td>Agree</td>
</tr>
<tr>
<td>Loss of hearing could result from exposure to loud noise</td>
<td>3.61 ± 0.49</td>
<td>-0.47</td>
<td>-1.80</td>
<td>Agree</td>
</tr>
<tr>
<td>My job function has to do with working with object, tools, equipment, machine, chemical etc. that has high temperature</td>
<td>1.33 ± 0.47</td>
<td>0.71</td>
<td>-1.51</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>Extreme heat could cause body cramp</td>
<td>1.63 ± 0.73</td>
<td>0.69</td>
<td>-0.80</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>My workplace shakes as a result of vibration from workplace machines and equipment</td>
<td>2.89 ± 0.87</td>
<td>-0.69</td>
<td>0.03</td>
<td>Disagree</td>
</tr>
<tr>
<td>Vibration could disorder the spine and causes fatigue</td>
<td>2.34 ± 0.78</td>
<td>-0.69</td>
<td>-1.03</td>
<td>Disagree</td>
</tr>
<tr>
<td>My workplace is adequately lighted</td>
<td>2.34 ± 1.29</td>
<td>-0.67</td>
<td>-1.65</td>
<td>Disagree</td>
</tr>
<tr>
<td>Inadequate illumination could affect the eyes</td>
<td>2.19 ± 0.79</td>
<td>-0.29</td>
<td>-1.33</td>
<td>Disagree</td>
</tr>
<tr>
<td>Radiations like in welding, radioactive substances etc. could be emitted as I perform my job function</td>
<td>1.80 ± 0.85</td>
<td>-0.35</td>
<td>-1.51</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>Radiation could cause cancer and premature skin aging</td>
<td>2.09 ± 0.81</td>
<td>-0.18</td>
<td>-1.47</td>
<td>Disagree</td>
</tr>
</tbody>
</table>

SD=Standard Deviation

**Source:** Field Survey, 2016.

### 4.4 Descriptive Statistics on Chemical Health Hazards

The Table 3 showed the outcome of chemical health hazards. The survey discovered that majority (M=1.87 & SD=0.87) of the employees strongly disagree that they work with chemical substances, another, (M=1.61 & SD=0.72) strongly disagreed that the substance they work with are solvents, mist, fume and gases and majority (M=2.45 & SD=1.14) of the workers disagreed that the substances they use involve dust particles, metals and metalloids.

In furtherance, a large number (N=2.98, SD=0.88) of employees disagreed that the
chemical/gases they use are flammable, poisonous and corrosive but a greater proportion (M=3.28 & SD=0.77) of the workers agreed that the hazardous chemicals are inhaled, injected, injected and sometimes spill over their skin. Similarly, majority (M=3.47 & SD=0.59) of the worker agreed that eating at a chemical contaminated area is highly prohibited with a larger number (M=3.43 & SD=0.66) agreed that chemical substances should be carefully handled and labelled and also, a reasonable number (M=3.62 & SD=0.49) agreed that chemical hazards are likely to affect their health when they are exposed for a long period of time. In addition, a greater majority (M=3.76 & SD=0.43) agreed that exposure to chemical hazards could cause reproductive disorders, cardiovascular diseases, respiratory diseases, renal diseases etc. and a greater portion (M=3.53 & SD=0.50) agreed that the health impact of hazards could lead to loss of human life.

### Table 3: Chemical Health Hazards

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean ± SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working with chemical substances is part of my job function</td>
<td>1.87 ± 0.87</td>
<td>0.26</td>
<td>-1.53</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>The substances are solvent, mist, fume and gases</td>
<td>1.61 ± 0.72</td>
<td>0.75</td>
<td>-0.73</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>The substances are dust, particles, metal and metalloid</td>
<td>2.45 ± 1.14</td>
<td>0.26</td>
<td>-1.37</td>
<td>Disagree</td>
</tr>
<tr>
<td>The chemical/gases are flammable, poisonous and corrosive</td>
<td>2.98 ± 0.88</td>
<td>-0.72</td>
<td>-0.03</td>
<td>Disagree</td>
</tr>
<tr>
<td>The hazardous chemicals are sometimes inhaled, ingested, injected and spill over my skin</td>
<td>3.28 ± 0.77</td>
<td>-1.18</td>
<td>1.56</td>
<td>Agree</td>
</tr>
<tr>
<td>Eating where there are chemicals is highly prohibited</td>
<td>3.47 ± 0.59</td>
<td>-0.59</td>
<td>-0.58</td>
<td>Agree</td>
</tr>
<tr>
<td>Chemical substances should be carefully handled and labelled</td>
<td>3.43 ± 0.66</td>
<td>-1.08</td>
<td>1.49</td>
<td>Agree</td>
</tr>
<tr>
<td>Chemical hazards are likely to affect one’s health when they are exposed to them for a long period of time</td>
<td>3.62 ± 0.49</td>
<td>-0.49</td>
<td>-1.78</td>
<td>Agree</td>
</tr>
<tr>
<td>Exposure to chemical hazards could cause reproductive disorder, cardiovascular disease, respiratory</td>
<td>3.76 ± 0.43</td>
<td>-1.22</td>
<td>-0.53</td>
<td>Agree</td>
</tr>
</tbody>
</table>
4.5 Descriptive Statistics on Mechanical/Ergonomic Health Hazards

The Table 4 presents descriptive result on ergonomic health hazards. From the study, a large number of workers (M=3.47 & SD=0.74) agreed that they sometimes take awkward postures while working, minority (M=3.04 & SD=0.90) disagreed that they sometimes work in height, another large proportion (M=3.57 & SD= 0.49) of workers agreed that when performing their work functions, they stand for long hours.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean ± SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>I sometimes take an awkward posture while working</td>
<td>3.47 ± 0.74</td>
<td>-0.99</td>
<td>-0.46</td>
<td>Agree</td>
</tr>
<tr>
<td>I sometimes work in height</td>
<td>3.04 ± 0.90</td>
<td>-0.88</td>
<td>0.18</td>
<td>Agree</td>
</tr>
<tr>
<td>When performing my job functions I stand for a long while</td>
<td>3.57 ± 0.49</td>
<td>-0.29</td>
<td>-1.94</td>
<td>Agree</td>
</tr>
<tr>
<td>The work material at my duty post is obsolete</td>
<td>1.33 ± 0.47</td>
<td>0.71</td>
<td>-1.51</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>I lift heavy objects manually the chair, desk and other working tools and materials arrangements in my workplace is very comfortable and convenient with my job functions</td>
<td>2.32 ± 0.84</td>
<td>-0.17</td>
<td>-0.83</td>
<td>Disagree</td>
</tr>
<tr>
<td>I sit most time when I am on duty</td>
<td>2.72 ± 0.94</td>
<td>-0.11</td>
<td>-0.95</td>
<td>Disagree</td>
</tr>
<tr>
<td>My work is repetitive and monotonous</td>
<td>2.42 ± 0.89</td>
<td>-0.18</td>
<td>-0.83</td>
<td>Disagree</td>
</tr>
<tr>
<td>Ergonomic hazards could cause deformity of one’s body</td>
<td>2.66 ± 1.13</td>
<td>-0.11</td>
<td>-1.40</td>
<td>Disagree</td>
</tr>
<tr>
<td>Mechanical/Ergonomic hazards could cause back, neck and body pain</td>
<td>2.24 ± 0.87</td>
<td>-0.03</td>
<td>-0.95</td>
<td>Disagree</td>
</tr>
</tbody>
</table>


SD=Standard Deviation
More so, minority (M=1.33 & SD=0.47), strongly agreed that the work materials at their
duty post is obsolete, majority (M=2.32 & SD=0.84) disagreed that they lift objects
manually. The chair, desk, and other working tools and materials arrangements in their
workplace is very comfortable and convenient with my function and minority (M=2.72 &
SD=0.94) agreed that they sit most times when they are on duty. Moreover, greater number
(M=2.42 & SD=0.89) disagreed that their work is repetitive and monotonous, majority
(M=2.66 & SD=1.13) also disagreed that ergonomic hazards could cause deformity of one’s
body and minority (M=2.24 & SD=0.87) agreed that mechanical/ergonomic hazards could
cause back, neck and body pain.

