VOL. 09 NO. 5,
AUGUST, 2025
E-ISSN 3027-1339
P-ISSN 3026-8257

African Scholar Publications & Research International
www.africanscholarpub.com

Journal of Systematic, Evaluation and Diversity Engr. (JSEDE)

Evaluating the Role of Accident Prevention Strategies in Enhancing Workplace Safety and Productivity in the Nigerian Oil and Gas Sector

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DOI: https://doi.org/10.70382/ajsede.v9i5.010

Abstract

This research investigates the role of accident prevention strategies in promoting sustainable workplace productivity within the Nigerian oil and gas industry, using Temile Nigeria Limited Ogunnu Supply Base as a case study. The oil and gas sector is inherently high-risk, and despite extensive safety awareness and training efforts, workplace accidents remain a persistent challenge with serious implications for employee well-being and organizational performance. The aim of the study was to evaluate how accident prevention measures impact productivity and sustainability at Temile Nigeria Limited. A structured questionnaire was administered to a sample of 64 employees, capturing demographic data, accident types, causes, and safety perceptions. Quantitative analysis was conducted using key performance indicators, and ethical research standards including informed consent and confidentiality were maintained throughout. The findings revealed a significant gap between perceived safety and actual accident occurrence. Notably, 84.3% of workers reported feeling safe, yet wet and slippery surface falls accounted for 46.8% of all recorded incidents. The study further identified that basic workplace hazards such as slips, trips, and chemical exposure dominate over technical failures. Contract workers, who represent 57.8% of the workforce, were found to be especially vulnerable due to limited integration and environmental familiarity. These results underscore the critical importance of shifting beyond training and awareness to improve infrastructure, implement consistent safety protocols, and foster transparent accident reporting. The study concludes that enhanced

preventive strategies especially for contract workers and the institutionalization of safety culture are essential for reducing accident rates and improving long-term productivity. Recommendations include conducting regular risk assessments, standardizing safety drills, strengthening hazard-specific protocols, and empowering all employee categories with equal access to safety tools and training.

Keywords: Occupational Health and Safety (OHS), Risk Management, Oil and Gas Industry, Safety Culture, Human Factors Engineering.

Introduction

The Oil and Gas industry is by its nature a high-risk industry. The industries' products, hydrocarbons produced and transported, supply the world market with substantial amounts of fuel and raw product for a number of industrial activities. Therefore, the Oil and Gas industry handles large quantities of flammable and hazardous substances in the high energy environment encountered subsurface, with high pressure and temperature scenarios (Andrew et al., 2019)

These high energy situations and severe forces call for highly developed Health, Safety and Environment (HSE) Management Systems and Cultures. Their effectiveness is proudly proclaimed by the industry and endorsed by significant reductions of personal injuries (Barling et al., 2020)). Despite the high-performance risk control approach the Oil and Gas industry has implemented, the industry has seen a number of major accidents with extensive consequences. A major accident involving hydrocarbons puts at stake the lives of personnel working at the site, the life and health of populations in neighboring communities, the viability of the ecosystem and can also massively impact the economic situation of a region. Bearing this in mind the prevention of major accidents is a task of outmost importance.

Accidents at work are estimated to kill more than 380,000 workers worldwide every year (Concha-Barrientos et al., 2005; EU-OSHA, 2017). Aside from the human cost, workplace accidents also represent a significant economic burden to society (EU-OSHA, 2017; Eurostat, 2004). Although the risks of accidents at work have been reduced over the last 30 years, the number of accidents remains unacceptably high and continues to receive much attention from a wide spectrum of policy and decision-makers. an "accident at work" is understood as an accident which causes physical harm (injury) to people at work; that injury may be minor, major or fatal. We use the term "accident" for the causal event(s) leading to the harmful exposure of an individual, whereas we reserve the term "injury" for physical harm as the consequence(s) of such an event. In the health and safety field it is important to distinguish "accidents" from chronic injuries related to long-term exposures, as the etiologies are different. We found the European Commission definition of a work accident the most exhaustive and clear (European Commission, 1999). An

accident at work is thus defined as "a discrete, sudden and unexpected occurrence in the course of work which leads to physical harm (injury)." This includes cases of acute poisoning and willful acts of other persons, but excludes deliberate self-inflicted injuries, and accidents on the way to and from work (commuting accidents).

