Evaluation of Workers Participation in Risk Assessment of Underwater Operations in the Oil and Gas Industry

Abstract

The study is a cross-sectional design assessment of workers participation in risk assessment of hazards associated with underwater operations in the Niger Delta. A sample size of 418 was computed through purposive sampling of employees from five oil and gas companies and questionnaires were administered with a response rate of 95.93%. Data analyses were carried out covering descriptive statistics, and crosstabulation. The result showed that there was significant relationship between the offshore workers participation in risk assessment and gender, χ^2 (1, N = 401) = 7.34, p = .007; there was significant relationship between the offshore workers participation in risk assessment and year of work experience, χ^2 (3, N = 401) = 22.00, p = .000. The result also showed that there was significant relationship between the offshore workers participation in risk assessment and educational status χ^2 (1, N = 401) = 22.16, p = .000. Significant relationship exists between workers participation in risk assessment and gender, workers participation in risk assessment and years of work experience, workers participation in risk assessment and educational status.

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Keywords: Risk Assessment matrix, Risk Analysis, Hazards, Risks, Underwater, Operations, Oil and Gas industry.

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1. Introduction

Globally, underwater oil and gas operations are very risky and dangerous with the environmental and economic impacts associated with the accidents arising from the operations usually massive and devastating. Underwater oil and gas activities have been accounting for a higher injury incident rate than other domains in the petroleum industry (Norazahar *et al*., 2014; Amir-Heidari *et al*., 2016; Cirimello *et al*. 2016; Strand and Lundteigen, 2016). In the years 2007 to 2012, the occupational

fatality rate of the oil and gas drilling industry was 2.5 times higher than the construction industry and 7 times higher than the general industry (Asad *et al*., 2018). Furthermore, there are many underlying risk factors involved leading to the high rate of underwater oil and gas fatalities, critical accidents and life-threatening injuries (Hassan *et al*., 2017; Asad *et al*, 2015).-

Underwater operations are carried out using a combination of several job tasks that include logistics for offshore mobilization, diving, pulling, lowering, lifting, dragging, cutting, welding among others. These job tasks require that risk assessments must be carried out to either approve or disapprove the operation. These risk assessments are usually carried out based on risk assessment matrix and involve subjective opinions and experience of participants and the workers on site. Furthermore, though standard risk assessment matrix is utilized to assess the risks, the ranking is not uniform when several of such Hazards Identification and Risk Assessments (HIRA) are reviewed.

The implication of this problem stated above is inconsistency in the output of the risk assessed and substandard controls or the controls recommended are not commensurate with identified risk leading to incidents. Equally, same job types handled by different team of workers will have different risks ranking under the same hazards and risks conditions. These inconsistencies during underwater operations have resulted in team of workers approving a job task that should be disapproved or disapproving a job task that should be approved and thus, resulting to several incidents and accidents leading to injuries, loss of man hours and lots of economic impacts on the companies, workers, and environment.

Statistics show that one worker dies every 15 seconds from work-related incident, and 153 workers have a work related accident. In addition about 6,300 people pass away daily as a result of work-related incidents or work-related ill-health (El Bouti and Allouch, 2018). These work accidents affect negatively both the company performance and bottom-line as well as the economic growth (Hämäläinen *et al*., 2006). The above-mentioned figures related to the occupational accidents and diseases which are reported and recorded globally do not reflect the real safety record situation of most companies, since there are cases of underreporting, especially in developing countries like Nigeria. Therefore, the real figures are likely far higher than the current recorded ones (Nenonen *et al*., 2010), a few catastrophic cases of these incidents receive public attention (Hämäläinen et al., 2006; ILO, 2014). The figures above indicate the scale of the problem when health and safety is not properly managed; the pain and suffering that is experienced by workers who simply go to work to earn their living. The negative impacts affect not only the victims, but also on their dependents, families, and friends. In order to prevent or reduce these impacts, a risk assessment must be carried

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out with a clear balance, consistency and outcome fit for purpose. This means an optimum risk assessment team should be formed that is a mix of gender, experience and education in line with ISO 45001:2018, Section 5.4. The Section requires and organization to establish, implement and maintain a process(es) for workers participation at all applicable levels and "functions in the development, planning, implementation, performance evaluation and actions for improvement of the OH&S management system." Brown, *et al.* (2021), Hitchcock, J.I (2001) have reported the differences in risk perception between females and males which should be utilized for effective and adequate risk assessments.

An adequate risk assessment is important to identify, analyze and put appropriate controls in place to avoid or mitigate incidents and this requires workers to perform such assessment. These workers are divers in terms of gender, work experience and educational status (Maratha, et al., 2017). While their studies were largely not related to risk assessments related to underwater operations, there is need to research the relationship and availability of these groups to participate in risk assessment related to underwater oil and gas operations. This research considered the relationship between marital status, gender, work experience and educational status and participation in risk assessment.