4.6 Descriptive Statistics on Biological Health Hazards
Table 5 presented the results on biological health hazards. The survey unearthed that
majority (M=2.62 & SD=1.09) disagreed that microbes could be found in some of the
substances they work with. With regards to hazardous waste, many of the employees
(M=2.38 & SD=0.91) disagreed that they generate hazardous waste while working and
equally high number of employees (M=1.87 & SD=0.84) strongly disagreed that some of
the hazardous waste could impact on their health. Regarding biological hazards, a greater
proportion (M=1.61 & SD=0.72) strongly disagreed that biological hazards could cause
Tuberculosis, pneumonitis, pneumoconiosis etc. and lastly, majority (M=2.01 & SD=0.76)
of the employees disagreed that proper environmental hygiene is lacking in their workplace.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean ± SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microbes could be found in some substances I work with in my work station</td>
<td>2.62 ± 1.09</td>
<td>-0.08</td>
<td>-1.31</td>
<td>Disagree</td>
</tr>
<tr>
<td>I generate hazardous waste while working</td>
<td>2.38 ± 0.91</td>
<td>-0.02</td>
<td>-0.84</td>
<td>Disagree</td>
</tr>
<tr>
<td>Some of this hazardous waste</td>
<td>1.87 ± 0.84</td>
<td>0.26</td>
<td>-1.53</td>
<td>Strongly</td>
</tr>
</tbody>
</table>
could impact on the health of workers

Biological hazards could cause Tuberculosis, pneumonitis, pneumoconiosis etc.

Proper environmental hygiene is lacking in my place of work

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean ± SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>My workload is very challenging</td>
<td>3.24 ± 0.53</td>
<td>0.17</td>
<td>-0.26</td>
<td>Agree</td>
</tr>
<tr>
<td>I would like to be transferred to another unit/department</td>
<td>3.57 ± 0.59</td>
<td>-1.00</td>
<td>0.03</td>
<td>Agree</td>
</tr>
<tr>
<td>I work in isolation</td>
<td>3.61 ± 0.49</td>
<td>-0.47</td>
<td>-1.80</td>
<td>Agree</td>
</tr>
<tr>
<td>I am constantly talked down by my Superior</td>
<td>3.48 ± 0.50</td>
<td>0.09</td>
<td>-2.01</td>
<td>Agree</td>
</tr>
<tr>
<td>I am faced with some kind of aggression and harassment in my place of work</td>
<td>3.58 ± 0.49</td>
<td>-0.31</td>
<td>-1.93</td>
<td>Agree</td>
</tr>
<tr>
<td>Psychosocial hazard could cause hypertension, anxiety, boredom etc.</td>
<td>3.62 ± 0.49</td>
<td>-0.49</td>
<td>-1.78</td>
<td>Agree</td>
</tr>
</tbody>
</table>

*SD=Standard Deviation*  

*Source: Field Survey, 2016.*
4.8 Descriptive Statistics on Precautionary Measure

The Table 7 presented precautionary measures. The study revealed that majority (M=3.44 & SD=0.72) agreed that they have pre-employment training when they were newly employed, majority (M=3.47 & SD=0.91) also agreed that they had pre-employment health examination when they were newly employed while another (M=2.56 & SD=1.09) disagreed that employers periodically calls for a health examination monitoring or surveillance on their on their employees and the greater proportion of employees (M=3.43 & SD=0.73) agreed that personal protective equipment (PPE) provided by management is adequate and appropriate.

Table 7: Precautionary Measure

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean ± SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>I had a pre-employment training when newly employed</td>
<td>3.44 ± 0.72</td>
<td>-0.89</td>
<td>-0.55</td>
<td>Agree</td>
</tr>
<tr>
<td>I had a pre-employment entrance health examination when newly employed</td>
<td>3.47 ± 0.91</td>
<td>-1.45</td>
<td>0.73</td>
<td>Agree</td>
</tr>
<tr>
<td>My employer periodically calls for a health examination monitoring/surveillance on their employees</td>
<td>2.56 ± 1.09</td>
<td>-0.18</td>
<td>-1.26</td>
<td>Disagree</td>
</tr>
<tr>
<td>Personal Protective Equipment (PPE) provided by Management is adequate and appropriate</td>
<td>3.43 ± 0.73</td>
<td>-0.87</td>
<td>-0.61</td>
<td>Agree</td>
</tr>
<tr>
<td>My employer periodically send the employees for trainings to update and upgrade their efficiency and effectiveness</td>
<td>1.33 ± 0.47</td>
<td>0.71</td>
<td>-1.52</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>There is a First Aid Box in my workplace</td>
<td>2.66 ± 1.25</td>
<td>-0.23</td>
<td>-1.59</td>
<td>Disagree</td>
</tr>
<tr>
<td>There is an HSE Policy that is duly signed by the Managing Director in my workstation</td>
<td>2.23 ± 0.69</td>
<td>-0.33</td>
<td>-0.86</td>
<td>Disagree</td>
</tr>
<tr>
<td>Implementation of the HSE Policy is taken seriously by Management</td>
<td>2.15 ± 0.71</td>
<td>-0.22</td>
<td>-0.99</td>
<td>Disagree</td>
</tr>
<tr>
<td>Management is completely</td>
<td>2.42 ± 0.86</td>
<td>-0.94</td>
<td>-0.97</td>
<td>Disagree</td>
</tr>
</tbody>
</table>
committed to the health and well-being of their workers. There is a very functional and active Occupational Health Safety System in place in my Company.  

$2.52 \pm 0.74$ -1.16 -0.71 Disagree  

SD=Standard Deviation  


Nonetheless, majority (M=1.33 & SD=0.47) of the employees strongly disagreed that employers periodically send them for trainings to update and upgrade their efficiency and effectiveness and a larger number (M=2.66 & SD=1.25) disagreed that there are first aid boxes at their workplace. Moreover, majority (M=2.23 & SD=0.69) disagreed there is HSE policy that is duly signed by managing directors at their workstation with a simile portion (M=2.15 & SD=0.71) disagreed that implementation of HSE policy is taken seriously by management. More so, majority (M=2.42 & SD=0.86) disagreed that management is completely committed to the health and well-being of their workers and lastly, (M=2.52 & SD=0.74) disagreed that there is a very functional and active occupational health and safety system in place in their company.