Accidents and injuries in the workplace have been a persistent issue, negatively affecting both the well-being of employees and the overall productivity and sustainability of organizations. The World Health Organization (WHO) and the International Labour Organization (ILO) estimate that there are more than 2.3 million deaths annually due to work-related accidents and diseases, underscoring the significance of addressing workplace safety and accident prevention. Moreover, the financial burden of workplace accidents is substantial, with a global economic cost surpassing 3.94% of the world's GDP (del Rocio Soto-Flores et al., 2021).

With increasing demands for enhanced workplace safety and sustainable productivity, it is imperative to understand the impact of accident prevention measures on overall organizational performance. While previous studies have explored the correlation between workplace accidents and productivity, there is a need for a comprehensive evaluation of the effectiveness of accident prevention strategies in promoting sustainable workplace productivity.

AIM AND OBJECTIVES

The aim of this study is to evaluate the role and impact of accident prevention on sustainable workplace productivity in Temile Group of Companies with the objectives to:

i. Determine the nature and types of accident that occur in the company
ii. Identify the key factors influencing workplace accidents within Temile Group of Companies and their impact on productivity.
iii. Assess the current accident prevention measures implemented by Temile Group of Companies and their effectiveness in mitigating workplace accidents.
iv. Determine the relationship between accident prevention initiatives and sustainable workplace productivity.

LITERATURE REVIEW

In the oil and gas industry, human factors have been identified as the most common causes of catastrophic accidents (Shappell et al 2021) For instance, the Piper Alpha disaster in 1988 caused 167 fatalities and complete destruction of the offshore platform (Singh et al 2020). The BP Deepwater Horizon blowout in 2010 one of the greatest oil spills ever recorded resulted in 11 fatalities and spilled over 4.5 million barrels of crude oil in the US Gulf of Mexico. The BP Texas refinery fire in 2005 caused 15 fatalities and 180 injuries. After investigations, the predominant causal factors identified in each of these incidents were attributed to human errors and operational flaws. Perhaps, most accident investigation tools used in high-risk industries such as the oil and gas industry were not robust enough to curb accident occurrence (Ismail et al 2021). A 2016 key performance indicator (KPI) report by the International Association of Oil and Gas Producers (IOGP) reveals a staggering trend of accidents in the oil and gas

industry from 2007 to 2016. Although the numbers of fatal accidents and fatalities have been reduced drastically over the years, 54 fatalities were recorded in 40 accidents in 2015 and 50 fatalities were documented in 29 accident cases in 2016. These results therefore reveal that the fatal accident rate (FAR) is on the increase, at 1.5 in 2015 and 1.7 in 2016. This infers that more fatalities occurred in fewer accidents in 2016 than in 2015. Thus, this raises the question of how robust safety measures are in oil and gas facilities. A study by Dhali and Subramanian (2023) revealed that over 30% of major accidents experienced in the oil and gas industry are triggered by inadequate maintenance. DeWolf (2019) opines that piping failures and chemical releases due to poor maintenance are predominant causal factors of 38% of accidents in the Netherlands petroleum industry. The Norwegian Shelf has also witnessed over 242 storage tank accidents largely attributed to poor maintenance and operations. Nonetheless. Darbra et al. (2020) and Dhirani et al., (2021) argued that external factors like sabotage, design flaws, equipment malfunction, earthquakes and climate change events like flooding and high temperatures should not be overlooked. A study by (Katsakiori et al. 2019) suggests that the major reason why offshore accidents keep occurring is due to poor asset integrity, as well as inadequate operational discipline and training of staff. Singh et al. (2020) suggest that a possible reason for this is the failure to properly learn and benchmark from previous accidents. Consequently, Skalle et al. (2019) and Emodi and Newankwo (2019) are of the view that integrating human causal factors with technical factors could help in ascertaining root causes of accidents. A study by Norazahar et al (2019) on the BP Deepwater Horizon accident in 2010 revealed that inadequate emergency preparedness, an unsafe environment, the physical ability of workers and poor communication all contributed as human and organizational failures in the accident. While Salwa et al., (2010) and Lees (2020) suggest that incompetence is not solely a causal factor of oil and gas accidents, Lindøe et al. (2021) avow that accident statistics differ across various sectors in the oil and gas industry. This claim is buttressed by the IOGP in their 2016 KPI report where the upstream, midstream and downstream sectors have distinct accident causal factors and rates. In their report, various sectors in the oil and gas industry such as exploration, drilling, production and construction were all analyzed. The results revealed that in the last 5 years, the exploration sector experienced the highest FAR of 2.9 per 100 million hours worked. Further analysis showed that in 2016 Europe recorded the highest FAR of 5 per 100 million hours worked. These statistics reiterate the importance of thorough analysis human causal factors in accident causation to develop better mitigation measures for accident prevention in the oil and gas industry.

