



Impact of Process Safety Culture on Employee Safety Motivation in Selected Oil and Gas Industries in Nigeria

Akaninyene Edet Ekong ^{a*}
and Babatunde Michael Ogunbawo ^b

^a The Nigerian Institution of Safety Engineers (NISafetyE), Nigeria.

^b Centre for Occupational Health, Safety and Environment, Institute of Petroleum Studies, University of Port Harcourt, Nigeria.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JSRR/2023/v29i121816

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/110667>

Original Research Article

Received: 15/10/2023
Accepted: 21/12/2023
Published: 22/12/2023

ABSTRACT

Multinational oil organisations are often involved in activities that needs adherence to strict safety rules. The decision of managements of oil and gas industries to ensure safety of workers is reflected in their safety culture and safety is a major need of oil workers. The study assessed the impact of process safety culture on employee safety motivation in selected oil and gas industries in Nigeria. Social exchange theory was adopted to underpin the study. The research was descriptive cross-sectional oil fields-based study. Purposive, convenience and quota sampling technique was adopted. The study adopted a well-structured self-administered questionnaire to get he perceptions of the 1,000 plants workers of the selected oil and gas industries on process safety culture of their

*Corresponding author: E-mail: ekongakaninyene@gmail.com;

companies. Data was collected through questionnaires as primary source and journals, e-book, newspapers as secondary source. The data was analyzed using descriptive statistics such as average mean and standard deviation. For the hypothesis testing this research adopted Multicollinearity analysis. Perceived process safety culture was found to significantly affect personnel safety motivation.

Keywords: Process safety culture; employee safety motivation; oil and gas industry.

1. INTRODUCTION

Accidents are caused, they do not just take place [1]. Unusual events do not cause incidents; rather, an unusual combination of regular events does. Ekong, Ugbeborand, and Brown [2] noted that over time, the industry has lost countless lives, billions of dollars' worth of assets, and millions of pounds trying to make up for process safety culture failures. More than 70% of accidents in oil and gas-related incidents are caused by human error as a result of a misperception of the process safety culture (Alkhldi, Kulatunga, and Pathirage, 2017). Deficiencies in process safety culture (PSC) bear primary responsibility for catastrophic events in petroleum facilities that result in loss of life or property and have created various environmental hazards (UK Department of Energy, 1990; [1]. Examples of these catastrophic events include the Esso Longford gas explosion, which resulted in approximately 1.3 billion US dollars in property (assets) and litigation losses, and the Piper Alpha oil platform, which documented 167 fatalities and a total insured loss of approximately 1.7 billion British pounds.

When it comes to safety culture in the petroleum industry, major incidents like fires, explosions, and the release of toxic chemicals that cause fatalities, damage to the surrounding area, and destruction of facilities are gradually starting to become real concerns for process industries and researchers [3]. Unfortunately, because of the increasing sophistication and scale of today's chemical process industries, these major accidents are becoming increasingly difficult to control [4]. Reason [5] stated that numerous disciplines, including banking and insurance companies, nuclear power plants, oil exploration, manufacturing facilities, chemical process installations, and other industries like transportation and even healthcare, can use the same general safety ideals and management techniques, which include workers looking out for hazards, maintaining the workplace clean and tidied, and

workers being supportive to their colleagues. Process safety culture measurement within an organisation can be a little individualised or subjective [6]. The Code of Federal Regulations (CFR), Chapter 29, Section 1910.119, established by the Occupational Safety and Health Administration (OSHA), contains fourteen (14) process safety elements that address worker involvement (2000). Process safety culture (PSC) is actually a subset of process safety management (PSM) and is primarily focused on preventing or minimising the significant impact of toxic, reactive, flammable, or explosive chemical leaks from enclosed processes that handle any one of the recognised one hundred and thirty-seven (137) extremely unsafe chemicals [7]. The process safety culture of an organisation is highly valued by the Centre for Chemical Process Safety (CCPS) as a crucial factor in controlling the program's success indicator for risk-based process safety (RBPS) [8]. Establishing and maintaining a strong process safety culture may end up being crucial in determining how well the system and its members function [8]. Over time, there have been many instances of process safety failures around the world, including the 2012 United States Chevron Richmond Refinery Fire injured six (6) project workers, and fifteen thousand (15 000) community members sought medical attention as a result of the fire's effects [5]. The company subsequently recorded an annual loss of 2.5 billion US dollars as a result of the reduced quantity of petroleum products in barrels that they produced at the exploded refinery, which also caused an oil and gas shortage that lasted the entire refinery maintenance period. The Chemical Safety Board (CSB) recommended that the California company seek to increase worker participation in bettering process safety by ensuring that there is equal involvement among company leadership and workforces in matters pertaining to health and safety. The incident's investigation revealed that ongoing poor worker participation in process safety contributed to the top event (CSB, 2019). In the years preceding the 2013 Williams Olefins Plant Explosion and Fire in

Louisiana, which resulted in a tragedy that claimed two (2) lives and injured one sixty-seven (167) others, CSB determined that Williams Geismar demonstrated the physiological signs of a weak process safety culture [9]. As a result, the Occupational Safety and Health Administration (OSHA) cited Williams Geismar for incidental PSM violations that were deemed to be "willful." Williams Geismar was also fined \$99,000. In addition, the fire significantly damaged the chemical plant that was undergoing expansion, a project that was valued at \$400 million US after the incident [9]. Williams established various teams with appropriate participation from management, technical specialists, and workforces, among other improvement measures, to enable more rigorous processes and making informed choices [7,10]. Locally, in Nigeria, we had the Tank 5 gas explosion occurrence in Lagos and the K.S. Endeavour explosion off the coast of Nigeria, which was an oil rig owned by Chevron an Oil Company and caught fire while on exploration in Lagos in 2012. According to a report based on employee testimonies from the drilling company overseeing the project, Chevron management was recommended to cease work due to the gas pressure only three days prior to the fatal incident, a request that Chevron refused to accept. As a result of the incident, the families of those who lost loved ones received a settlement of twenty-nine (29) million US dollars; which is among the largest known settlements for wrongful death cases offshore [11]. Oil company management needs to understand the value of human resources in addition to financial and capital resources. Useful safety education and implementation initiatives directly lead to superior safety behaviour. Shah [12] noted that when employees feel unsafe at their workplace they might not give their best thus they can be motivated by education them through safety trainings, enforcement programmes, and higher management provides funding for them. Mariana and Curcuruto [13] stated that better field safety behaviour also requires the collaboration of frontline supervisors and employees. Conversely, firm members have to be ready to operate at a higher level of safety to show their motivation towards achieving the safety culture of their organisation [14]. Based on the stated background, this study assessed impact of process safety culture on employee safety motivation in selected oil and gas industries in Nigeria.