4.9 T-Test Results on Operational Risk and Safety Culture at TOR  

Table 8 presents T-test results on operational risk and safety culture practices at TOR. There was a significant statistical ($t_{185} = 17.33$, $p$-value = 0.000 < 0.05) mean differences between expected and actual depreciation of the cedi against major currencies in the company.  

<table>
<thead>
<tr>
<th>Statements</th>
<th>t-value</th>
<th>df</th>
<th>95% CI</th>
<th>p-value</th>
<th>MD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instability in global oil prices</td>
<td>27.97</td>
<td>185</td>
<td>1.85-2.14</td>
<td>0.000</td>
<td>1.99</td>
</tr>
<tr>
<td>Depreciation of the cedi against major currencies</td>
<td>17.34</td>
<td>185</td>
<td>0.65-0.82</td>
<td>0.000</td>
<td>0.74</td>
</tr>
<tr>
<td>Health &amp; safety</td>
<td>46.59</td>
<td>185</td>
<td>2.79-3.04</td>
<td>0.000</td>
<td>2.91</td>
</tr>
<tr>
<td>Credit safety-default on the part of OMC’s</td>
<td>81.02</td>
<td>185</td>
<td>3.12-3.28</td>
<td>0.000</td>
<td>3.19</td>
</tr>
<tr>
<td>Theft</td>
<td>76.32</td>
<td>185</td>
<td>3.26-3.44</td>
<td>0.000</td>
<td>3.35</td>
</tr>
<tr>
<td>Issue</td>
<td>Mean</td>
<td>Std. Dev</td>
<td>Lower CI</td>
<td>Upper CI</td>
<td>T Value</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>---------</td>
</tr>
<tr>
<td>Political interference</td>
<td>75.35</td>
<td>185</td>
<td>3.25</td>
<td>3.44</td>
<td>0.000</td>
</tr>
<tr>
<td>Environmental safety</td>
<td>66.23</td>
<td>185</td>
<td>3.11</td>
<td>3.31</td>
<td>0.000</td>
</tr>
<tr>
<td>Brain Drain</td>
<td>78.44</td>
<td>185</td>
<td>2.91</td>
<td>3.06</td>
<td>0.000</td>
</tr>
<tr>
<td>Shortage of crude oil</td>
<td>77.75</td>
<td>185</td>
<td>3.19</td>
<td>3.36</td>
<td>0.000</td>
</tr>
<tr>
<td>Safety of attack on TOR’s facilities</td>
<td>86.07</td>
<td>185</td>
<td>3.06</td>
<td>3.21</td>
<td>0.000</td>
</tr>
<tr>
<td>Operational safety (Fire and breakdown of equipment)</td>
<td>36.05</td>
<td>185</td>
<td>3.03</td>
<td>3.39</td>
<td>0.000</td>
</tr>
<tr>
<td>Huge debt owed Ghana commercial bank</td>
<td>64.73</td>
<td>185</td>
<td>2.64</td>
<td>2.81</td>
<td>0.000</td>
</tr>
<tr>
<td>Reputation: Critique from the general public</td>
<td>9.62</td>
<td>185</td>
<td>0.27</td>
<td>0.40</td>
<td>0.000</td>
</tr>
</tbody>
</table>

CI = Confidence Interval, MD=Mean Difference

**Source:** Field Survey, 2016

On average actual depreciation of the cedi against major currencies was 0.74 points higher than expected (95% CI [0.65, 0.82]). The survey further revealed significant statistical ($t_{185} = 46.59$, $p$-value = 0.000 < 0.05) mean differences between expected and actual Health & safety policy in the company. On average actual safety policy was 2.9 points lower than expected (95% CI [2.7, 3.04]). These findings affirmed the works many researchers (ILO, 2013; Asumeng et al., 2015; OSHA, 2015) on health and safety particularly in the oil and gas sector. These authors had reported that the problem of policy insufficiency poses numerous risks and safety concerns.

More so, the study found significant statistical ($t_{185} = 81.02$, $p$-value = 0.000 < 0.05) mean differences between expected and actual credit risk-default on the part of Oil Marketing Companies (OMCs) in the company. On average actual credit risk-default on the part of OMC’s was 3.1 points higher than expected (95% CI [3.12, 3.27]). The study found significant statistical ($t_{185} = 46.59$, $p$-value = 0.000 < 0.05) mean differences between expected and actual theft in the refinery in the company. On average actual theft in the refinery was 3.34 points higher than the expected (95% CI [3.26, 3.43]). These results lean support to Osabutey et al. (2013) that TOR should ensure that their customers that have high
risks be given products secured with assets while and others with poor credit repayment should be dealt with on cash transactions.

The study found significant statistical ($t_{185} = 66.23$, $p$-value $= 0.000 < 0.05$) mean differences between expected and actual environmental pollution caused by the company. On average actual environmental pollution was 3.2 points higher than expected (95% CI [3.11, 3.31]). Relating to this finding Schneider et al. (2013) reported that the contribution of the oil and gas industry to the world’s economy cannot be overlooked but the sector has negatively affected the environment more than any other sector hence sustainable management operations are needed to protect the environment in which they operate. Schneider et al. (2013) evaluated the oil and gas industry towards the maturity of the environment, health and safety (EHS) towards the sustainability of the natural ecosystem. The study analysed ten oil and gas companies around the world and the results showed that these companies have made progress in the area of environment, health and safety.

The study found significant statistical ($t_{185} = 75.35$, $p$-value $= 0.000 < 0.05$) mean differences between expected and actual political interference in the company. On average actual political interference was 3.33 points higher than the expected (95% CI [3.24, 3.42]). The study found significant statistical ($t_{185} = 77.75$, $p$-value $= 0.000 < 0.05$) mean differences between expected and actual rates of crude oil shortage in the company. On average actual crude oil shortage was 3.2 points higher than the expected (95% CI [3.19, 3.36]). The survey found significant statistical ($t_{185} = 27.97$, $p$-value $= 0.000 < 0.05$) mean differences between expected and actual global oil prices safety cultural practices in the company. On average actual risk and safety associated with instability in global oil prices was 1.99 points higher than the expected (95% CI [1.85, 2.14]).
Osabutey et al. (2013) asserted that TOR should ensure that their customers that have high risks be given products secured with assets while and others with poor credit repayment should be dealt with on cash transactions. Using this strategy will reduce TOR’s debts and autonomy should be given to TOR to manage their own finances free from government interferences. The study found significant statistical ($t_{185} = 86.07$, $p$-value = 0.000 < 0.05) mean differences between expected and actual debt owed commercial banks. On average actual debt owed Ghana commercial bank was 2.72 points higher than the expected (95% CI [2.64, 2.81]). The study found significant statistical ($t_{185} = 9.62$, $p$-value = 0.000 < 0.05) mean differences between expected and actual debt owed commercial banks. On average actual debt owed Ghana commercial bank was 0.33 points higher than the expected (95% CI [0.27, 0.40]).

The study found significant statistical ($t_{185} = 78.44$, $p$-value = 0.000 < 0.05) mean differences between expected and actual rates of brain drain in the company. On average actual brain drain was 2.9 points higher than the expected (95% CI [2.91, 3.06]). The study found significant statistical ($t_{185} = 86.07$, $p$-value = 0.000 < 0.05) mean differences between expected and actual rates risk of attack on the company facilities. On average actual attacks was 3.1 points higher than the expected (95% CI [3.06, 3.20]). The study found significant statistical ($t_{185} = 36.05$, $p$-value = 0.000 < 0.05) mean differences between expected and actual rates of fire and breakdown of company equipment. On average actual fire and breakdown of company equipment was 3.2 points higher than the expected (95% CI [3.03, 3.39]).