RESEARCH METHOD

Sample Population and Data Collection Instrument

The target sample population size constituted 95 respondents that were selected for the study with 15 persons selected from the mechanical, electrical, drilling, administrative sections while 35 constitutes contractors that come in for one activity or the other as the respondents. This sample size was chosen because of availability of this minimum population at each point

in the workplace. A total of 64 copies of retrieved which formed the basis of analysis for the study. The process utilized online tools, specifically Google Forms, to administer structured questionnaires designed to address the impact of accident prevention for sustainable workplace productivity among oil and gas workers. Questionnaires were distributed across various departments and job roles to ensure inclusivity and a representative sample.

Data Analysis

Collected data underwent meticulous organization and cleaning using data management tools to ensure accuracy and reliability. Quantitative data from Google Forms questionnaire responses underwent statistical analysis expressing the results in percentages and presented using Tables.

RESULTS AND DISCUSSION

Age of Respondents

The distribution of respondents across different age groups is noticeable as shown in Table 1. The majority falls within the 38-47 age range, constituting 46.9% of the sample, followed closely by the 48-57 age group at 28.1%, while 28-37 age group constitute 12.5%. The distribution gradually decreases with increasing age, with the 58 and above group having the fewest respondents at 7.8%. This age distribution pattern suggests a relatively youthful workforce in Temile Nigeria Limited Ogunu Supply Base. It's noteworthy that the energetic demands of the oil and gas industry often attract a younger demographic.

The age distribution of employees emerges as a pivotal factor in shaping effective accident prevention strategies within the oil and gas industry. In this study, the concentration of workers within the 28-37 age range, recognized for their physical vitality and active engagement, shows the necessity of tailoring safety protocols and emergency response strategies to align with the demographic characteristics of the workforce.

The demographic distribution observed in this research carries profound implications for the dynamics of the workforce and safety management practices. With a predominantly youthful workforce, the implementation of targeted training programs becomes imperative, taking into account the unique physical capabilities and potential vulnerabilities associated with younger employees.

Table 1: Age of Respondents

Variable	Respondents	Percentage
18-27	3	4.7
28-37	8	12.5
38-47	30	46.9
48-57	18	28.1
58 and above	5	7.8
Total	64	100

Marital Status of Respondents

The majority of respondents are married (46 out of 64), which constitutes approximately 71.8%. Single respondents make up around 18.8%, widowed respondents account for 6.3%, and divorced respondents are the least represented group at 3.1% as shown in Table 2

Table 2: Marital Status of Respondents

Variable	Respondents	Percentage
Single	12	18.8
Married	46	71.8
Separated/Divorced	2	3.1
Widowed	4	6.3
Total	64	100.00

Educational Background of Respondents

The education background of the respondents as gotten from the study showed that 12.5% of the respondents have the Senior School Certificate Examination (SSCE) certification, 15.6% have the Ordinary National Diploma (OND) and 21.9% have their HND and BSc certification, while 50% of the respondents have their Master's certificate and above respectively as shown in Table 3

Table 3: Educational Background of Respondents

Variable	Respondents	Percentage
SSCE	8	12.5
OND	10	15.6
HND/BSC	14	21.9
MSc and above	32	50
Total	64	100.00

Status of Workers

Table 4 shows that contract workers form the majority, with 37 respondents. This indicates a significant reliance on contract-based employment within the analyzed group. Casual workers account for 21.9%, while Tenure workers represent 20.3%. This suggests that permanent or long-term employment (Tenure) is almost as casual arrangements.