2. LITERATURE REVIEW

2.1 Conceptual Clarification

2.1.1 Process safety culture

People's thoughts and behaviours reflect an institution's culture, which is its set of values and it controls what is deemed appropriate and inappropriate [15]. According to Arendt [16], safety culture is how individuals or groups act or perform when there is no one there to examine or watch. The majority of contemporary definitions of process safety have focused more on the attitudes, behaviours, and beliefs of people working in an institution or organisation (Goncalves and Waterson, 2018). Process safety culture is described as that assemblage of opinions and physical characteristics in individuals and establishments, which generates that as a dominant preference, nuclear plant safety issues receive the consideration appropriate of their importance [17]. According to Goncalves [18] process safety culture is viewed as an important predictor of safety management effectiveness rather than focusing solely on safety attitudes. Additionally, an excellent process safety culture gives safety its highest priority in its entirety [19]. Each organisation has a unique culture that might have a big impact on how its members behave. An organisation with a strong organisational culture will be stable. Organisational culture is a system of indicating sharing that members carry out that sets an organisation apart from others, according to Widyanty and Kasmoo [20].

Symptoms of a weak safety culture according to Wasileski [15] includes:

- The importance of process safety is minimal.
- Vulnerability is not a well-developed sense.
- Risk is either misunderstood or not adequately resourced for risk management
- Warning signs for process safety are often ignored.
- Poor housekeeping practises exist in the plant.
- Other deviations and subpar performance are normalised
- Tenacious reliance on management to categorise risks.

Goncalves [18] opined that if a company is interested in enhancing the culture of process safety, they should evaluate whether employees feel free to report safety problems without fear of reprisal, and whether the company or any of its facilities effectively investigate worker safety worries and take prompt, efficient corrective action in response to worker reporting.

The following tactics for establishing a safe workplace are cited by Shah [12].

1. Create a Safe Working Environment:

Establishing a safe working environment starts with this. First and foremost, employers must identify safety concerns and workplace hazards. They then need to act to address them appropriately. Hazardous electrical equipment, hazardous chemicals, and mechanical problems are a few examples of workplace safety hazards. When using machinery at work, mechanical issues can arise at any time. Additionally, operating heavy machinery is dangerous and prone to mishaps. The company needs to instill caution and guarantee adherence.

2. Implementing Workplace: Safety Programs^[12] Including workplace safety in the mission statement of the business is one way to achieve this. Every employee should be responsible for adhering to the safety protocols. Every workplace accident should be looked into by the employer. They ought to motivate staff members to adhere to all safety protocols. Additionally, employers ought to put in writing the risks of breaking them. This lowers the possibility of errors.

3. Providing Proper Safety Training to Employees: Every business's safety programme must include training in order to shield workers from mishaps. According to research, there is an increased risk of workplace accidents for new hires. This increased risk is brought on by a lack of awareness of workplace dangers and safe work practises. In order to lower workplace accidents, employers should give staff members the appropriate training. All machinery and equipment should be operated by employees in a safe and effective manner.

4. Using Protective Safety: Equipment^[12] Wearing protective gear reduces exposure to potential hazards that can result in workplace

inquires. Failing to do so may result in harm or even death. Workers might be required to handle chemicals, machinery, electronics, and other potentially dangerous materials. Employers are required to give personal protective equipment (P.P.E.) to these workers. P.P.E. needs to be comfortably fitted, safely designed, and built. P.P.E. items include things like hard hats, gloves, protective eyewear, clothes, and earplugs.

5. Reporting Unsafe Working: Conditions^[12] Employees must notify any risks to safety or dangers at work to the management. It is legally required of employers to provide a safe workplace for their workers. Ending workplace safety hazards and promoting workplace safety are imperative.

6. Practicing Correct Posture: One of the main causes of back pain is poor posture. Maintaining proper posture is essential for lowering the chance of injury.

7. Reducing Workplace Stress:^[12] Stress at work can lead to a variety of health issues, including depression and anxiety. Workplace stress is brought on by factors such as a heavy workload, bullying at work, and job insecurity. Find out how to manage workplace stress and prevent its negative effects. Stress at work can have a negative impact on both employee health and productivity.

8. Promoting Regular Breaks: Regular breaks are something that employers should promote to their staff. Frequent pauses will help you avoid becoming fatigued and exhausted. This will help to further avoid sicknesses or injuries. Workers who take breaks are more alert and concentrated.

9. Easy Access to Exits: In Case of emergencies^[12] it is crucial to have quick accessibility to emergency exits in case of an emergency. Less casualties and injuries will result from easy entry into emergency exits. Having rapid methods for shutting down equipment in an emergency is also crucial.

10. Using Mechanical Aids:^[12] Workers: In an industrial position might have to handle large machinery. Attempting to carry and transport heavy objects carries a number of injury risks. Instead of lifting things by hand, workers can use a wheelbarrow, forklift, or conveyor belt [12].

2.2 Employees Safety Motivation

Employee safety motivation, as defined by Mariana and Curcuruto [13], is the willingness of a person to put forth effort to practise safety habits and the valence related to that behaviour. Both overt and covert behaviours are purposefully directed and maintained for the intended results, typically for the organization's benefit, as a result of motivational stimulation [21]. According to organisational culture and climate theory, organisational safety climate factors represent how employees view their workplace; their identification identifies areas where they believe analysis and change may be required [14], while organisational safety culture influences how employees behave in a safe manner [4]. The two main categories of factors that affect process safety culture are social and organisational. Group norms, task conditions, management styles in safety operation, safety attitudes and channels of interactions, staff cultural diversity, safety implementation, and regulations are examples of organisational factors that happen within the company itself [22,4]. There are external social factors that affect the organisation. The government's regulations, society's perspective on safety, and the impact of regional culture on safety culture are among them [23].

2.3 Advantages of Safety Motivation of Workers

Motivation for worker safety has a big influence on raising output and productivity levels. Employees are generally more self-assured and at ease when their employers are worried about their safety. Additionally, employees become more focused on completing their tasks and absenteeism rates decrease [12]. Both employers and employees benefit from workplace safety. Better health follows from improved safety. Healthier workers are generally happier and more productive at work. In a safe workplace, there are barely any accidents. This lowers worker's compensation costs and minimises downtime for safety investigations. This also shortens the amount of time workers need to recover from wounds. According to Obiora, Ani, Chukwuemeka, and Ezeh [21], employees' perceptions of their motivation are influenced by a variety of factors, such as their worries regarding safety and their awareness of the differences in the motivation that the organisation provides for expatriates and local workers.

