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Evaluation of Occupational Health and Safety Management Systems of a Selected Oil & Gas Company in Nigeria

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Abstract
Implementation of occupational health and safety systems (OHSMS) affects the overall performance of organizations. This study thus examined the implementation of OHSMS in the oil and gas industry with responses from strategically selected 122 respondents from Ponticelli Nigeria Limited, Rivers State, Nigeria. The obtained responses were analysed using SPSS version 20. The findings of the study indicated that there exists some form of OHSMS in the organization, yet the implementation of the provisions of the system was not greatly felt by the workers. Also, the study found that with management implementing all the provisions of the OHSMS, workers are bound to improve their safety performance indicators which could have a multiplier effect on the overall safety performance of the organizations.
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1. Introduction

The Occupational Health and Safety Management System (OHSMS) is a result of a progression of thoughts and possible improvement by the International Labour Organization (ILO) in 2001. According to ILO, millions of individuals die from work related mishaps or business-related illnesses. Various examinations, for example, Fernández-Muñiz et al. (2008) show that the OHS based administration frameworks lessen mishaps and injury rates. According to Fernández-Muñiz et al. (2008), work related mishaps and dangerous working circumstances not just severely affect human asset but also harms the material, lessens the efficiency and decreases the inspiration of labourers.

Occupational Wellbeing and Safety Management System (OHSMS) is basic to wellbeing in working circumstances, and human element has a massive impact of execution of the administration framework. OHSMS was embraced as an instrument to guide nations, organizations, and establishments for the management of issues and concerns related to the safety of workers and the workplace during the First International Conference on Safety and Health at New York in 2001 (Phuspa et al., 2019). Also, OHSMS was adopted as a standard for addressing issues related to workplace hazards identification, management, and control. It is therefore important to consider OSH as a primary source of providing care for workers and the workplace across industries and especially in the oil and gas industry (Alremawi et al., 2018).

The extent to which OHSMS are implemented is a function of the degree of safety and health in any industry (Phuspa et al., 2019) and especially the oil and gas industry (Poh et al., 2018). It has become imperative that OHSMS be implemented in the sector that has to do with oil and gas due to the increasing number of accidents, injuries and fatalities recorded therefrom (Ehiaguina and Moda, 2020). While it noted that the oil & gas industry implements very sound OHSMS, accidents still occur. As such, insufficiently carrying out the systems in the industry exposes workers to numerous work-related hazards and work sites will continuously remain unsafe.

While some empirical studies on the effectiveness of OHSMS have been conducted, none have, to the best of our knowledge, addressed the state of OHSMS in the Nigerian oil and gas industry, with a particular focus on workers in River State. Also, there are no empirical examinations in the Nigerian context that examines the factors that

influence the implementation of OHSMS in the Nigerian oil and gas industry with specific focus on Rivers State. Thus, this paper focused on evaluation of occupational health and safety management systems among oil & gas servicing companies in Rivers State so as to ascertain the need to either improve or implement OHSMS frameworks in such organizations.

2. Materials and methods

2.1 Study area

This study was conducted in an oil and gas servicing company in Bonny Island, Rivers State, Nigeria. Ponticelli Nigeria Limited, one of the plant maintenance companies of the Nigeria LNG Limited Project Trains with over 2500 workers across various skills set, was selected as the company of examination. Characteristically, Bonny Island is home to numerous multinational international oil and gas companies with over 100, 000 workforce. It is one of the 23 local governments in Rivers State and is on the verge of the Atlantic Ocean.

2.2 Study population

The study targeted workers of Ponticelli Nigeria Limited, which includes, management, skilled and unskilled workforce. The number of workers was 2750.

2.3 Sampling Techniques

The study used stratified sampling method. First, the workers were classified into 4 main divisions. That is management/administrative, skilled, semi-skilled and unskilled. Since the skilled workers division has the majority of workers, it was classified into 9 job skills set. Other workers were then classified into 4 groups according to the nature of their work. These were office workers, labourers and general workers. General workers in this case were all those workers who did not fit in any of the above groups.