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2. Materials and Methods

2.1 Study Area

Niger Delta occupies the Gulf of Guinea continental margin in equatorial West Africa, between latitudes 4° and 6° N and longitudes 5° and 8° E (Reijers *et al.*, 1997) as show in Map 1. The region shares boundary with Ogun, Osun, Ekiti, Kogi, Anambra, Enugu and Ebonyi states. The Niger Delta is host to Nigeria's huge deposits of oil and gas. This well-endowed ecosystem, which contains high concentrations of biodiversity on the planet, in addition to supporting the abundant flora and fauna, arable terrain that can sustain a wide variety of crops and economic trees, has more species of freshwater fish than any ecosystem in West Africa. Nigeria oil & gas reserves are situated in the region, contributing to 90% of government revenue.

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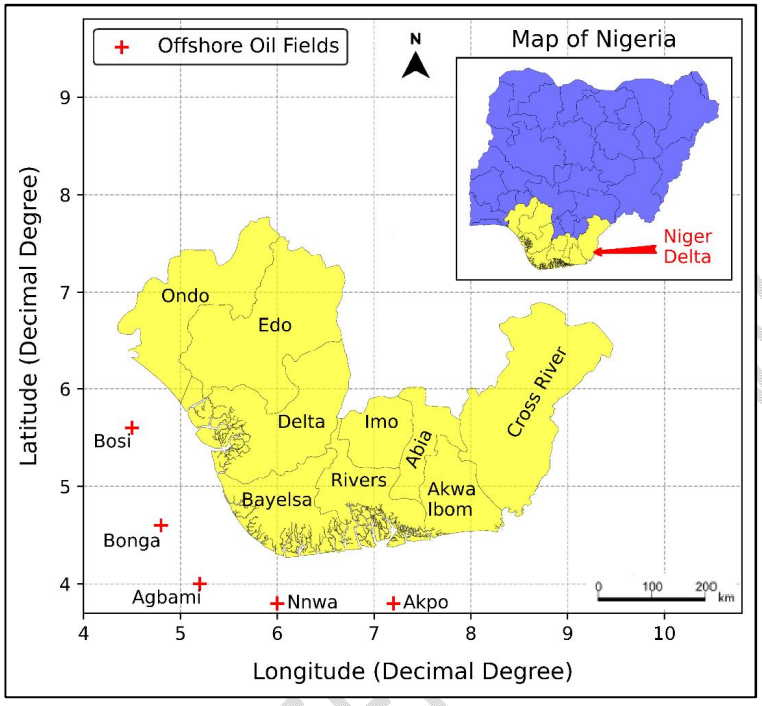

Source: Map developed using ESRI ArcGIS

Map 1: Map of study area showing some offshore oilfields

2.2 Research Design

Due to the need to obtain research findings that are representative and can be generalized, a cross-sectional research design was adopted. Cross-sectional study design is a type of observational study design where the investigator measures the cause and effect in a study population at the same time (Setia, 2016).

2.3 Sample and Sampling Technique

The total number of employees considered after factoring in the attrition rate was 7500 workers in five selected oil and gas companies that are involved in offshore or underwater oil and gas related operations in the Niger Delta. This study adopted a purposive sampling technique, a type of non-probability sampling method where the sample is taken from a group of relevant people easy to contact or to reach.

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Sample size was determined using Equation (1) (Taro-Yamane (1967)

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

where, n is sample size, N is population size (7500) and e^2 is degree of precision at 5% (0.05)

thus, $n = \frac{7500}{1+7500(0.05^2)} = 379.75 \approx 380$

For this study, 418 copies of questionnaire were distributed after estimation of the attrition rate.

2.4 Data Collection and Quality Control

The template and structure of the questionnaire were adopted from ISO 19900, ISO 19901-2, ISO 19904, ISO 19905-1 and industry Hazards Identification and Risk Assessment (HIRA) level 2. The questionnaire had three (3) sections namely, sections A, B, and C. Section A contained information on socio-demographic data/occupational history. Section B contained items on the likelihood of underwater hazards, frequency or occurrence of hazards, and severity of hazards. Section C contained information on the consequences of the hazards.

An official letter was addressed to respective management in the various studied facility seeking their consent before undertaking the data collection process. Confidentially was assured to the managements regarding the information from respondents/participants.