2.4 Oil and Gas Industry in Nigeria

In Nigeria, the oil and gas sector is mostly governed by the government and is not completely deregulated. The Petroleum Industry Bill (PIB) [24] will enable full deregulation; sadly, it is still in the national assembly's legislative process. Aye [25] noted that because Nigeria is one of the world's top producers of both oil and gas, the type of work and working conditions in the majority of oil and gas companies are therefore far from ideal. Most oil and gas company employees complain that their working conditions are appallingly subpar [26]. Crucially, the Nigerian oil and gas industry's unfavourable working conditions are mostly caused by threats to security, health, and safety [27]. Adim and Mezeh [28] stated that these issues undoubtedly have an impact on employees' satisfaction, productivity, and motivation. The degree to which this claim is accurate relates to the problems that each organization's safety culture is facing [29]. Industry stakeholders contend that, even in the absence of control over the application of industry standards, particularly with regard to safety issues, organisational cultures within businesses greatly influence their compliance, particularly with regard to safety culture [30].

2.5 Theoretical Framework

2.5.1 Social exchange theory

Blau [31] developed the social exchange theory, noting that social behaviour is influenced and elicited by human interaction, particularly in the workplace. Social behaviours are human interactions that can be used or manipulated to increase productivity at work. According to Ahmad, Nawaz, Ishaq, Khan and Ashraf [32], the theory posits that social exchange, as a social conduct, might have economic and social consequences. Additionally, it may have effects on employees, jobs, and organisations in the workplace. In the context of this study, an organization's process safety culture is viewed as an expanded form of intrinsic drive and interaction that may influence employee behaviour. Human interaction has a social outcome in which relationships that maximise rewards and benefits and minimise costs are preferred over others [28]. This social outcome forms the basis of employee behaviours among members of an organisation in the workplace. Going by the social exchange theory, workers will be demotivated and may not give their all at

work or risk being stolen by another company if they believe that their safety isn't assured at their place of employment (no safety policies, no execution of safety policies).

2.6 Empirical Review

Adetunji, Azeta, Onubaiye, and Aregbe [33] looked at how these safety procedures affected workers' motivation and output. Secondary sources provide the data that are then subjected to content analysis. The necessity for employers to develop policies that guarantee and encourage workplace safety is advocated in the article's conclusion. It is anticipated that this will improve workers' confidence, motivation, and output. In order to identify factors related to the achievement of gold mining workers in East Java, Indonesia, Widyanty and Kasmu [20] looked at the impact of safety culture on worker efficiency through encouragement and satisfaction with work. A sample from the Indonesian gold mining company in East Java was used to collect data. Motivation and work satisfaction are significantly impacted by safety culture, according to the results of data processing using SEM. Additionally, the authors discovered that employee performance is significantly impacted by motivation and job satisfaction. Because the results indicate that safety culture might have a positive effect on worker productivity, the findings recommend that practitioners should emphasise creating safety culture as a top concern for company management. Companies also emphasise developing safety culture as the highest priority for company management. The enthusiasm, fulfilment, and productivity triad as well as the moderation of safety culture were investigated by Obiora, Ani, Chukwuemeka, and Ezeh [21]. The results suggest that low productivity and

employee dissatisfaction will be rampant if the low level of motivation is not improved. Poor safety cultures, which are currently evident in Nigeria's oil and gas industry and are a result of inadequate policy implementation and industry standard compliance, are to blame for the low levels of motivation. A study conducted Cakit, Olak, Murata, Karwowski, Alrehalli, and Marek [23] offers some recommendations for assessing the perceived safety culture in Japanese petrochemical companies. First of all, worker safety motivation is largely influenced by the perceived safety culture. These findings highlight the need to assess and enhance the petrochemical company's viewed safety culture. The transcendent aspect of the perceived safety culture was confirmed by this study as a predictor of increased staff safety motivation. Second, it seemed that the development of worker safety behaviours was primarily influenced by the perceived safety culture. This result demonstrated the need for management to reduce unsafe employee behaviour by implementing safety strategies and procedures into daily operations. The study's findings also emphasize how important it is to examine safety framework management and identify organizational traits that either directly or indirectly affect risky behaviour at work. Thomas and Gordon [34] looked at how to inspire workers to succeed in safety. Building on the findings of Herzberg and Deming, the research found that active involvement and participation in safety provides the strongest incentive for employees to succeed in safety. Employee engagement becomes a powerful source of motivation when they are given the chance to participate in the improvement approach in genuine and meaningful ways. This is what behavior-based safety has to offer.

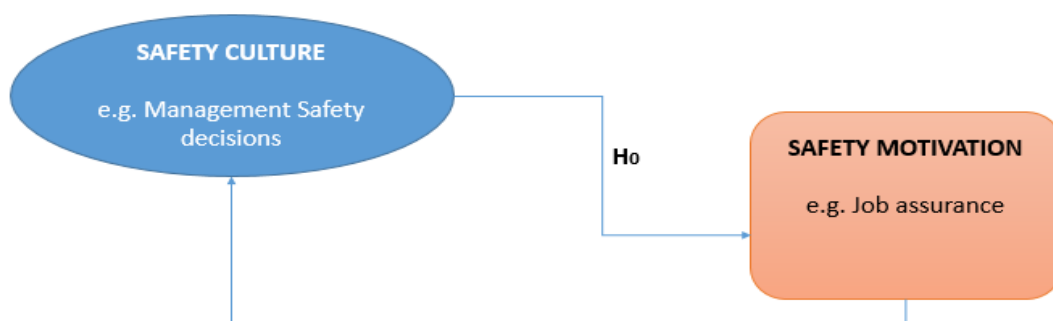


Fig. 1. Study model of process safety culture and safety motivation

2.7 Research Aim

The aim of the study is to assess the impact of process safety culture on employee safety motivation in selected oil and gas industries in Nigeria.

2.8 Research Question

This study will concentrate on providing an answer to the following question in order to fulfill the purpose and goals of the investigation: What impact does safety culture have on workers' safety motivation in Nigeria's oil and gas sectors?

2.9 Research Hypotheses

To address the research goal, the hypothesis was tested: Null Hypothesis (H1): Perceived process safety culture does not have effects on employees' safety motivation in the Oil and Gas industries.

3. MATERIALS AND METHODS

3.1 Research Design

A framework for planning and executing a specific investigation is referred to as research design [35]. This research was cross-sectional and descriptive, focusing on oil fields. Utilising a descriptive design, one can identify and gather information about the features of a particular issue, such as one involving the public, a group, or an individual (McNabb, 2010).