To ensure proper representation of the workers, the Gay and Diehl (1992) procedure was used. This process involved five steps. Firstly, was to define the population. For this study, the population was i25, 000. Next, the sample size for this study (350) was based on Krejcie and Morgan (1970) table for determining a sample size. This was followed by logically defining the clusters. The clusters for this study were all the oil and gas companies in Bonny Island.

An average number of population elements within the clusters was determined by dividing the population size (25, 000) by the number of clusters (79 companies), which gave 316 elements by cluster. The number of clusters was then determined by the sample size (350 workers) by the number of elements in a cluster (316). This was approximately 1 cluster. In essence, only one company was randomly selected and copies of questionnaire administered to all the elements.

2.4 Sample size determination

The sample size (288) was calculated using Fischer's method as shown in Equation (1).

$$n = \frac{z^2(p*q)}{d^2} \quad (1)$$

where n is the desired sample size, p is the given statistic for level of confidence (95%), q is calculated by subtracting p from 1 (1-p), and d is margin of precision (0.05). It was ensured that there was proportional gender balance in each category of the workers, and involved members of the management, skilled and unskilled workers.

2.5 Data collection

Data were collected through structured interviews with a range of workplace personnel, including senior managers, line managers and supervisors. Other subjects included safety and health representatives, safety and health committee members, and employees. The other instruments included structured self-administered questionnaire and checklist. Documents were examined on all aspects of safety and health where necessary, both as a source of information and to verify the interview data. In most cases, workplace inspections assisted the verification process and provided an opportunity to speak to employees. In a number of workplaces, further information on how safety and health management work in practice was gleaned from observing safety and health committees in action.

2.6 Data analysis

Data obtained were analysed using descriptive statistics including frequencies and percentages. Some data were analysed qualitatively using content analysis.

3. Results and discussion

3.1 Response irate

In all, 430 copies of questionnaire were distributed and 310 copies were retrieved from the respondents. This indicates a 72.1% response rate. Also, out of the 310 copies retrieved, 6 were wrongly completed and thus were discarded to avoid the non-response bias error (Bell et al., 2022).

This leaves the total number of usable copies of questionnaire to 304 (70.7%). The response irate for this study is considered quite adequate. In the same vein, the number of usable copies of questionnaire was also considered adequate for further analysis as it agrees with some underlying assumptions for data analysis. Firstly, the total number of usable copies of questionnaire agrees with Bartlett et al. (2001) suggestion that for an analysis related to regression, the sample size should be between five and ten times the number of independent variables. However, Halinski and Feldt (1970) opined that the more conservative figure of ten is preferred in order to avoid over fitting. The summary of the response irate is presented in Table 1.

Table 1: Questionnaire administration and retrieval

Questionnaire	Number	Percentage
Number administered	430	100%
Number retrieved	310	72.1%
Number analysed	304	70.7%

3.2 Respondents gender distribution

The result of gender distribution is shown in Table 2. The findings indicate that the respondents profile comprised more males (76.2 %) than females (23.8 %). The study also established that at significant level of r=0.01, there was weak positive correlation (r = 0.061) between gender and the duration of work (Table 3). However, there was strong negative (r= -0.054) correlation between those workers who suffered work related illness and the duration that they had worked at the company under investigation.

3.3 Category of workers

In order to determine how different categories of workers were exposed to hazards, the respondents were categorized into 4 groups. These were management/administrative staff, skilled workforce, semi-skilled and unskilled. Table 4 shows the distribution of various workers according to their categories.

Table 2: Gender distribution

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	93	76.2	76.2	76.2
	Female	29	23.8	23.8	100.0
	Total	122	100.0	100.0	

Table 3: Correlations between variables

Correlations

		Gender	Duration Worked	Illness
Gender	Pearson Correlation	1	-.073	.061
	Sig. (2-tailed)		.425	.503
	N	122	122	122
Duration worked	Pearson Correlation	-.073	1	.054
	Sig. (2-tailed)	.425		.555
	N	122	122	122
Illness	Pearson Correlation	.061	.054	1
	Sig. (2-tailed)	.503	.555	
	N	122	122	122

Table 4: Category of workers

Category	Males	Females
Management/administrative (n=9) 7.4%	4 (4%)	5 (22.7%)
Skilled (n=47) 38.5%	39 (39%)	8 (36.4%
Semi-Skilled (n=35) 28.7%	30 (30%)	5 (22.7%)
Unskilled (n=31) 25.4%	27 (27%)	4 (18.2)
Total = 122 (100%)	100 (82%)	22 (18)