The overall distribution shows a preference for flexible or temporary workforce solutions (Casual and Contract), possibly reflecting organizational priorities, labor market trends, or economic considerations.

Table 4: Status of workers

Variable	Respondents	Percentage
Tenure	13	20.3
Casual	14	21.9

Contract	37	57.8
Total	64	100.00

Years of Experience

The years of experience of the workers are shown in Table 5, the majority of respondents fall in the 11–15 years category, with 23 individuals with 35.9%. This suggests that the group has a considerable number of mid-career professionals, potentially indicating stability in employment and professional growth at this stage. The 0–5 years category has the fewest respondents, only 8. This indicates a smaller proportion of individuals at the early stages of their careers, possibly reflecting recruitment trends or the surveyed group's focus on more experienced professionals.

Respondents in the 6–10 years and 16–20 years categories are moderately represented, with 12 and 11 individuals, respectively. This highlights a relatively balanced distribution among these groups.

The over 20 years category comprises 10 respondents, showcasing a significant portion of individuals with extensive experience, likely reflecting expertise and leadership within the group. The distribution highlights a workforce heavily skewed towards experienced individuals (11+ years), suggesting that the focus might be on retaining skilled professionals. It also points to potential challenges in attracting or retaining early-career professionals (0–5 years).

Table 5: Years of Experience

Variable	Respondents	Percentage
0-5 years	8	12.5
6-10 years	12	18.8
11-15 years	23	35.9
16-20 years	11	17.2
Over 20 years	10	15.6
Total	64	100.00

Types of Accident Experienced in the Workplace

Table 6 shows the various types of workplace accidents, along with the count of incidents and the percentage of respondents who reported each type. It provides valuable insights into the types of accidents occurring in the workplace. Wet and slippery surfaces in the workplace is the most common type of accident accounting for 46.8% response from the respondents, It suggests a need for better floor maintenance and the use of non-slip mats or footwear.

Suspended Load Fall During Lifting and Hoisting, this type of accident is also quite frequent, highlighting potential issues with lifting and hoisting procedures accounting for 6.3% of the respondents. Falls from height are particularly dangerous and indicate a need for better fall protection systems and training on working at heights. 7.8% of the respondents experienced this type of accident. Accidents involving rotating engine parts suggest a need for stricter

safety protocols during maintenance activities. 4.7% of the respondents experienced this type of accident

Although less common, slips and trips under tension still pose a risk and should be addressed through better housekeeping and awareness training. 1.6% of the respondents experienced this type of accident

Exposure to biological hazards and sharp objects indicates a need for better personal protective equipment (PPE) and training on handling materials safely. 23.4% of the respondents experienced this type of accident. Accidents involving ignition sources highlight the importance of fire safety measures and proper handling of flammable materials. 7.8% of the respondents experienced this type of accident.

Table 6: Types of accident experienced in the workplace

Variable	Respondents	Percentage
Wet Slippery surface fall	30	46.8
Suspended load fall during lifting and hoisting	4	6.3
Object or Personnel fall from height above 1.8 meters	5	7.8
Rotating engine part during maintenance	3	4.7
Slinks, ropes under tension	1	1.6
Biological hazards, sharp objects and manual materials	15	23.4
Ignition sources	5	7.8
Black oil and chemicals in the ware house	1	1.6
Total	64	100

Causes of Accident in the Workplace

Table 7 shows that, slippery surfaces dominate at 31.3% nearly one-third of all incidents, Inappropriate Handling and Keeping of hazardous chemicals accounts for 18.8%, Poor Manual Handling and Lifting Techniques represents 15.6%, Inappropriate use and keeping of equipment Accidents at 12.5%, Working at Heigh without PPE and being struck by objects accounts for 4.7% respectively while workplace vehicle accidents, repetitive motion injuries, lack of training, and inadequate and non-compliance to safety policies each represent 3.1% of causes of accidents in the workplace.