2.5 Data Analysis

Data from the questionnaire received from respondents were transcribed into Excel sheet and then transferred to XLSTAT version 17. Demographic analysis of the respondents was done using frequency analysis and percentage of proportion. Cross tabulation was used to understand the relationship Workers Participation in Risk Assessment of Underwater Operations in the Oil and Gas Industry. Thereafter, Chi-square test of independence was used in evaluating if the relationship observed in the cross-tabulation just exist in the sample dataset or if it exists in the population. Correspondence analysis was done to understand whether national or multinational company staff participated more in risk assessment. The frequency analysis and correspondence analysis were

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carried out using Microsoft XLSTAT version 17 while both the Cross-tabulation and Chi-square test of independence was done using SPSS version 26

3. Results

The result of the demographic analysis is presented in Figure 1. Results in Figure 1a showed that more males participated in the study with 91.02% as against 8.98% female participation from the total population of underwater operations personnel that participated in the study. In the area of work experience, the result shown in Figure 1d has 40.4% of the participants have more than 15 years' experience. Those with 1-5 years, 6-10 years and 11-15 years' experience made up 4.2%, 22.94% and 32.42% respectively. 95.5% of the participants as presented in Figure 1c have tertiary education. The result from Figure 1b showed that most of the participants were between the ages of 40-44 years, as 37.66% of the total respondents fell into this group.

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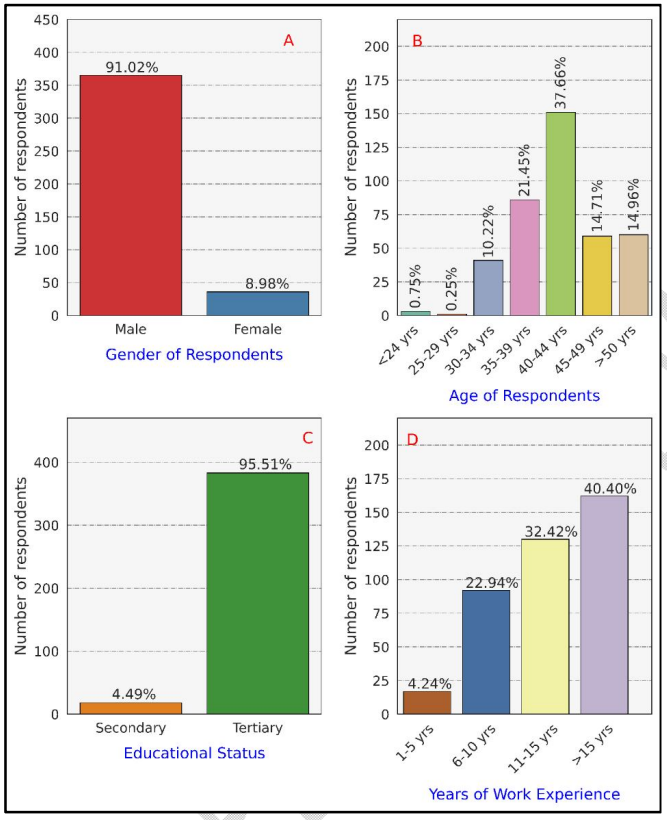

Figure 1: Demography of respondents

Comment [A14]: Distribution of respondents according to demography

3.1 Cross-Tabulation of Underwater Workers Participation in Risk Assessment and Gender

Hypothesis 1

H_{01}: There is no relationship between underwater workers participation in risk assessment and gender of workers

The cross-tabulation relating respondents' participation in risk assessment and gender is presented in Table 1. From the result, it can be observed that male underwater workers have participated more in risk assessment than female workers. The Table shows that 351 out of 365 male respondents indicated that they have participated in risk assessment which accounted for 96.2% of male offshore workers that have participated in risk assessment while 14 out of 365 male respondents indicated that they have never participated in risk assessment which accounted for 3.8% of the male respondents that indicated that they have not participated in risk assessment. The result from Table 1

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also shows that 31 out of 36 female respondents indicated that they have participated in risk assessment which accounted for 86.1% of female offshore workers that have participated in risk assessment while just 5 out of the 36 female workers indicated that they have never participated in risk assessment which accounted for 13.9% of the female offshore workers that indicated that they have not participated in risk assessment.

The chi-square test of independence was performed to assess the validity of the relationship between offshore workers participation in risk assessment and gender and the result is presented in Table 2. The result from Table 2 shows that there is significant relationship between underwater workers participation in risk assessment and gender $\chi^2(1, N = 401) = 7.337$, $p = .007$, which provides strong evidence that there is a relationship between underwater workers participation in risk assessment and gender.

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Table 1: Relationship between offshore workers participation in risk assessment and gender

Gender		During the course of my work		
		I participated in a risk assessment	I have never participated in a risk assessment	Total
Male	Count	351	14	365
	% Within Gender	96.2%	3.8%	100.0%
	% of Total	87.5%	3.5%	91.0%
Female	Count	31	5	36
	% Within Gender	86.1%	13.9%	100.0%
	% of Total	7.7%	1.2%	9.0%
Total	Count	382	19	401
	% Within Gender	95.3%	4.7%	100.0%
	% of Total	95.3%	4.7%	100.0%

Table 2: Chi-square showing the relationship between underwater workers participation in risk assessment and gender of workers.