3.2 Study Area

The Niger-Delta region of Nigeria was chosen as the study's location. It contains roughly 606 oilfields, 355 of which are onshore and 251 of which are offshore. The region, which is made up of nine states in Nigeria: Akwa Ibom, Bayelsa, Delta, Edo, Cross River, Imo, Rivers, and Ondo, intersects the South-South, Southwest, and Southeast geopolitical zones. With a surface area of 112,000 square kilometres and a population of more than 31 million people, the region is home to roughly 3000 households [36]. Four (4) ecological areas make up the region's environment: lowland rainforest, mangrove swamp forests, freshwater swamps, and coastal barrier islands [37]. The majority of the population works in agriculture, fishing, raffia/oil palm, traditional

mangrove exploitation, etc. Fig. 2 depicts a map of Nigeria's Niger Delta, which is made up of nine states and various kinds of oil wells.

3.3 Population for the Study

Only field production and process plant employees of local, national, and global oil corporations were taken into account for the study, with a focus on those who work in the dependent (process plant) areas of the chosen companies. These are the chosen IOCs and LOCs in the Niger-Delta region who make up the study's population: employees of the processing units of local oil companies like Nigerian National Petroleum Corporation, Aiteo Eastern Exploration & Production, Network Exploration & Production, Frontier Oil, and Universal Energy Resources Ltd. and international oil companies like ExxonMobil, Shell Petroleum Development Company, Total Exploration & Production Company, Agip Oil Company, and Savannah Energy Plc.

3.4 Sample and Sampling Techniques

Purposive, convenient, and quota sampling techniques were combined in the study's non-probability sampling method. The goal of the study serves as the focal point of purposeful sampling [38]. Consequently, the knowledge and traits that are appropriate for the study will determine how the population's elements are chosen. Workers in various departments of oil and gas plants, known as process operations workers, are a good fit for the study given that they process crude oil on a daily basis, demonstrating their familiarity with the risks associated with the job and their understanding of what can be achieved in terms of viewed process safety culture in the management of process safety procedures for their respective sections. Nonetheless, convenience sampling was used in this study to choose one thousand (1000) process operations employees from the chosen Local Oil Companies (LOCs) and International Oil Companies (IOCs) throughout the Niger-Delta region. Convenience sampling is a data collection technique that involves selecting samples that are conveniently located near an online service, like a location or Google form [39]. One feature of this method of sampling is that sample size does not need to be calculated [40]. When using quota sampling, a sample is chosen based on an equal number and drawn from a population with similar characteristics.

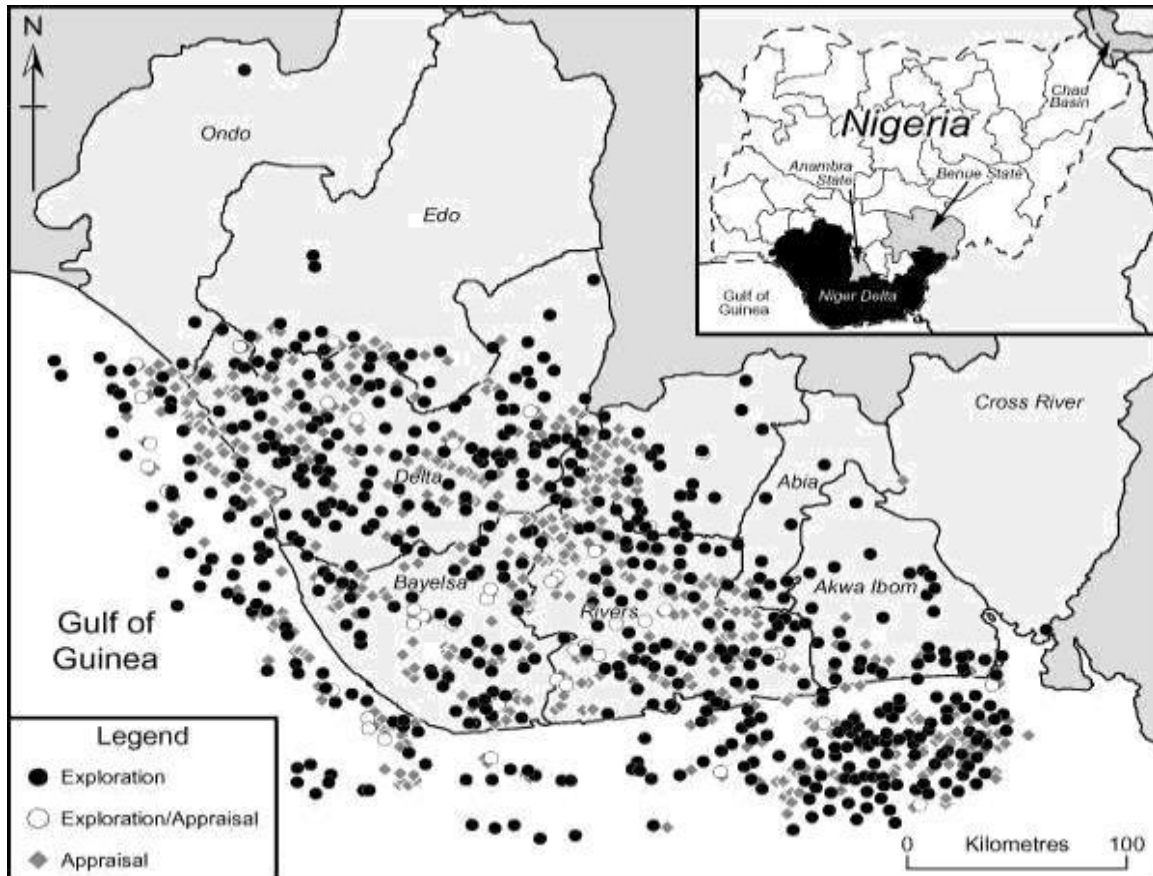


Fig. 2. Nigerian Niger Delta map, displaying nine states and various oil well classifications

Most selection decisions are based on predetermined standards [41]. Because the chosen local and international oil companies share the same requirements for the processes involved in oil exploration and production, the workers in their process operations are equally at risk. Nevertheless, the selection was based on a 50–50% ratio because the research compared the process safety cultures of the Local and International Oil Companies.

3.5 Nature and Source of Data

The study used a well-designed, self-administered questionnaire to gather information about the process safety culture of the companies from the plant workers in the chosen oil and gas industries. In conclusion, this study used the results from the field questionnaire (both hardcopy questionnaires and Google form) as the primary data. The survey data meet the criteria of primary data. On the other hand, secondary data for the study is information from related secondary sources,

such as newspapers, e-books, journals, and other online sources. Email correspondence from process operations staff in the petroleum process units of all ten (10) LOCs and IOCs used in the study—sent using the specially created Google form—constituted a portion of the primary data that was collected from the Human Resources department of the chosen oilfields.

3.6 Methods of Data Collection, Instrumentation and Completion rate

An original, pre-tested, well-structured, adopted, and modified self-administered questionnaire was the tool employed to respond to the study's research inquiries and test its hypotheses in order to meet its goals. There were three sections on the questionnaire. Five (5) questions, including those about gender, age, group, company classification, and duration of work experience, are included in Section A, which collected the sociodemographic details of the respondents. Section B comprises ten (10)

distinct questions designed to examine the perceived Employee Safety Motivation (ESM).