Table 7: Causes of accidents in the workplace

Variable	Respondents	Percentage
Slippery Surfaces	20	31.3
Poor Manual Handling and lifting techniques	10	15.6
Working at Heigh without PPE	3	4.7
Being struck by objects	3	4.7
Workplace vehicle accident	2	3.1
Inappropriate Handling and Keeping of hazardous chemicals	12	18.8
Inappropriate use and keeping of equipment	8	12.5

Variable	Respondents	Percentage
Repetitive motion and strain injuries	2	3.1
Lack of proper training	2	3.1
Inadequate and non-compliance to safety policies	2	3.1
Total	64	100

PERCEPTION OF SAFETY IN THE WORKPLACE

Safety of the Workers in their Workplaces

Table 8 presents results about safety perceptions from the respondents. The data shows that the majority of respondents (84.3%) feel safe, with 35 people (54.6%) rating conditions as Safe and 19 people (29.7%) rating them as Very Safe. Only a small minority expressed safety concerns, with 6 respondents (9.4%) rating conditions as Unsafe and 4 respondents (6.3%) rating them as Very Unsafe. Overall, the data indicates a generally positive safety perception among the surveyed population.

Table 8: Safety of workers in their workplaces

Safety Rating	Respondents	Percentage (%)
Very Safe	19	29.7
Safe	35	54.6
Unsafe	6	9.4
Very Unsafe	4	6.3
Total Responses	64	100

Awareness of Safety Procedure in the Workplace

Table 9 measures respondents' safety awareness procedures 85.9% are very familiar with safety procedures 9.4% are somewhat familiar 4.7% are not familiar at all. This shows excellent safety awareness, with nearly 86% of respondents being very familiar with safety procedures, indicating effective safety communication and training programs.

Table 9: Awareness of safety procedure

Safety Awareness Procedure	Respondents	Percentage
Very Familiar	55	85.9
Somewhat Familiar	6	9.4
Not Familiar at all	3	4.7
Total	64	100

Frequency of Safety Drills at workplace

Table 10 shows how often safety drills are conducted according to the 64 respondents 35.9% report monthly safety drills, 31.3% report annual safety drills, 15.6% report weekly safety drills 7.8% report quarterly safety drills, 9.4% reports never having safety drills. Monthly drills

are the most common practice, though there's significant variation in drill frequency across different workplaces.

Table 10: Safety drills at workplace

Safety Drills Frequency	Respondents	Percentage
Weekly	10	15.6
Monthly	23	35.9
Quarterly	5	7.8
Annually	20	31.3
Never	6	9.4
Total	64	100

Accident Reporting in the Workplace

Table 11 displays how frequently respondents report accidents in their workplace 46.9% rarely report accidents 37.5% frequently report accidents 15.6% occasionally report accidents. The data suggests that nearly half of respondents rarely report accidents, which could indicate either a very safe workplace or potential underreporting of incidents.

Table 11: Accident reporting in the workplace

Accident Report Frequency	Respondents	Percentage
Rarely	30	46.9
Frequently	24	37.5
Occasionally	10	15.6
Total	64	100

Accident Prevention Measures in Study Area

Table 12 shows that a total number of 37.5% of respondent said that there should be an upgrade in hazard specific safety system such as strengthen protocols for manual handling, suspended load lifting, chemical exposure, and fall protection -incorporating ergonomic training, mechanical aids, PPE enhancements, ventilation systems and equipment inspections. 12.5% of respondent were of the view that there should be a reinforce workplace environment safety such as introduce rigorous floor maintenance programs with daily inspections, spills response-protocols, non- slip surfaces and footwear, and drainage system upkeep to reduce slips, trips and falls. 18.8% of respondent saith that there should be a standardize safety drills and training such as implement monthly scenario-based safety drills across all department and ensure regular refresher training to improve real time preparedness and hazard response. Empowering contract workers with equal safety resources as a measure to prevent accident has a total number of 9.4% of respondent such as providing contractors with onboarding programs, mentorship opportunities, mandatory certifications, and equitable access to training and tools to align them with permanent staff safety standards. Finally, a total of 21.8% of respondent said that there should establish transparent reporting and accountability systems, such as

deploys anonymous digital platforms, promote a no blame culture for reporting, hold regular safety discussions, incentive proactive reporting and ensure leadership responsibility in incident follow up.