3.4 Age distribution

Table 5 shows the age distribution of the respondents. Majority (32.9%) of the respondents were in age category of 30-34 years. Similarly, the National Bureau of Statistics report of 2010 shows that the highest age of employed professionals, technical and managerial workers fell within this same age bracket. This was followed by 24.1% of age category of 35-39 years, 20.7% ranging between 25-29 years, 11.3% ranging between 40-44 years and others as noted in Table 5. The age distribution was really inclusive, and thus the responses obtained could be relied upon to make study conclusions.

3.5 Marital status

The marital status of the respondents was checked in order to determine if it contributed to psychosocial hazards at the work place. Some hazards like psychosocial can be as a result of family issues rather than the work they were engaged in. Fig. 1 shows that majority of the respondents were married (64%), 22% were single, 8% were separated and 6% were divorced. This conformed to the findings on age bracket that most of the workers at Ponticelli Nigeria Limited were at their mid age and therefore married representing the highest percentage of the sample.

Table 5: Age distribution

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 20	4	1.3	1.3	1.3
	21-24	17	5.3	5.3	6.6
	25-29	66	20.7	20.7	27.3
	30-34	105	32.9	32.9	60.2
	35-39	77	24.1	24.1	84.3
	40-44	36	11.3	11.3	95.6
	45-49	10	3.1	3.1	98.7
	50 and above	4	1.3	1.3	100.0
	Total	319	100.0	100.0	

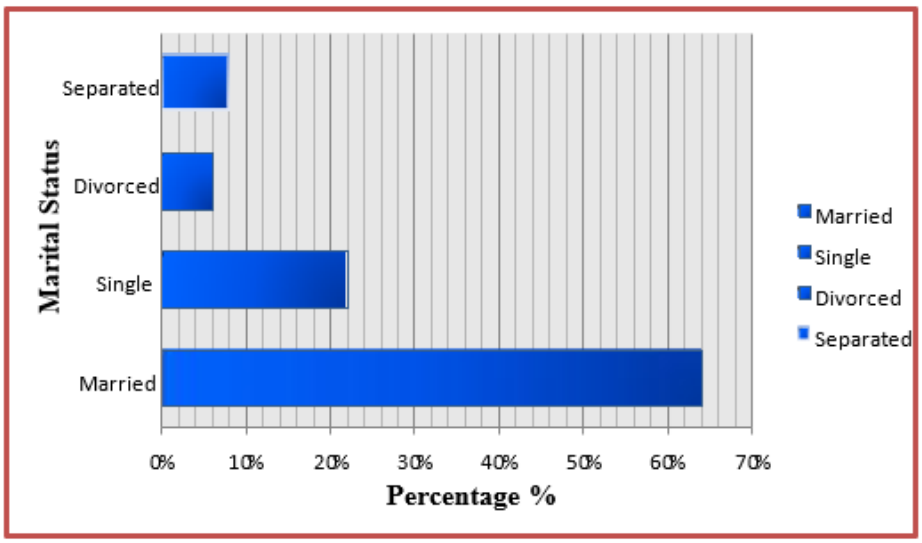

Fig. 1: Respondents' marital status

3.6 Sources of hazards

Fig. 2 shows the sources and types of hazards encountered in the oil and gas industry. The laboratory sector was the highest (20%) source of occupational hazards. These include chemical and biological laboratories, and service laboratories (like the hospital/site clinics). The second major source was construction and maintenance and repair (18%). The main activities that contributed to hazards from construction sites were during excavation and trenching. This finding correlates with observation made by the United States Bureau of Labour and Statistics (USBLS) which recorded 271 worker fatalities in trenching and cave-ins. Currently several construction activities are on-going due to the Train 7 Project. Office work was reported as the third highest with 15%. This can be explained by the fact that many of the workers at one point or the other have to use or visit the offices. The office work particulate matter from photocopiers, glare from unshielded computers, slips and falls, lack of ergonomic equipment and detergent used for cleaning the offices among others were the observed hazards. Some reported long working hours with no work shifts leading to monotony.