Section C, which consists of fifteen (15) distinct questions, was created in the meantime to evaluate the Process Safety Culture (PSC) of the Local and International Oil Companies. The tool used is a closed-ended questionnaire based on the construct. The questions in Sections B and C were taken from Alrehaili [42] and modified. With the exception of section, A (socio-demographic characteristics), the questions in the other two sections included responses on a five-point Likert scale, ranging from "1 = strongly disagree" to "5 = strongly agree," or 1 being strongly disagree, 2 being disagree, 3 being agree, 4 being agree, and 5 being strongly disagree.

A pre-test of the instrument was conducted with a group of twenty petroleum process workers and twelve specially chosen process safety students to gauge their comprehension of the instrument's component constructs. Twenty-nine (29) of the thirty-two (32) questionnaires that were distributed for the pre-test were completed. A request for participation in the survey and a consent form, which is required before the assessment instrument is distributed, were enclosed in a cover letter with questionnaires. All employees who gave their consent to participate in the survey received a questionnaire, which was then collected electronically through email and in person with the assistance of research assistants.

Over the course of seven (7) months, one hundred questionnaires were sent to each of the five (5) local and five (5) international oil firms that satisfied the selection criteria. Based on the handed out and retrieved questionnaires from the chosen oil and gas companies, Table 1 displays the completion rate.

A total of 1000 questionnaires were given out for the study's survey; however, only 816 of those were fully completed and returned. The total completion rate, as defined by Anochie & Mgbemena [43], is calculated by dividing the percentage of all completed questionnaires by the percentage of all distributed questionnaires. The overall completion rate of 81.6% was achieved by using this formula. According to Boughab et al. [17], this completion rate is regarded as excellent. Prior to data analysis, a number of tests were carried out, including reliability and normality tests, to determine the

respondents' level of bias, inclusiveness, and distribution of the data in relation to the survey instrument that the researcher had created.

3.7 Reliability Test

Once the data was input into SPSS IBM 20, the reliability test was conducted by selecting Analyse from the toolbar. Next, the Scale in the Analyse section was selected, and finally, the reliability analysis was clicked. Finding out how suitable the data's internal and external regularity is is the aim of this test. Moore [44] states that an acceptable level of internal consistency is indicated by Cronbach's alpha (α) ≥ 0.6 , and an external reliability of good is indicated by a test-retest reliability of 0.7 or higher.

According to Table 2, the reliability test conducted by the examiner on the instrument yielded a Cronbach's alpha (α) value of 0.856. This suggests that the tool has a very high degree of dependability. This indicates that neither the researcher's nor the participants' biases were present in the instrument.

3.8 Methods of Data Analysis

The Eight hundred and sixteen (816) data retrieved from the survey (both online through Google form and in person via hardcopy) were coded on Spreadsheet Package for Social Science (SPSS) IBM 20 version. In order to provide answer to the study's research questions; descriptive statistics such as average mean and standard deviation was utilized. The choice of mean and standard deviation was for the reason that the research questions aimed at knowing and comparing the level of process safety culture of both the international and local oil companies and also because the information on the questionnaire is a 5-points Likerts scale which is a measure of an interval scale [37]. For the hypothesis testing this research adopted Multicollinearity analysis. Before going on to use Multicollinearity analysis it is vital to verify its suitability by means of checking Variance Inflation Factors (VIF). SPSS was utilized to compute the variance inflation factor (VIF) for all of the non-endogenous factors in-group of data. According to Hair, Hult, Ringle, & Sarstedt [45], when all computed VIFs are not higher than Five (5) they are considered acceptable. A common thumb rule is that awkward Multicollinearity may be in existence when the coefficient of VIF is higher than 5.0 (Byrne,

2016). Using SPSS's regression model statistics tool, multicollinearity is checked. The 95% confidence level and 0.05 significance level were used in this investigation. Not only were the ground p-value and other important factors like standardised coefficient (β), t-statistics, and R-squared discussed, but also the hypothesis itself.

Table 2 reveals the socio demographic characteristics of the study's respondents. When considering the age distribution of the

respondents, the gender distribution results indicate that a great deal of the respondents, or 574, were male (or 70.3%). The age distribution of the respondents reveals that the majority of the 451 respondents (55.3%) were between the ages of 35 and 44. In terms of the Cadre, the highest distribution (449,55%) was junior management/supervisor. The majority of responders—50.1%—were International Oil Company (IOC) employees. The majority of responders (287, or 35.2%) reported working for 11 to 15 years.

Table 1. Completion rate of field survey

S.no	Oil and Gas Company	Distribution Questionnaires	Completed Questionnaires	Completion Rate (%)
1.	ExxonMobil	100	87	87
2.	Shell petroleum development company	100	80	80
3.	Total Exploration & Production company	100	91	91
4.	Agip oil company	100	82	82
5.	Savannah Energy PLC	100	74	74
6.	Nigerian national petroleum corporation	100	90	90
7.	Aieteo eastern exploration & production	100	92	92
8.	Network Exploration & Production	100	85	85
9.	Frontier oil	100	70	70
10.	Universal energy resources ltd	100	65	65
Total		1000	816	81.6

Table 2. Social demographic characteristics

Variables	Frequency (N=816)	%
Male	574	70.3
Female	242	29.7
Age Group		
Below 25	38	4.6
25-34	287	35.21
35-44	451	55.3
45-54	40	4.9
Cadre		
Junior Staff	449	55
Senior Staff	367	45
Company Classification		
International oil company	287	35.2
Local oil company	529	64.8

3.9 Process Safety Culture (PSC)

Table 3 examined respondents reactions on process safety culture. When asked if they believed that the respondents' company took safety seriously, the majority of respondents—340 (41.7%), 269 (32.9%), 105 (12.9%), 85 (10.4%), and 17 (2.1%)—strongly agreed, disagreed, and disagreed individually. While 77(9.4%) respondents strongly disagreed, 314(38.5%) and 352(43.1%) respondents agreed that their company makes it clear that safety is important. While 88(10.8%) respondents strongly disagreed, the majority of respondents—369(45.2%) and

314(38.5%)—agreed that their organisation has clear targets and goals for safety. While 76(9.3%) respondents strongly disagreed, 492(60.3%) respondents agreed that their company has an interest in workers' opinions on safety.