**4.10 Descriptive Statistics Results on Safety Management Procedure**

The survey revealed that 66.7% of the respondents have indicated that there are standard guidelines on procedure of managing safety, meanwhile 33.3% refute there are standard
guidelines on procedures of managing safety. The survey results imply that there are standard safety guidelines and procedures in managing safety at TOR. Moreover, the survey results indicated that 59.1% of the respondents affirmed that there were control measures in implementing safety management process whereas 40.1% were not aware of control measures in implementing safety management process. This result suggests that majority of the respondents were aware of the existing control measures in safety implementation.

Regarding policy implementation, the study found that below one-third (26.9%) of the employee’s contributions were inculcated into the implementation of safety management at TOR, meanwhile, a large majority (73.1%) contributions were not inculcated into the safety management implementation at TOR. This result suggests that employee’s needs and aspirations were to a greater extent ignored by management in the preparation and implementation of safety policy.

Table 9: Descriptive Statistics Results on Safety Management Procedure

<table>
<thead>
<tr>
<th>Statements</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard guidelines on procedures of managing</td>
<td>Yes 66.7%</td>
</tr>
<tr>
<td>Control measures in implementing safety management process</td>
<td>No 33.3%</td>
</tr>
<tr>
<td>Inculcating employee’s contribution into the</td>
<td>Yes 59.1%</td>
</tr>
<tr>
<td>implementation of safety management</td>
<td>No 40.9%</td>
</tr>
<tr>
<td>Inculcation of employee’s contribution into the implementation of</td>
<td>Yes 26.9%</td>
</tr>
<tr>
<td>safety management</td>
<td>No 73.1%</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2016

4.11 Descriptive Statistics on Operational Risk and Safety Culture

The survey results found that slightly above one-third (39.8%) of the respondents showed that instability in global oil prices have high effect on safety culture, 26.9% indicated that instability in global oil prices as having moderate effect on safety culture, 26.3% claimed instability in global oil prices have low effect on safety culture and at least 7% revealed that instability in global oil prices as having very low effect on safety culture. The survey
revealed that majority (59.7%) of the respondents rated depreciation of the cedi against major currencies as having low effect on safety culture practice, 33.3% rated depreciation of the cedi against major currencies as having very low effect on safety culture practice, whiles 7% rated depreciation of the cedi against major currencies as having moderate effect on safety culture practice. The survey discovered that majority (67.2%) rated Credit safety-default on the part of OMC’s as having high effect on operational risk and safety culture practice at TOR, 26.3% rated Credit risk-default on the part of OMC’s as having critical effect on operational risk and safety culture practice at TOR, finally 6.4% rated Credit safety-default on the part of OMC’s as having moderate effect on operational risk and safety culture practice at TOR.

The study revealed that 52% of the respondents rated theft as having critical effect on operational risk and safety culture practice at TOR, 41.4% rated theft critical as having critical effect on operational risk and safety culture practice at TOR, also 6.5% rated theft as moderately having critical effect on operational risk and safety culture practice at TOR. The survey found that 52.7% of the respondents indicated that political interference has high effect on operational risk and safety culture practice at TOR, 40.3% indicated that political interference has critical effect on operational risk and safety culture practice at TOR, finally 7% agreed that political interference have moderately effect on operational risk and safety culture practice at TOR. The study found that 52.2% of the respondents have showed that environmental risk has high effect on safety culture practice at TOR, 34.4% regarded this as critical whiles 13.4% viewed this as moderate.

The survey showed that 73.1% of the respondents indicated that brain drain has high effect on operational risk and safety culture practice at TOR, 14% agreed that brain drain has moderate effect on operational risk and safety culture practice at TOR whiles 12.9%
believed that brain drain has critical effect on operational risk and safety culture practice at TOR. The study found that majority (59.7%) of the respondents highly agreed that that shortage of crude oil has high effect on operational risk and safety culture practice at TOR, 33.9% of the respondents considered effect as critical whiles 6.5% described this effect as moderate. The survey found that majority (73.7%) of the respondents agreed that there was high risk of attack on TOR facilities has effects on operational risk and safety culture practice at TOR, 19.9% agreed that there were critical attack on TOR facilities has effects on operational risk and safety culture practice at TOR, finally 6.5% indicated that risk of attack on TOR facilities has moderately effect on operational risk and safety culture practice at TOR.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Critical</th>
<th>High</th>
<th>Moderate</th>
<th>Low</th>
<th>Very low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instability in global oil prices</td>
<td>-</td>
<td>39.8%</td>
<td>26.9%</td>
<td>26.3%</td>
<td>7.0%</td>
</tr>
<tr>
<td>Depreciation of the cedi against major currencies</td>
<td>-</td>
<td>-</td>
<td>7.0%</td>
<td>59.7%</td>
<td>33.3%</td>
</tr>
<tr>
<td>Credit risk-default on the part of OMC’s</td>
<td>26.3%</td>
<td>67.2%</td>
<td>6.5%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Theft in the refinery</td>
<td>41.4%</td>
<td>52.2%</td>
<td>6.5%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Political interference</td>
<td>40.3%</td>
<td>52.7%</td>
<td>7.0%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Environmental risk</td>
<td>34.4%</td>
<td>52.2%</td>
<td>13.4%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Brain Drain</td>
<td>12.9%</td>
<td>73.1%</td>
<td>14.0%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Shortage of crude oil</td>
<td>33.9%</td>
<td>59.7%</td>
<td>6.5%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Risk of attack on TOR’s facilities</td>
<td>19.9%</td>
<td>73.7%</td>
<td>6.5%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Operational safety (Fire and breakdown of equipment)</td>
<td>60.2%</td>
<td>19.9%</td>
<td>7.0%</td>
<td>6.5%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Huge debt owed Ghana commercial bank</td>
<td>6.5%</td>
<td>59.7%</td>
<td>33.9%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Reputation: Critique from the general public</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>33.3%</td>
<td>66.7%</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2017
The survey revealed that majority (60.2%) of the respondents have rated Fire and breakdown of equipment as having critical effect on operational risk and safety culture practice at TOR, 19.9% have rated Fire and breakdown of equipment as having high effect on operational risk and safety culture practice at TOR, 7% have rated Fire and breakdown of equipment as having moderate effect on operational risk and safety culture practice at TOR, 6.5% each respectively have rated Fire and breakdown of equipment as having low and very low effects on operational risk and safety culture practice at TOR.

The survey found that majority (59.7%) of the respondents have rated huge debt owed Ghana commercial bank as having high effect on operational risk and safety culture practice at TOR, 33.9% have rated huge debt owed Ghana commercial bank as having moderate effect on operational risk and safety culture practice at TOR, finally 6.5% have rated huge debt owed Ghana commercial bank as having moderate effect on operational risk and safety culture practice at TOR. The study found that majority (66.7%) of the respondents have rated Critique from the general public as having very low effect on operational risk and safety culture practice at TOR, 33.3% rated Critique from the general public as having very low effect on operational risk and safety culture practice at TOR.