3.7 Types of hazards

Fig. 3 shows the different types of hazards identified and their proportion. The types of hazards identified include: chemical (32%), mechanical (23%), physical (13%), biological (11%), psycho-social (l5%) and ergonomics (16%). Chemicals were used as detergents to clean the floor, windows and working tables/ desks. Chemicals were used in teaching labs. Precautionary safety measures were taken by all workers handling chemicals. Mechanical hazards were identified at the mechanical department where all the repairs were carried out. A number of workers were not using PPEs, thus exposing them to risk of cuts, bruises, blisters, soft tissue injuries and even fractures. Physical hazards were identified among workers at the kitchen, recreational facilities where the temperatures were high, some offices had dim light and poorly ventilated. Biological hazards were identified mainly at two areas, namely the sanatorium where sick workers and students go for treatment, and overcrowded workspaces. Despite concerted effort to provide its workforce with proper and adequate working tools, the study identified ergonomic hazards. This contributed 16% of all the hazards encountered. Workers in some sections complained of low back pain (LBP) due to prolonged sitting and uncomfortable chairs.

The male technicians (20%) were more affected by the chemical hazards than their female counterparts (16.7%) as seen in Table 6. The explanation for this is because the number of male technicians is higher than that of female. On the other hand, female workers reported more incidences of mechanical hazard as compared to the male workers. Ergonomic hazards cuts across all the groups in almost equal proportions. This can be attributed to inadequate working environment. Many workers were improvising tools / equipment in order to achieve required results while others used un-ergonomic tools.