The majority of respondents, 346 (42.4%), 242 (29.7%), and 20 (2.4%), disagreed and strongly disagreed that they will believe their supervisor. Of the respondents, 369 (45.2%) strongly agreed, 63 (7.7%) strongly disagreed, and 42 (5.2%) were neutral about their safety committee's performance. Of the respondents, 328 (40.2%) felt that they receive enough

Table 3. Reactions on Process Safety Culture (PSC) [n = 816]

Statements	SA F (%)	A F (%)	D F (%)	SD F (%)	N F (%)
My company is very serious about safety.	340(41.7)	269(32.9)	85(10.4)	105(12.9)	17(2.1)
My company clearly states that safety is vital.	352(43.1)	314(38.5)	67(8.2)	77(9.4)	6(0.8)
My company has clear objectives and targets for safety.	369(45.2)	283(34.7)	44(5.4)	88(10.8)	32(3.9)
My company is interested in workers' views on safety.	123(15.1)	492(60.3)	85(10.4)	76(9.3)	45(4.9)
I will trust my supervisor.	242(29.7)	346(42.4)	205(25.1)	20(2.4)	3(0.4)
The safety committee does a good job on safety.	257(31.5)	369(45.2)	85(10.4)	63(7.7)	42(5.2)
We get sufficient information from supervisors on safety matters.	245(30.0)	328(40.2)	123(15.1)	101(12.4)	19(2.3)
If safety rules are violated, you will be treated equally.	80(9.8)	162(19.9)	205(25.1)	123(15.1)	246(30.1)
My supervisor listens to my ideas on safety.	120(14.7)	451(55.2)	123(15.1)	111(13.6)	11(1.4)
When a safety concern arises, someone follows up very quickly.	126(15.4)	445(54.5)	98(12.0)	107(13.2)	40(4.9)
The workforce is regularly satisfied with management's decisions on safety.	80(9.8)	226(27.7)	200(24.5)	105(12.9)	205(25.1)
Safety workers generally do a good job.	121(14.8)	615(75.4)	40(4.9)	29(3.5)	11(1.4)
The safety program is well managed in this company.	60(7.4)	492(60.3)	144(17.4)	83(10.4)	37(4.5)
We have good safety standards in this company.	161(19.7)	492(60.3)	82(10.0)	41(5.0)	40(4.9)
Safety training and drills in this company is of high quality.	205(25.1)	369(45.2)	122(15.0)	119(14.6)	1(0.1)

Note: SA is Strongly Agree, A is Agree, D is Disagree, SD is strongly Disagree, and N is Neutral. F represents Frequency respondents, while (%) represent percentage of respondents

Table 4. Reactions on Employee Safety Motivation (ESM) [n = 816]

Statements	SA F (%)	A F (%)	D F (%)	SD F (%)	N F (%)
My company does a lot for its workers.	402(49.3)	324(39.7)	21(2.6)	60(7.4)	9(1.0)
My job is secure with this company.	274(33.5)	415(50.9)	77(9.4)	48(5.8)	2(0.4)
Workers will trust the management in my company.	240(29.4)	287(35.2)	169(20.7)	28(3.4)	92(11.3)
Management is genuinely serious about safety.	200(24.5)	210(25.7)	123(15.1)	80(9.8)	203(24.9)
Management at all times puts safety first.	40(4.9)	328(40.2)	243(29.8)	123(15.1)	243(29.8)
Management listens to workers' views on safety.	40(4.9)	328(40.2)	164(20.1)	123(15.1)	161(19.7)
My supervisor genuinely cares about safety.	122(15.0)	451(55.3)	40(4.9)	123(15.1)	80(9.8)
My supervisor always puts safety first.	123(15.1)	451(55.3)	120(14.7)	41(5.0)	81(9.9)
Recognition is given when job is carried out safely.	80(9.8)	410(50.2)	246(30.1)	67(8.2)	13(1.7)
I am satisfied to work for this company.	205(25.1)	328(40.2)	123(15.1)	151(18.5)	9(1.1)

Note: SA is Strongly Agree, A is Agree, D is Disagree, SD is strongly Disagree, and N is Neutral. F represents Frequency respondents, while (%) represent percentage of respondents

information from management regarding safety matters, while 101 (12.4%) strongly disagreed. 80(9.8%) respondents strongly agreed, while 246(30.1%) agreed that they are regarded equally with others when they break safety rules. 111(13.6%) respondents strongly disagreed, while 451(55.2%) participants agreed that their boss is attentive to their opinions on safety.

Of the respondents, 445 (54.5%) agreed that somebody follows up right away if they raise a security concern, 98 (12%) disagreed, and 40 (4.9%) were neutral. When asked if their employees are consistently satisfied with management's safety decisions, the majority of respondents—200, or 24.5%—disagreed and strongly disagreed, 105, or 12.9%, and 80, or 9.8%, strongly agreed. While 29 respondents (3.5%) strongly disagreed, the majority of respondents (615, or 75.4%) thought that safety workers usually do a good job. While 83 respondents (10.4%) strongly disagreed, the majority of respondents (492, or 60.3%) agreed that their company's safety programme is well-managed.

When asked if their company had good safety standards, 492 respondents (or 60.3%) said

that it did, 40 respondents (or 4.9%) were indifferent, and 41 respondents (or 5.0%) strongly disagreed. 119 respondents (14.6%) strongly disagreed, while 369 respondents (45.2%) agreed and 205 respondents (25.1%) strongly agreed that safety education and drills in their company are of high quality.

3.10 Employee Safety Motivation (ESM)

The results of the Employee Safety Motivation (ESM) survey are presented in this section. They show that, while 21 (2.6) and 60 (7.4) participants disagreed and strongly disagreed that their firm does a lot for its workers, 402 (49.3) respondents and 324 (39.5) respondents strongly agreed. A large number of respondents agreed that their job is assured with their company; 28 respondents (3.4%) strongly disagreed, while 240 respondents (29.4) and 287 respondents (35.2%) strongly agreed and strongly agreed that employees will trust their bosses in their company. While 80(9.8) respondents strongly disagreed, 200(24.5) and 210(25.7) respondents strongly agreed and agreed that management takes safety seriously. While 328 (40.2) concurred that management always prioritises safety, 243(29.8), 123(15.1),

and 243(29.8) disagreed, disagreed strongly, and were neutral.

328(40.2) respondents strongly disagreed with the statement that management pays attention to employees' concerns regarding safety. While 40 (4.9) respondents disagreed, 451 (55.3) respondents agreed that their supervisor actually cares about worker safety. 41(5.0) respondents strongly disagreed with the majority of respondents, 451(55.3), who agreed that their supervisor always prioritises safety. 410(50.2) respondents concurred that they are recognised for their safe work practises. 67(8.2) were dissenting. 328 respondents (40.2%) agreed and 123 respondents (15.1) disagreed that they are happy to work for their company.