4.12 Means and Standard Deviations on Operational Risk and Safety Culture

The survey found that majority (M=3.1, SD=0.97) of the respondents regarded instability in global oil prices as having moderately effect on operational risk and safety of the company. Also, the survey found that majority (M=1.73, SD=0.57) regarded depreciation of the cedi against major currencies as having very low effect on operational risk and safety of the company. Moreover, the survey found that majority (M=4.0, SD=0.85) regarded Health &
safety policy as having high effect on operational risk and safety of the company. More so, the survey found that majority (M=4.2, SD=0.53) regarded credit risk-default on the part of OMC’s as having high effect on operational risk and safety of the company. The survey revealed that majority (M=4.3, SD=0.59) regarded theft in the refinery as having high effect on operational risk and safety of the company. Also, the survey discovered that majority (M=4.2, SD=0.53) rated political interference as having high effect on operational risk and safety of the company. The survey discovered that majority (M=4.2, SD=0.66) rated environmental pollution as having high effect on operational risk and safety of the company. Again, the survey uncovered that majority (M=4.0, SD=0.52) rated brain drain as having high effect on operational risk and safety of the company. Furthermore, the survey discovered that majority (M=4.2, SD=0.57) rated shortage of crude oil as having high effect on operational risk and safety of the company. Similarly, the survey discovered that majority (M=4.13, SD=1.23) rated safety of attack on TOR’s facilities as having high effect on operational risk and safety of the company. Moving on, the survey discovered that majority (M=4.2, SD=0.49) rated Operational safety (Fire and breakdown of equipment) as having high effect on operational risk and safety of the company. Moreover, the survey found that majority (M=3.72, SD=0.57) rated Huge debt owed Ghana commercial bank as having moderate effect on operational risk and safety of the company. Finally, the survey found that majority (M=1.33, SD=0.47) rated Critique from the general public as having very low effect on operational risk and safety of the company.

Table 11: Means and Standard Deviations on Operational Risk and Safety Assessment

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean ± Std. D</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instability in global oil prices</td>
<td>3.01 ± 0.97</td>
<td>Moderate</td>
</tr>
<tr>
<td>Depreciation of the cedi against major currencies</td>
<td>1.74 ± 0.58</td>
<td>Very low</td>
</tr>
<tr>
<td>Health &amp; safety</td>
<td>4.02 ± 0.85</td>
<td>High</td>
</tr>
<tr>
<td>Credit risk-default on the part of OMC’s</td>
<td>4.19 ± 0.54</td>
<td>High</td>
</tr>
</tbody>
</table>
Theft 4.35 ± 0.59 High
Political interference 4.33 ± 0.60 High
Environmental safety 4.21 ± 0.66 High
Brain Drain 4.01 ± 0.52 High
Shortage of crude oil 4.27 ± 0.57 High
Safety of attack on TOR’s facilities 4.13 ± 0.49 High
Operational safety (Fire and breakdown of equipment) 4.21 ± 1.21 High
Huge debt owed Ghana commercial bank 3.73 ± 0.57 Moderate
Reputation: Critique from the general public 1.33 ± 0.47 Very low

Source: Field Survey, 2017

4.13 SEM Results for Inner Model

The study had measured number of constructs to determine the reliability and validity of the newly proposed model. Construct reliability measures the extent of internal consistency of measures used. In this study cronback alpha was used to determine construct reliability which has 0.7 as the acceptable level of internal reliability among the individual items employed in the study (Hair et al., 2010). From the construct reliability and discriminant validity scores as shown in Table 4.13 Cronback alpha were above 0.7 suggesting that these multiple measures are reliable to a greater extent for the measurement of each construct which is an indication of acceptable measure of reliability. Construct validity assesses the degree to which the observed measurement items logically connect and represent a construct proposed by fundamental theory (Fornell and Larcker, 1981). It is assessed through convergent validity and discriminant validity (Hair et al., 2010).

Convergent validity is the extent to which the measurement items together explain the construct they represent in the structural model (Hair et al., 2010). The convergent validity was assessed through composite reliability (CR) with acceptable minimum of 0.70 (Fornell and Larcker, 1981; Hair et al., 2010). As shown in Table 4.14 all the AVEs scores for each construct were above 0.50 indicating that items for each construct collectively explain the
constructs they represent, confirming convergent validity of the derived measures. From the inner model the CR scores for all constructs ranged from 0.60 to 0.83 which is acceptable.

Discriminant validity is the extent to which the measurement items explain adequately their respective constructs more than they do explain other constructs in the structural model (Hair et al., 2010). It is achieved when the square root of the AVEs for each construct is greater than their respective inter-construct correlation (Hair et al., 2010; Fornell and Larcker, 1981). From Table 4.13 the square roots of the AVEs (in the diagonal) are greater than their respective inter-construct correlations. The results of the inner model imply that the proposed model is deemed fit to explain the moderating effect of Health Hazards on safety culture on risk management in the oil and gas sector.

4.14 Results of Structural Model

The Table 12 presents results on path estimate and hypothesis testing. The new model accurately predicted 92% and 77% respectively for health hazards and risk management. This model is supported by it predictive power to consistently predict safety cultural behaviours in the oil and gas sector in Ghana. From the mode the strongest determinant of safety culture is hazard health ($\beta=0.66$), this is also followed by risk management ($\beta=0.45$).

<table>
<thead>
<tr>
<th>Hypothesized relationship</th>
<th>Regression weight</th>
<th>Mean</th>
<th>Standard error</th>
<th>t-Statistics</th>
<th>p-value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>BH - &gt; Health Hazards</td>
<td>0.265</td>
<td>0.207</td>
<td>0.151</td>
<td>1.75</td>
<td>0.003</td>
<td>Supported</td>
</tr>
<tr>
<td>CH - &gt; Health Hazards</td>
<td>0.227</td>
<td>0.266</td>
<td>0.135</td>
<td>1.67</td>
<td>0.006</td>
<td>Supported</td>
</tr>
<tr>
<td>HH - &gt; RM</td>
<td>0.209</td>
<td>0.260</td>
<td>0.176</td>
<td>1.18</td>
<td>0.238</td>
<td>Unsupported</td>
</tr>
<tr>
<td>HH - &gt; SC</td>
<td>0.664</td>
<td>0.575</td>
<td>0.280</td>
<td>2.36</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>MH - &gt; Health Hazards</td>
<td>0.271</td>
<td>0.330</td>
<td>0.121</td>
<td>2.23</td>
<td>0.008</td>
<td>Supported</td>
</tr>
<tr>
<td>Psy H - &gt; Health Hazards</td>
<td>0.272</td>
<td>0.223</td>
<td>0.123</td>
<td>2.21</td>
<td>0.009</td>
<td>Supported</td>
</tr>
<tr>
<td>PH - &gt; Health Hazards</td>
<td>0.228</td>
<td>0.144</td>
<td>0.186</td>
<td>1.22</td>
<td>0.224</td>
<td>Unsupported</td>
</tr>
<tr>
<td>RM - &gt; Safety Culture</td>
<td>0.451</td>
<td>0.421</td>
<td>0.233</td>
<td>1.93</td>
<td>0.056</td>
<td>Supported</td>
</tr>
<tr>
<td>Health Hazards</td>
<td>0.915</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk Management</td>
<td>0.769</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: * Significant at 0.05, ** significant at 0.01, *** significant at 0.00.
**NB:** BH= Biological hazards, CH= chemical Hazards, HH= Health Hazards, SC= Safety Culture, PsyH= Psychological Hazards, MH= Mechanical Hazards, RM= Risk Management.