Table 12: Proposed Accident Preventive Measures

S/N	Accident Preventive Measures	Frequency	Percentage (%)
1	Upgrade Hazard-Specific Safety Systems	**24**	**37.5**
2	Reinforce Workplace Environment Safety	**8**	**12.5**
3	Standardize Safety Drills and Training	**12**	**18.8**
4	Empower Contract Workers with Equal Safety Resources	**6**	**9.4**
5	Transparent Reporting & Accountability Systems	**14**	**21.8**
	TOTAL	**64**	**100**

DISCUSSION

The demographic profile of respondents reveals a mature and highly qualified workforce at Temile Nigeria Limited Ogunu Supply Base, with significant implications for safety management strategies. The concentration of workers in the 38-47 age range and 48-57 age range has an average value of (37.5%), combined with the fact that 71.8% are married and 50% hold Master's degrees or higher, suggests a stable, experienced workforce with substantial personal and professional responsibilities, these results are in collaboration with that of Dewolf *et al*, 2019. However, the predominance of contract workers (57.8%) and the fact that most employees (35.9%) have 11-15 years of experience indicates potential challenges in maintaining consistent safety culture and institutional knowledge transfer. The high educational attainment levels present an opportunity for implementing sophisticated safety protocols, while the contract-heavy employment structure may require enhanced onboarding and safety orientation programs to ensure all workers, regardless of employment status, maintain the same safety standards are in line with the study by Lindøe et al. (2021) and Norazahar et al. (2019) which emphasizes that contract workers face unique safety challenges due to unfamiliarity with company protocols.

The study of workplace accidents reveals a concerning pattern dominated by fundamental safety hazards that should be preventable with proper protocols and infrastructure maintenance. Wet and slippery surface falls account for nearly half (46.8%) of all reported accidents, while exposure to biological hazards and sharp objects represents another significant portion (23.4%). When combined with the causes of accidents data, slips, trips, and falls constitute 31.3% of incidents, and exposure to hazardous chemicals accounts for 18.8%, together representing exactly 50% of all safety incidents. This concentration of accidents in basic workplace hazards suggests that while the workforce may be highly educated and experienced, the fundamental safety infrastructure and maintenance protocols require immediate attention. The relatively lower percentages of equipment-related accidents (12.5%)

and training-related issues (3.1%) indicate that technical competency is generally adequate, but environmental safety conditions need substantial improvement, this corresponds to the study by Darbra *et al.* (2020).

Despite the high frequency of preventable accidents, the survey reveals a situation where workers maintain generally positive safety perceptions and demonstrate high levels of safety awareness. An overwhelming 84.3% of respondents feel safe or very safe in their workplace, and 85.9% report being very familiar with safety procedures, this is in line with the study by Andrew & Masood (2019). Additionally, 90.6% have received accident prevention training, indicating that safety education programs are well-established and comprehensive. This disconnect between actual accident rates and perceived safety suggests that workers may have become accustomed to certain risk levels or that the accidents, while frequent, are perceived as minor or manageable. The high level of safety awareness and training completion rates demonstrates that the foundation for a strong safety culture exists, but there may be gaps between knowledge and practical implementation of safety measures.

The study identifies critical areas requiring immediate intervention, particularly in accident reporting practices and safety drill consistency. The finding that 46.9% of respondents rarely report accidents is particularly concerning, as it suggests significant underreporting that could mask the true extent of safety issues and prevent proper risk assessment, this strongly agrees with the study of Davies & Tomasin (2016) and Massey & Walford (2020) who linked poor safety culture and leadership neglect to low incident disclosure. The variation in safety drill frequency, with 35.9% conducting monthly drills but 31.3% only conducting annual drills and 9.4% never conducting drills, indicates inconsistent safety preparedness across different work areas or shifts, this is in line with the study conducted by Cooper & Phillips (2004) and Lingard (2002).

CONCLUSION

To address these challenges, the organization should prioritize improving basic infrastructure maintenance to prevent slips and falls, establish mandatory accident reporting protocols with clear consequences for non-compliance, standardize safety drill frequencies across all operations, and implement targeted interventions for contract workers to ensure they receive equivalent safety training and support as permanent employees. The combination of a highly educated workforce with strong safety awareness provides an excellent foundation for implementing these improvements effectively.

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