4. RESULTS

Result in Table 5 the result of the Multicollinearity analysis. The hypothesis posits that there is no relationship between employees' safety motivation and what they think of process safety culture in the oil and gas sectors. In the Nigerian oil industry, the process safety culture significantly improved employee safety motivation, with a standardized weight of β -0.247 and a p-value of $0.000 < 0.05$ (rejecting the null hypothesis). This suggested that, in the chosen oil and gas industries, employees' safety motivation is influenced by their perceptions of the process safety culture.

5. DISCUSSION OF FINDINGS

It has been discovered that employee motivation for safety is highly impacted by perceived process safety culture. This research indicates that the oil and gas industry's perceived safety culture needs to be evaluated

and improved. This study validated the significant influence of perceived safety culture as a predictor of increased employee motivation for safety. This result is consistent with that of Adetunji, Azeta, Onubaiye, and Aregbe [33], who investigated how these safety practises affected workers' motivation and output and discovered that encouraging a safety culture at work raises worker motivation.

Shimawua and Sunday [46] discovered that low motivation limits employees' productivity in both the Nigerian public sector and multinational oil companies. Low levels of motivation among workers in Nigeria's oil and gas sector are a sign of inadequate sector management, inadequate individual organisational management, and government legislative responsibility. Low productivity and worker discontent will be rampant if the current situation is not improved. Probst [47] examined the impact of job insecurity on safety outcomes of workers and found that worker with high perception of job insecurity show reduced safety motivation and compliance which indirectly is links to greater level of accidents and injuries in the work environment. Lack of job security was also revealed to be a significant stressor. Twagirumukiza [48] also noted that security in job greatly impacts the performance of workers and performance in the oil industry is also is also judged based on a workers ability to obey safety regulations. Thus ensuring job security is vital for every organisation especially those in the oil and gas organisation. Also, job satisfaction, which is a positive attitude, can motivate workers to hold unto organisational goals and ethics driving to work better to achieve the set objectives of the organisation [49]. This will ensure the improvement on workers quality of behaviour and adherence to safety [50-52].

Table 5. Shows the result of the Multicollinearity analysis

Hypothesis (H0)	Relationship	Standardized Coefficients (Beta)	P-value (Significance at 0.05 confidence level)	R-Square	t-statistics	Hypothesis test remarks (Based on the Alternate)
1	Process Safety Culture - > Employee Safety Motivation	0.247	0.000	0.223	7.283	Significant

Poor safety cultures, which are currently evident in the oil and gas sector in Nigeria and are a result of inadequate policy execution and industry standard compliance, are to blame for the low levels of motivation. For this reason, a safe workplace is crucial for both employers and employees. All workers have a right to a safe working environment. Safety in the workplace is crucial, no matter how big the company is.

6. CONCLUSION AND RECOMMENDATION

One essential human need is safety. Employees seek safety in the workplace in addition to the fundamental safety, stability, protection, and absence of fear that they expect. An environment free from accidents or equipped with sufficient resources to support each worker's health in the event of an unforeseen incident at work. The study evaluated how employee safety motivation was impacted by process safety culture in a few Nigerian oil and gas industries. It was discovered that employee safety motivation is highly impacted by perceived process safety culture.

The investigation's findings highlight the necessity for management to establish safety culture policies and the instruments required to carry out these laws. Employers need to stress the value of upholding safety standards and adhering to regulations that model safe work practises. In addition, as an element of their process safety culture, oil and gas company management ought to keep an eye on employees' activities and take appropriate action against those who violate workplace safety regulations. There is little chance that a safety law violation will occur again when workers are penalized for it.

For future studies, researchers should examine the kind of motivation that encourages employees to better obey the safety culture of their organisation i.e. whether intrinsic motivation or extrinsic motivation.

CONSENT

As per international standards or university standards, Participants' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standards or university standards written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Oyet G. Human errors in process safety management. "A case study of Oando Marketing PLC Apapa PMS Tank 5 Explosion Incident". Resource Material for M.Sc. lecture in Centre of Occupational Health Safety and Environment, Uniport; 2018.
2. Ekong AE, Ugbeborand JN, Brown BK. Influence of safety culture on employee safety motivation and error behaviour in selected petroleum industries in Niger-Delta. *Asian Journal of Advanced Research and Reports*. 2021;15(4):49-62.
3. Vinodkumar MN, Bhasi M. Safety climate factors and its relationship with accidents and personal attributes in the chemical industry, *Safety Science*. 2009;47:659–667.
4. Kastenber WE. Ethics, risk, and safety culture: reflections on Fukushima and beyond. *Journal of Risk Research*. 2014;18(3):304-16.
5. Reason JT. *Managing the risks of organizational accidents*. London: Routledge Taylor and Francis Group; 2016.
6. Pordanjani TR, Ebrahimi AM. Safety motivation and work pressure as predictors of occupational accidents in the petrochemical industry. *Health Scope*. 2015;4(4).
7. United States Chemical Safety and Hazard Investigation Board (CSB,). *Safety digest: The importance of workers participation*; 2007.
8. Center for Chemical process Safety (CCPS). *Process safety culture in the risk based process safety model*. The American Institute of Chemical Engineers; 2007.
9. Al-Bayati AJ. *Impact of construction safety culture and construction safety climate on*