**Table 13: Construct Reliability and Discriminant Validity**

<table>
<thead>
<tr>
<th></th>
<th>PHH</th>
<th>CHH</th>
<th>MHH</th>
<th>BHH</th>
<th>PSYH</th>
<th>RM</th>
<th>HH</th>
<th>SC</th>
<th>AVE</th>
<th>CR</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHH</td>
<td>0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.57</td>
<td>0.60</td>
<td>0.70</td>
</tr>
<tr>
<td>CHH</td>
<td>0.05</td>
<td>0.71</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.50</td>
<td>0.75</td>
<td>0.81</td>
</tr>
<tr>
<td>MHH</td>
<td>0.46</td>
<td>0.38</td>
<td>0.88</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.77</td>
<td>0.74</td>
<td>0.67</td>
</tr>
<tr>
<td>BHH</td>
<td>0.18</td>
<td>0.33</td>
<td>0.16</td>
<td>0.74</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.56</td>
<td>0.79</td>
<td>0.71</td>
</tr>
<tr>
<td>PSYH</td>
<td>-0.04</td>
<td>0.48</td>
<td>0.37</td>
<td>-0.16</td>
<td>0.76</td>
<td></td>
<td></td>
<td></td>
<td>0.58</td>
<td>0.73</td>
<td>0.70</td>
</tr>
<tr>
<td>RM</td>
<td>0.13</td>
<td>-0.01</td>
<td>0.16</td>
<td>-0.01</td>
<td>-0.03</td>
<td>0.71</td>
<td></td>
<td></td>
<td>0.51</td>
<td>0.83</td>
<td>0.80</td>
</tr>
<tr>
<td>HH</td>
<td>0.61</td>
<td>0.69</td>
<td>0.78</td>
<td>0.55</td>
<td>0.39</td>
<td>0.09</td>
<td>0.62</td>
<td></td>
<td>0.38</td>
<td>0.69</td>
<td>0.89</td>
</tr>
<tr>
<td>SC</td>
<td>0.67</td>
<td>0.12</td>
<td>0.49</td>
<td>0.20</td>
<td>-0.28</td>
<td>0.25</td>
<td>0.49</td>
<td>0.45</td>
<td>0.20</td>
<td>0.62</td>
<td>0.69</td>
</tr>
</tbody>
</table>

**Note:** The Square root of AVEs are in the diagonal; correlations are underneath the diagonal; AVE: Average Variance Extracted, CR- Composite Reliability. **NB:** BH= Biological hazards, CH= chemical Hazards, HH= Health Hazards, SC= Safety Culture, PsyH= Psychological Hazards, MH= Mechanical Hazards, RM= Risk Management.

Other significant determinants were identified as follows: Biological hazards (β=0.26), chemical Hazards (β=0.22), Mechanical Hazards, RM= Risk Management (β=0.27) and Psychological Hazards (β=0.27). The study also found insignificant effects of Psychological Hazards on health hazards; also, health hazards had no significant impact on risk management. The Figure 1 further elaborated on the new model.

The research results allows to create a new safety structure model. The graphical interpretation of analysis results uncovers relations between individual determinants in safety sector. This model could be expressed as a bichromatic oriented graph with weighted arcs. Because the condition of alternating vertices cant be met here, this is called as incomplete bichromatic graph. The proposed net consist of 8 circles representing main safety determinants and 71 partial safety areas conected with oriented weighted arcs. Its graphical interpretaion is in the figure 1.
In the figure 1 are represented factors in the corporate environment that affect work safety. Distinctive relationships between the found safety determinants are noted. Each of the determinants aggregates partial elements that are represented by yellow frames. The degree of interaction of the individual determinants (represented by blue circles) with each other is represented by the weights of the respective oriented arcs.

Explain, what the numbers in arcs (arrows) means and how You got them. Use then the name You used here for it.

Explain what the names of partial factors means. There must be clear, what is the difference between RM10, RM 11, ..., SC1, SC2
Explain in detail (like for a stupid man) what is represented in the graph like:

The analysis uncovers, that the safety culture here represented by blue circle (with the name Safety culture) is influenced by 10 factors with different importance marked by weights of appropriate arcs. Numbers characterizes the importance of these partial factors. Higher value means more important factor. Here for example like most important factor influencing the safety culture the SC3 with value (the name) 4.831 was found. There are other important factors found, namely SC1 and SC9 with values 2.200 and 2.397.

Similarly, the significance of the individual partial factors is represented by the arcs connecting them with the relevant determinants. In this graphical interpretation are the arcs oriented from determinant to partial factors.

On the basis of the result thus represented, it is possible to quickly and clearly assess the various factors affecting safety in the workplace. At the same time, it is also clear to what extent each of them participates in the possible risk. Possible conclusions can be found in chapter 5.0.

4.15 Summary of Chapter

The chapter provided data analyses and discussion on the study. The analyses were grouped according to the main objectives as follows; examined a symbiotic relationship between Occupational health hazards and safety culture, to demystify operational risk and improve safety culture and finally, to examine the Modelling effect of Health Hazards on Risk Management and Safety Culture at Tema Oil Refinery (TOR) in Ghana. The data were analysed using Statistical Package for Social Sciences (SPSS) and Smart Partial Least Square (PLS). The study discovered that the newly proposed model accurately predicted 92% and 77% respectively for health hazards and risk management on safety culture practices in the oil and gas sector in Ghana. From the model the strongest determinant of safety culture in the oil and gas is health hazard (β=0.66), followed by risk management (β=0.45). Other significant determinants were identified as follows: Biological hazards
(β=0.26), chemical Hazards (β=0.22), Mechanical Hazards, RM= Risk Management (β=0.27) and Psychological Hazards (β=0.27). The study also found insignificant effects of psychological hazards on health hazards; also, health hazards had no significant impact on risk management.
CHAPTER FIVE

5.0 IMPLICATIONS AND CONCLUSIONS

This chapter presents the implications and conclusions of the study. The implications were deduced from the meanings derived from the data analyses and conclusions were duly provided. This study was conducted to examine a symbiotic relationship between Occupational health hazards and safety culture at Tema oil refinery in Ghana. The study employed both exploratory and descriptive research designs. Convenient sampling technique and structured questionnaires were deployed to elicit information from 186 participants.

In line with the first objective which assessed the incidence of occupational health hazards and safety culture at TOR in Ghana, the study found out that the causes of accidents were identified as poor working conditions, human errors and the lack of protective clothing represented by “...” in the model result in figure 1. The study results further suggest that noise is an intricate part of job functions at the work environment. This has the potential to impair the hearing of employees both now and may have lasting effect on their hearing in the future. Moreover, there is poor illumination, which may have immense negative effect on the sight of employees particularly those with generic eye problems. From the chemical hazards perspective, the study implied that employees’ are perpetually exposed to chemical substances. The incessant exposure to hazardous chemical poses health complications like respiratory diseases, reproductive disorders, cardiovascular diseases, renal diseases and others.