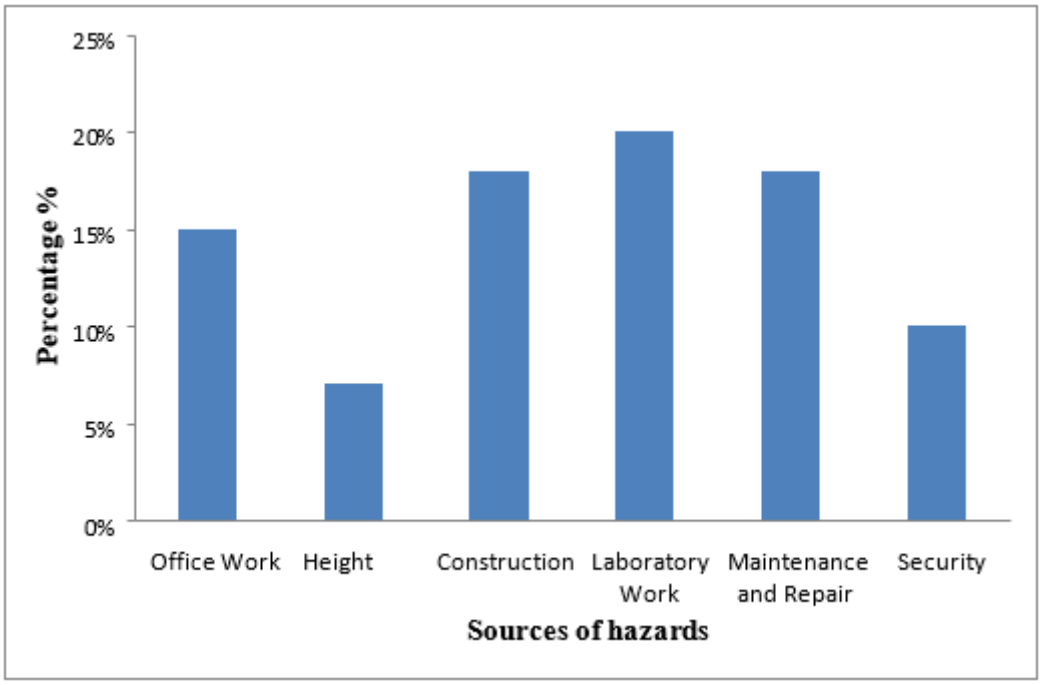

Fig. 2: Sources of hazards

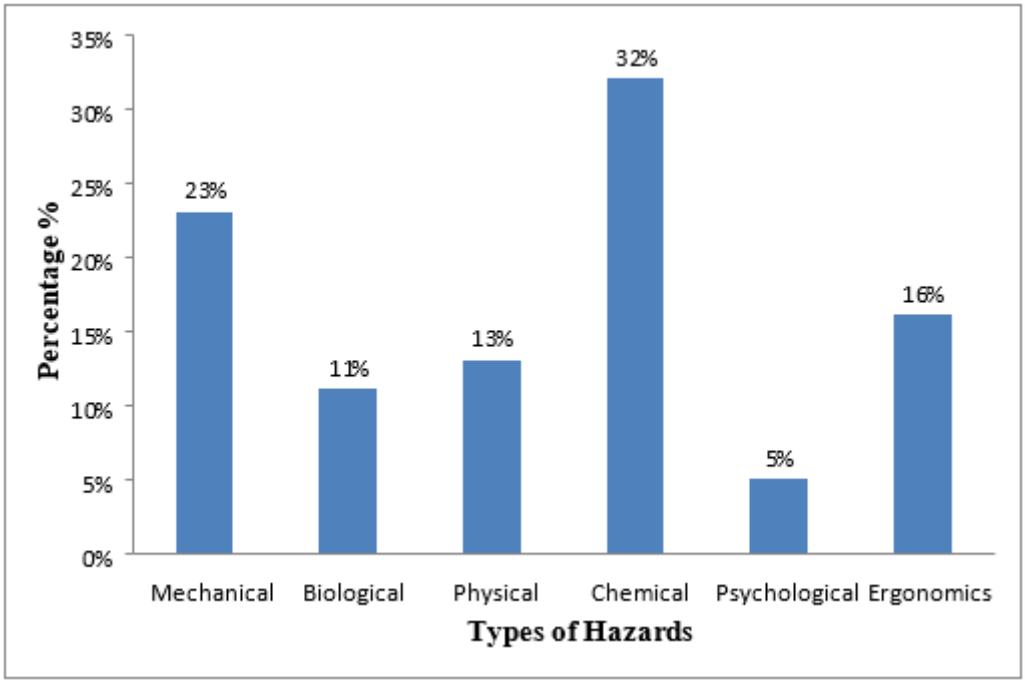

Fig. 3: Types of hazards

Table 6: Category of workers

	Teaching Staff		Office Workers		Technicians		General Workers	
Hazards	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
Mechanical in=59(21%)	2(3.4%)	3(5.0%)	0(0%)	3(5.0%)	13(2.2%)	16(27.1%)	9(15.4%)	13(22%)
Biological in=31 (11%)	0(0%)	0(0%)	3(9.7%)	5(16.1%)	7(18.9%)	4(12.9%)	5(16%)	7(18.9%)
Physical in=37 (13%)	2(5.5%)	6(16.2%)	4(10.8%)	7(18.9%)	3(8.1%)	4(10.8%)	6(11.2%)	5(13.5%)
Chemical in=90 (32%)	5(5.6%)	2(2.2%)	8(8.9%)	7(7.8%)	18(20%)	15(16.7%)	12(13.3%)	2(23.3%)
Psychosocial in=14(5%)	0(0%)	0(0%)	2(14.3%)	4(28.6%)	0(0%)	1(7.1%)	4 (38.6%)	3(21.4%)
Ergonomics in = (18%)	6(11.7%)	8(15.7%)	9(17.6%)	7(13.7%)	3(5.9)	6(11.8%)	5(9.8%)	6(18%)

3.8 Level of implementation of OSHMS

The level of implementation of occupational safety and health management systems at Ponticelli Nigeria Limited is as indicated in Fig. 4**.** This was done by determining the level of each component as required. Also, other undertakings including adequacy and efficiency of working tools, and working environment were investigated. The state of organizing component of OHSMS was at 60%, followed by 55% for implementation, and 50% and 30% being the level of planning and monitoring and evaluation, respectively. There was a safety and health committee in place but not well coordinated.