- safety behavior and safety motivation. *Safety*. 2021;7:41.
Available:<https://doi.org/10.3390/safety7020041>
10. OSHA. Process safety management-guidelines for compliance. U.S Department of Labor Occupational Safety and Health Administration; 2000.
 11. Bayram M, Unggan MC. The relationships between OHS prevention costs, OHSMS practices, employee satisfaction, OHS performance and accident costs, Total Quality Management and Business Excellence. 2018;1-20.
Available:<https://doi.org/10.1080/14783363.2018.1480897>
 12. Shah AA, Vintage CB. Workplace safety: Importance, benefits, and ways to incorporate it; 2022.
Available:<https://blog.vantagecircle.com/workplace-safety/>
 13. Mariana MG, Curcuruto M. Employee safety motivation: Perspectives and measures on the basis of the self determination theory. *La Medicina de lavoro*. 2015;106(5):333-341.
 14. Hosny G. A comparative assessment of safety climate among petroleum companies. *Egyptian Journal of Occupational Medicine*. 2017;41(2):307–24.
 15. Wasileski R. An introduction to risk based process safety. *Solutions for managing hazards and risk*. Baker Risk. 2017;1984-2014.
 16. Arendt S. Continuously improving PSM effectiveness— A Practical Roadmap, in 20th Annual CCPS International Conference, Atlanta, Georgia; 2005.
 17. Boughab A, Hassane C, Roukia O. Safety culture assessment in petrochemical industry: A comparative study of two algerian plants. *Safety and Health at Work*. 2014;5(2):60–65.
Available:<https://doi.org/10.1016/j.shaw.2014.03.005>
 18. Goncalves FA, Waterson P. Maturity models and safety culture: A critical review. *Safety Science*. 2018;105:192–211.
 19. Cooper M. Towards a model of safety culture. *Safety Science*. 2000;36(2):111–136. ^{[[[} _{SEP]}
 20. Widyanty W, Kasmu AB. Toward a model of the linkages between safety culture and employee performance in gold mining companies. *Advances in Economics, Business and Management Research*. 2019;100.
 21. Obiora CA, Ani KJ, Chukwuemeka E, Ezech LN. Motivation-satisfaction-productivity triad: The moderating role of safety culture among employees in oil and gas firms in Niger Delta, Nigeria. *Journal of New Zealand Studies*. 2023;35:544.
Available:<https://doi.org/10.5281/zenodo.7805488>
 22. Salleh A. Safety behavior in the Malaysian petrochemical industry. PhD thesis. Malaysia: University of Utara Malaysia; 2010.
 23. Cakit E, Olak A, Murata A, Karwowski W, Alrehalli O, Marek T. Assessment of the perceived safety culture in the petrochemical industry in Japan: A cross sectional study. *Plosone journal*. 2019; 4(9):29.
 24. De Montclos MAP. The politics and crisis of the Petroleum Industry Bill in Nigeria. *The Journal of Modern African Studies*. 2014;403-424.
 25. Aye B. NUPENGASSAN': Combatting precarious work in the nigerian oil industry. Working Paper 50, Geneva: International Labour Office; 2017.
 26. Lawrence A. The role of labor in transforming Nigerian oil politics. In *Working for Oil (31-158)*. Palgrave Macmillan, Cham; 2018.
 27. Agboola AA, Esan OT, Ojo TO, Omotosho OS. Perceived effect of occupational safety measures on workers' performance in warri refining and petrochemical company, Delta State, Nigeria. *Nigerian Medical Journal: Journal of the Nigeria Medical Association*. 2020;61(3): 144.
 28. Adim CV, Mezeh AA. Health and safety training and employee performance in oil and gas companies in rivers state, Nigeria. *British International Journal of New Zealand Studies*. 2020;35.
Available:<https://doi.org/10.5281/zenodo.7805488>
 29. Vierendeels G, Reniers G, van Nunen K, Ponnet K. An integrative conceptual framework for safety culture: The Egg Aggregated Model (TEAM) of safety culture. *Safety science*. 2018;103:323-339.

30. Bernardi A. Using the capability approach and organizational climate to study occupational health and safety. *Insights into Regional Development*. 2019;1(2):138-154.
31. Blau PM. *Exchange and power in social life*. New York: John Wiley; 1964.
32. Ahmad R, Nawaz MR, Ishaq MI, Khan MM, and Ashraf HA. Social exchange theory: Systematic review and future directions. *Front. Psychol.* 2023;13:1015921. Available:<https://doi.org/10.3389/fpsyg.2022.1015921>
33. Adetunji BA, Azeta V, Onubaiye AA, Aregbe TA. Employee safety and productivity: benefits and strategies for creating safe work environment, *International Journal of Advanced Studies in Economics and Public Sector Management, IJASEPSM.* 2022;10(1):2354-4228.
34. Thomas RK, Gordon S. *Motivating employees for safety process*. Behavioural Science Technology International, Bracknell RG12 1JB; 2001.
35. Ekong A, Michael BO. Awareness, attitude, and practice of liquefied petroleum gas station workers to fire emergency response in Ikotun, Lagos, Nigeria. *Asian Journal of Advanced Research*. 2023;7(12):43-55.
36. Greyl L, Ojo GU, Williams C, Certoma C, Greco L, Ogbara N, Ohwojeheri A. Digging deep corporate liability. *Environmental Justice Strategies in the world of oil*. EJOLT. 2013;9:(73).
37. Kamalu OJ, Wokocho CC. Land resource inventory and ecological vulnerability: Assessment of onne area in Rivers state, Nigeria, *Research Journal of Environmental and Earth Science*. 2011;3(5):438-447.
38. Ben-Shlomo Y, Brookes O, Hickman M. *Lecture Notes: Epidemiology, Evidence-based Medicine and Public Health (6th ed.)*, Wiley-Blackwell, Oxford; 2013.
39. Zhi HL. A comparison of convenience sampling and purposive sampling. *PubMed*. 2014;7(8):105-11.
40. Leiner DJ. convenience samples and respondent pools. 2014;1-36.
41. Warmbrod JR. Conducting, interpreting, and reporting quantitative research. *Research Pre-Session*, New Orleans, Louisiana; 2001.
42. Alrehaili O. Assessing safety culture among personnel in governmental construction sites at Saudi Arabia: A quantitative study approach". *Electronic Theses and Dissertations*. 5261. University of Central Florida, USA; 2016. Available:<https://stars.library.ucf.edu/etd/5261>
43. Anochie UC, Mgbemena OO. Evaluation of some oil companies in the Niger delta region of Nigeria: an environmental impact approach. *International Journal of Environment and Pollution Research*. 2015;3(2):13-31.
44. Moore M. The global dimension of public health preparedness and implication for US action, *American Journal of Public Health*. 2012;102(6):1-12.
45. Hair JF, Hult GTM, Ringle C, Sarstedt MA. *Primer on partial least squares structural equation modeling (PLS-SEM)*. Sage publication; 2016.
46. Shimawua D, Sunday A. Nigerian public sector and the challenge of workers' productivity: An evaluation. *KIU Journal of Social Sciences*. 2018;4(2):225-233.
47. Probst TM. The effect of job insecurity on employee safety outcomes: Cross-Sectional and Longitudinal explorations, *Journal of Occupational Health Psychology*. 2001;6(2):139-59.
48. Twagirumukiza L. Job security and employee performance in a selected funded local Ngo, Rwanda: The case of A.E.E Rwanda. A Thesis Presented to The School Of Postgraduate Studies and Research, Kampala International University; 2014.
49. Kim M, Kim B. Analysis of the importance of job insecurity, psychological safety and job satisfaction in the CSR-Performance Link, *Sustainability*. 2020;12:3514. Available:<https://doi.org/10.3390/su12093514>
50. Casey T, Griffin MA, Flatau H, Neal A. Safety climate and culture: integrating psychological and systems perspectives. *J. Occup. Health Psychol.* 2017;22:341-353.

51. Fleming M. Assessing employee safety motivation; 2012.
Available:<http://www.worksafebc.com/contact.us/research.Results/res60101170>
[Accessed on last access 18-04-2013]
52. Ismail Z, Doostdar S, Harun Z. Factors influencing the implementation of a safety management system for construction sites; 2012.

© 2023 Ekong and Ogunbanwo; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<https://www.sdiarticle5.com/review-history/110667>