Also, protective wears and equipment are lacking resulting in the inhalation of hazardous chemicals and sometimes spillage over their skin. The study further illustrated that employees take awkward postures while working, they are made to work at heights with
less or no protective tools and materials, when performing their work functions, they stand for long hours which has great effect on the joints of employees especially those who are tall in nature. Moreover, the work materials at their duty post is obsolete, they lift objects manually on chairs, desks and other working tools and material arrangements in their workplace and nonetheless, there are employees that sit most times when they are on duty for longer hours putting more pressure on the waist.

Furthermore, their work is repetitive and monotonous, ergonomic hazards could cause deformity of one’s body and mechanical or ergonomic hazards could cause back, neck and body pain. More so, there is a clear indication of poor employee welfare hence the Tema Oil Refinery can be described to be product centred other than projecting the interest of employees. In relation to biological health hazards, the study implied that less or no health complications to affect employees at TOR owing to a very minimal or no direct or indirect dealings with biological substances. The survey unearthed that microbes could be found in some of the substances they work with. With regards to hazardous waste, they generate hazardous waste while working and some of the hazardous waste could impact on their health. Regarding biological hazards, the biological hazards could cause Tuberculosis, pneumonitis, pneumoconiosis etc. and the employees disagreed that proper environmental hygiene is lacking in their workplace.

From the psychosocial health hazard perspective, the study implied that the job description at TOR is very challenging, tedious and time consuming. This has led to many of the employees requesting for transfer from their current department to another. In addition, the right of employees is violated by management and sometimes they harass employees and intimidate them. Finally, the study suggested that although TOR offers pre-employment training before employees are employed, the company lacks continuous policy on training
where employees are periodically trained to equip them on health and safety practices. Surprisingly, TOR is less proactive about the health of employees because they lack policies that ensure occasional check-ups for health issues. The study recommends that there is the urgent need to integrate policies and models to effectively manage safety culture at TOR. Furthermore, the study recommends that integrated model is required to comprehensively explain the safety culture at TOR since implementation of occupational health and safety management system (OHS-MS) has been proven inadequate.

This study based on the objective two of the study which was conducted to demystify operational risk and improve safety culture at Tema Oil Refinery (TOR) in Ghana. The study drew responses from the perspectives of employees and management of TOR with regards to safety culture. The study utilized positivism assumption by empirically observing facts. Every oil producing company like the Tema Oil Refinery and country are confronted with limitless challenges emanating from the production of oil. The expanse of this challenge cannot be over emphasized as they cut across every aspect of human endeavour from the psychological level to the physical and environmental levels. Researchers like Schneider et al. (2013) reported that the contribution of the oil and gas industry to the world’s economy cannot be overlooked but the sector has negatively affected the environment more than any other sector hence sustainable management operations are needed to protect the environment in which they operate. Schneider et al. (2013) evaluated the oil and gas industry towards the maturity of the environment, health and safety (EHS) towards the sustainability of the natural ecosystem. The study analysed ten oil and gas companies around the world and the results showed that these companies have made progress in the area of environment, health and safety.
Owing to the mercurial nature of oil producing companies and their hyper-susceptible tendencies to danger and fierce explosions and varying degrees of negative repercussions, the Tema Oil Refinery offers pre-employment training when new people are employed and they go further to conduct pre-employment health examination and personal protective equipment (PPE) provided by management is adequate and appropriate. On the contrary, periodic medical or health examinations and not conducted and employers do not periodically send them for trainings to update and upgrade their efficiency and effectiveness. The company also lack first aid boxes that help to manage situation when an accident occurs and this have huge negative impact on employees’ health and wellbeing. The study revealed that factors such as fire outbreak, breakdown of equipment, shortage of crude oil, environmental pollution, brain drain, huge debt and public critique have devastating effect on the operations and safety culture of the company. The study further revealed that the inadequacy nature of theoretical and methodological strategies concerning safety culture limit any attempt towards the development of appropriate assessment tools.

The link between safety measures at the workplace and accidents have received little attention in Ghana with regards to the causatives of accidents at our workplaces. Developing adequate safety climate indicators is a valuable contributing factor to reducing accidents and risks.

This implies that there are standard safety guidelines and procedures in managing safety at TOR. Subramaniam et al. (2017) examined the perception of employees towards safety and how it affects safety behaviours at the workplace. Management safety practices are the pre-bases for safety compliance, which is proceeded by co-worker safety and job safety.
Supervisors may influence employees on safety measures but the act of supervisor being health and safety conscious himself has no effect on employees’ health and safety practices. It must be noted that different working environments demands different health and safety practices to promote OHS standards at the work premises. Moreover, the survey indicated that there were control measures in implementing safety management process and workers at the TOR were aware of the existing control measures in safety implementation.

The survey showed that brain drain has high effect on operational risk and safety culture practice at TOR and the shortage of crude oil has high effect on operational risk and safety culture practice at TOR. The survey further found there were high risk of attack on TOR facilities that has effect on operational risk and safety culture practice at TOR, and the employees rated Fire and breakdown of equipment as having critical effect on operational risk and safety culture practice at TOR. The survey found that huge debt owed Ghana commercial bank is having high effect on operational risk and safety culture practice at TOR and Critique from the general public as having very low effect on operational risk and safety culture practice at TOR.

Regarding policy implementation, the study found that employees contribution was inculcated into the implementation of safety management at TOR, meanwhile, employee’s needs and aspirations were to a greater extent ignored by management in the preparation and implementation of safety policy.

5.1 Summary of Chapter

The main aim of the study was to model the influence of health hazards on risk management and safety culture at Tema oil refinery (TOR) in Ghana.
The analysis in the preceding chapters indicated that the newly proposed model accurately predicted 92% and 77% respectively for health hazards and risk management on safety culture practices in the oil and gas sector in Ghana. The model showed that the strongest determinant of safety culture in the oil and gas is health hazard ($\beta=0.66$), followed by risk management ($\beta=0.45$). Other significant determinants were also identified as follows: biological hazards ($\beta=0.26$), chemical hazards ($\beta=0.22$), mechanical hazards, RM= Risk Management ($\beta=0.27$) and Psychological hazards ($\beta=0.27$). The study also found insignificant effects of psychological hazards on health hazards; also, health hazards had no significant impact on risk management.

In the nutshell, noise was found to be an intricate part of job functions, which has the potential to impair the hearing of employees. Moreover, there was poor illumination, chemical hazards that poses health complications like respiratory diseases, reproductive disorders, cardiovascular diseases, renal diseases and others. The study further illustrated that there were lapses and weak ergonomic arrangements, poor employee welfare, biological health hazards, psychosocial health hazard perspective. In addition, the right of employees was violated by management and sometimes they harass employees and intimidate them.

However, the dissertation encountered limitations in the course of data collection due to resource constraints (time and finance). Also, respondence were unwilling to disclose truly the nature of the hazardous situation and challenges facing TOR for the fear of being sacked by management as it were in the case of the TOR employees respondence. Nevertheless, these limitations were dealt with through direct observation during the field survey in 2016. The study concludes that the newly integrated model be adopted to effectively manage safety culture at TOR. This is mainly due to its advantages of promoting validity. The
model allows for simultaneous observation of several variables helping to draw more valid conclusion which other models fail to provide. Additionally, the model overtly takes measurement error into account by ensuring measurement error variables that correspond to the measurement error portions of observed variables. By this, biased conclusions about the relationships between constructs and measurement error are delimited.