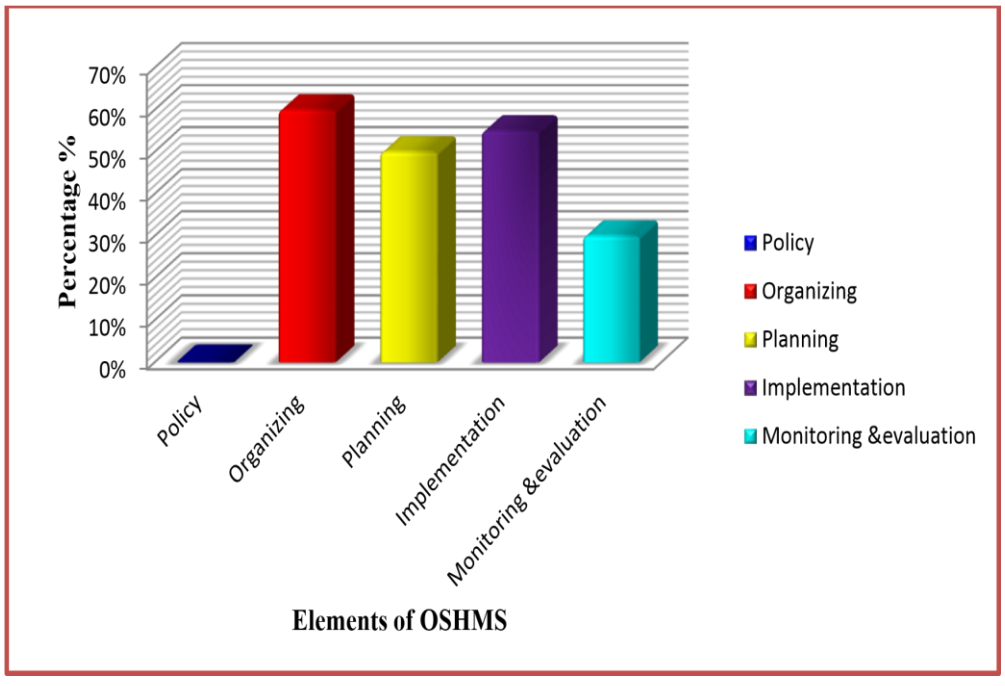

Fig. 4: Level of implementation of OSHMS

3.9 Adequacy of working machines, tools or equipment

Majority (68%) indicated that the working machines, tools or equipment were inadequate at their work site, while 32% indicated that there were adequate working tools and equipment at the workplace. Workers who did not have adequate machines, tools or equipment were forced to improvise with un-ergonomic tools or equipment and hence exposing them to mechanical hazards. As

the provision of the tools decreases the number of ailments at workplace increases.

3.10 Efficiency of machines, tools or equipment at workplace

Majority (54%) rated the efficiency of their working tools and equipment as good, 42% rated their working machines as fair, while only few 4% rated their working machines tools or equipment as excellent. The implementation of a decision to change ensures that all affected members of the organization are properly informed and trained in emergency prevention, preparedness and response, providing information to, and communication with, the relevant competent authorities, and the neighborhood and emergency response services; addressing first-aid and medical assistance, firefighting and evacuation of all people at the work site; providing relevant information and training to all members of the organization, at all levels, including regular exercises in emergency prevention, preparedness and response procedures (OSHA, i2007).

3.11 Rating of working environment

The employees' perception of their workplace environment as a motivating factor to their work was investigated. From the findings, majority (62%) rated their work environment to be good, 36% rated their work environment as fair, and only few (2%) rated their work environment as excellent. This implies that the institutional workplace environment is generally good according to the perception of the employees.

3.12 Factors affecting implementation of OHSMS

The factors that affected implementation of OHSMS of the studied company was determined. Majority (28%) indicated inadequate resources as the major hindrance to full implementation of OHSMS, 25% indicated limited knowledge on OSH requirement, 20% indicated inadequate financial support from the management, 14% indicated low awareness, and only 13% indicated few persons trained on OSH. This implies that resources, knowledge and support from the management are very crucial in the implementation of OHSMS. Resource allocation like resources and personnel for implementation of OSHMS are of importance. According to occupational safety and health administration report of 2007, all the workers are expected to know the safety and health requirements and comply with the law. Only i25% of the respondents were aware about these requirements. The level of those trained on aspects of OSH was also very low (13%). This causes low awareness (14%) of the safety and health measures at the workplace. The safety culture of the community was also low as some people were not concerned about their working environment, and attitude towards safety was negative. The focus was more ion worker's compensation than prevention and control of the hazards.