This model despite it grounded advantages has some limitations as seen in most Structural Equation Models. Firstly, the model consists of a multitude of parameters which are simultaneously observed. The empirical relation between these variables may be limited when information provided for the estimation by the model is not based on the input hence, it does not link other possible distinctive entries. Another challenge of the model is it computational intensity which may lead to estimation problems. Lastly, there is problem arising in the interpretation of results mainly because, the model is a means for observing causal relationships based on statistics. Therefore, in the case where different assumptions are made about the causal relationship variables by other models, it becomes impossible for decisions to be made solely on the statistic criteria of the model. It is recommended that this integrated model is required to comprehensively explain the safety culture at TOR since implementation of occupational health and safety management system (OHS-MS) has been proven inadequate. In the light of the findings and the above summary, the aim of the thesis is deemed achieved.
References


Arewa A. O. & Farrell P. (2012). A review of compliance with health and safety regulations and economic performance in small and medium construction enterprises In: Smith,


Horbah, F, Pathirage, C & Kulatunga, U (2017). Assessing the safety climate in Ghana’s upstream oil and gas sector. University of Salford Manchester


Yankson, E. (2012). The Effect of Health and Safety Standards on Productivity in Ghana Rubber Estates Limited. Institute of Distance Learning, Kwame Nkrumah University of Science and Technology


Appendix 1

SURVEY QUESTIONNAIRE

SECTION A: BIODATA

1. Age
   a. <20
   b. 21-30
   c. 31-40
   d. 41-50
   e. >50

2. Sex
   a. Male
   b. Female

3. Religion
   a. Islam
   b. Christianity
   c. Others

4. Educational level
   a. Primary
   b. Secondary
   c. Degree
   d. Masters
   e. Others

5. Marital status
   a. Married
   b. Single
   c. Divorce
   d. Widow/er

6. Years of working in TOR
   a. < 5
   b. 5-9
   c. 10-14
   d. 15>

7. Nature of employment
   a. Backup
   b. Full Time
   c. Contractor
   d. Casual

8. Running of shift
   a. Yes
   b. No
SECTION B: HEALTH HAZARDS IDENTIFICATION

Indicate your level of agreement/disagreement, using the scale; SD=strongly disagree, D=disagree, A=Agree, SA=Strongly Agree

<table>
<thead>
<tr>
<th>Statements</th>
<th>SA</th>
<th>A</th>
<th>D</th>
<th>SD</th>
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</thead>
<tbody>
<tr>
<td><strong>Physical Health Hazards</strong></td>
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<tr>
<td>The noise level in my workplace is relatively high</td>
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<tr>
<td>Loss of hearing could result from exposure to loud noise</td>
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<tr>
<td>My job function has to do with working with object, tools, equipment, machine, chemical etc. that has high temperature</td>
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<tr>
<td>Extreme heat could cause body cramp</td>
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<td>My workplace shakes as a result of vibration from workplace machines and equipment</td>
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<tr>
<td>Vibration could disorder the spine and causes fatigue</td>
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<tr>
<td>My workplace is adequately lighted</td>
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<tr>
<td>Inadequate illumination could affect the eyes</td>
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<tr>
<td>Radiations like in welding, radioactive substances etc. could be emitted as I perform my job function</td>
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<tr>
<td>Radiation could cause cancer and premature skin aging</td>
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<td><strong>Chemical Health Hazards</strong></td>
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<tr>
<td>Working with chemical substances is part of my job function</td>
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<tr>
<td>The substances are solvent, mist, fume and gases</td>
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<tr>
<td>The substances are dust, particles, metal and metalloid</td>
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<tr>
<td>The chemical/gases are flammable, poisonous and corrosive</td>
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<tr>
<td>The hazardous chemicals are sometimes inhaled, ingested, injected and spill over my skin</td>
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<tr>
<td>Eating where there are chemical is highly prohibited</td>
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<tr>
<td>Chemical substances should be carefully handled and labeled</td>
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<tr>
<td>Chemical hazards are likely to affect ones health when they are exposed to them for a long period of time</td>
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<tr>
<td>Exposure to chemical hazards could cause reproductive disorder, cardiovascular disease, respiratory diseases, renal diseases etc.</td>
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<tr>
<td>The health impact of chemical hazards could lead to loss of life</td>
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<td><strong>Mechanical/Ergonomic Health Hazards</strong></td>
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<td>I sometimes take a awkward posture while working</td>
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<tr>
<td>I sometimes work in height</td>
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<tr>
<td>When performing my job functions I stand for a long while</td>
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<td>The work material at my duty post is obsolete</td>
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<tr>
<td>I lift heavy objects manually The chair, desk and other working tools and materials arrangements in my workplace is very</td>
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</table>
comfortable and convenient with my job functions
I sit most time when I am on duty
My work is repetitive and monotonous
Ergonomic hazards could cause deformity of one's body
Mechanical/Ergonomic hazards could cause back, neck and body pain

**Biological Health Hazards**
Microbes could be found in some substances I work with in my work station
I generate hazardous waste while working
Some of this hazardous waste could impact on the health of workers
Biological hazards could cause Tuberculosis, pneumonitis, pneumoconiosis etc.
Proper environmental hygiene is lacking in my place of work

**Psychosocial Health Hazards**
My workload is very challenging
I would like to be transferred to another unit/department
I work in isolation
I am constantly talked down by my Superior
I am faced with some kind of aggression and harassment in my place of work
Psychosocial hazard could cause hypertension, anxiety, boredom etc.

**Precautionary Measures**
I had a pre-employment training when newly employed
I had a pre-employment entrance health examination when newly employed
My employer periodically calls for a health examination monitoring/surveillance on their employees
Personal Protective Equipment (PPE) provided by Management is adequate and appropriate
My employer periodically send the employees for trainings to update and upgrade their efficiency and effectiveness
There is a First Aid Box in my workplace
There is an HSE Policy that is duly signed by the Managing Director in my workstation
Implementation of the HSE Policy is taken seriously by Management
Management is completely committed to the health and well-being of their workers
There is a very functional and active Occupational Health Safety System in place in my Company

**SECTION C: RISK ASSESSMENT**
Using the scale; 1=very low, 2=low, 3=moderate, 4=high, 5=critical indicate management’s assessment of risk confronting Tema Oil Refinery (TOR)

**Management Assessment of Risk confronting TOR**

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<th>Statements</th>
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<th>2</th>
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<tbody>
<tr>
<td>Instability in global oil prices</td>
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<td>Depreciation of the cedi against major currencies</td>
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<td>Health &amp; safety</td>
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<td>Credit safety-default on the part of OMC’s</td>
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<td>Theft</td>
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<td>Political interference</td>
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<td>Environmental safety</td>
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<td>Brain Drain</td>
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<td>Shortage of crude oil</td>
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<td>Safety of attack on TOR’s facilities</td>
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<td>Operational safety (Fire and breakdown of equipment)</td>
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<td>Huge debt owed Ghana commercial bank</td>
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<td>Reputation: Critique from the general public</td>
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**Safety Management Procedure**

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<tr>
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<tr>
<td>Standard guidelines on procedures of managing</td>
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<td>Control measures in implementing safety management process</td>
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<td>Inculcating employees contribution into the implementation of safety management</td>
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</table>
Appendix 3