4. Conclusion

The findings from this study indicate that the level of implementation of Occupational Safety and Health Management system (OHSMS) as a tool for addressing hazards is relatively fair. This is attributed to the fact that there is inadequate allocation of resources for OSHM. Workers are exposed to several forms of hazards, including Mechanical (23%) also commonly affecting technicians, Biological (11%) Psychosocial (5%), Physical (13%), and Ergonomic (16%). The variation of employees' exposure to the different types and sources of hazards could be attributed to inadequate and unstructured manner in which OHSMS is implemented. The factors that led to this scenario were identified as inadequate resources, limited knowledge on OSH requirement, inadequate financial support from the management, low awareness, and few competent persons on OSH. Thus, it is concluded that resources, knowledge and support from the management are very crucial in the implementation of OHSMS in the oil and gas company.

References

Alremawi, M.S.A., Tambi, A.M.B.A. and Abdullah, A.A. (2018) Review of Previous Literature of Occupational Health and Safety (OSH) Factors Affecting Employees Performance. American Based Research Journal, 7(02). Available at https://ssrn.com/abstract=3577638

Bartlett, J.E., Kotrlik, J.W. and Higgins, C.C. (2001) Organizational Research: Determining Appropriate sample Size in Survey Research. Information Technology, Learning, and Performance Journal, 19(1): 43-50.

Bell, E., Bryman, A. and Harley, B. (2022) Business research methods. Oxford university press.

Ehiaguina, E. and Moda, H. (2020). Improving the safety performance of workers by assessing the impact of safety culture on workers' safety behaviour in Nigeria oil and gas industry: A pilot

study in the Niger Delta region. International Journal of Medical and Health Sciences, 14(6): 152-156.

Fernández-Muñiz, B., Montes-Peón, J.M. and Vázquez-Ordás, C.J. (2009) Relation between occupational safety management and firm performance. Safety science, 47(7): 980-991.

Gay, L. and Diehl, P. (1992) Research methods for business and management: Macmillan Coll Div.

Hair Jr, J.F., Howard, M.C. and Nitzl, C. (2020) Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. Journal of business research, 109: 101-110.

Halinski, R.S. and Feldt, L.S. (1970) The selection of variables in multiple regression analysis. Journal of Educational Measurement 7: 151–57.

Krejcie, R.V. and Morgan, D.W. (1970) Determining sample size for research activities. Educational and psychological measurement, 30(3): 607-610.

Moon, J. (2022) Missed reporting of nonfatal occupational injuries: estimation using the International Labor Organization datasets. International archives of occupational and environmental health, 95(6): 1343-1356.

Okeke, U.K., Nwaichi, E.O. and Ugbebor, J.N. (2021) Occupational Health and Safety Management System and Organizational Performance in Selected Industries in Cross River State, Nigeria. Journal of Engineering Research and Reports, 20(7): 1-11.

Phuspa, S., Rachmawati, A., Kamaluddin, I., Bakri, W. and Trisnani, A. (2019) Implications of Indonesian Occupational Health and Safety Management System Award to the Safety Culture. In Proceedings of the 1st International Conference on Business, Law and Pedagogy, ICBLP 2019. European Alliance for Innovation (EAI).

Pisu, A., Elia, N., Pompianu, L., Barchi, F., Acquaviva, A. and Carta, S. (2024) Enhancing workplace safety: A flexible approach for personal protective equipment monitoring. Expert Systems with Applications, 238, 122285.

Poh, C.Q., Ubeynarayana, C.U. and Goh, Y.M. (2018) Safety leading indicators for construction sites: A machine learning approach. Automation in construction, 93: 375-386.

Ramos, D., Afonso, P. and Rodrigues, M.A. (2020) Integrated management systems as a key facilitator of occupational health and safety risk management: A case study in a medium sized waste management firm. Journal of Cleaner Production, 262: 121346.

Sekaran, U. and Bougie, R. (2016) Research methods for business: a skill-building approach. 7th ed. Haddington: John Wiley & Sons.

Zhang, M., Shi, R. and Yang, Z. (2020) A critical review of vision-based occupational health and safety monitoring of construction site workers. Safety science, 126: 104658.