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Comment [A23]: Identification of relationship between underwater workers participation in risk assessment and gender of workers by chi-square test

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.337[a]	1	.007		
Continuity Correction[b]	5.279	1	.022		
Likelihood Ratio	5.196	1	.023		
Fisher's Exact Test				.020	.020
Linear-by-Linear Association	7.319	1	.007		
N of Valid Cases	401				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 1.71.
b. Computed only for a 2x2 table

3.2 Cross-Tabulation of Underwater Workers Participation in Risk Assessment and Years of Work Experience

Hypothesis 2

H_{02}: There is no relationship between underwater workers participation in risk assessment and years of work experience.

The cross-tabulation showing the relationship between underwater workers participation in risk assessment and years of working experience is shown in Table 3. Table 3 shows that there was a linear relationship between the workers participation in risk assessment and years of work experience. It was observed that the more years of work experience workers had, the more they must have participated in risk assessment. The result shows that all underwater operators with more than 15 years of work experience have participated in risk assessment before. A total of 162 workers with more than 15 years of work experience indicated that they have participated in risk assessment. A total of 14 workers with 1-5 years of work experience indicated that they have participated in risk assessment, which accounted for 82.4% of workers with 1-5 years of work experience. A total of 82 offshore workers with 6-10 years of work experience indicated that they have participated in risk assessment, which accounted for 89.1% of offshore workers with 6-10 years of work experience. A total of 124 offshore workers with 11-15 years of work experience indicated that they have participated in risk assessment, which accounted for 95.4% of workers with 11-15 years of work experience.

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The chi-square test of independence was performed to assess the validity of the relationship between underwater workers participation in risk assessment and years of work experience, and the result is

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presented in Table 4. The result from Table 4 shows that there is significant relationship between underwater workers participation in risk assessment and year of work experience, χ^2 (3, N = 401) = 22.00, p = .000, which provides strong evidence that there is a relationship between underwater workers participation in risk assessment and year of work experience. The result indicates that the more years of experience of the workers, the more they are likely to have participated in risk assessment.

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Table 3: Relationship between underwater workers participation in risk assessment and year of work experience.

Years of work experience			During the course of my work		
			I participated in a risk assessment	I have never participated in a risk assessment	Total
Years of Work Experience	1 - 5 years	Count	14	3	17
		% within Years of Work Experience	82.4%	17.6%	100.0%
		% of Total	3.5%	0.7%	4.2%

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6 - 10 years	Count	82	10	92
	% within Years of Work Experience	89.1%	10.9%	100.0%
	% of Total	20.4%	2.5%	22.9%
11 - 15 years	Count	124	6	130
	% within Years of Work Experience	95.4%	4.6%	100.0%
	% of Total	30.9%	1.5%	32.4%
> 15 years	Count	162	0	162
	% within Years of Work Experience	100.0%	0.0%	100.0%
	% of Total	40.4%	0.0%	40.4%
Total	Count	382	19	401
	% within Years of Work Experience	95.3%	4.7%	100.0%
	% of Total	95.3%	4.7%	100.0%

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Follow some standard journal for arrangement of Table

Table 4: Chi-square showing the relationship between offshore workers participation in risk assessment and years of work experience

Comment [A29]: Identification of relationship between offshore workers participation in risk assessment and years of work experience by chi-square test

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	22.001[a]	3	.000
Likelihood Ratio	25.240	3	.000
Linear-by-Linear Association	21.734	1	.000
N of Valid Cases	401		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is .81.

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3.3 Cross-Tabulation of Underwater Workers Participation in Risk Assessment and Educational Status

Hypothesis 3

H_{03}: There is no relationship between underwater workers participation in risk assessment and educational status

The cross-tabulation showing the relationship between underwater workers participation in risk assessment and educational status is shown in Table 5. The result shows that more underwater workers with higher educational status have participated in risk assessment than workers with lower educational status. Table 5 shows that 369 out of 384 respondents with tertiary education indicated that they have participated in risk assessment which accounted for 96.3%, while 14 out of 384

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respondents with tertiary education have never participated in risk assessment which accounted for 3.7% of the respondents with some form of tertiary degree. The result also shows that 13 out of the 18 respondents with secondary school education indicated that they have participated in risk assessment which accounted for 72.2% of workers that attended secondary school, while 5 out of the 18 respondents with secondary school education indicated that they have never participated in risk assessment before which accounted for 27.8% of the workers with secondary school degree in the total population.

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The chi-square test of independence was performed to assess the validity of the relationship between underwater workers participation in risk assessment and educational status, and the result is presented in Table 6. Result shows that there is significant relationship between workers participation in risk assessment and educational status χ^2 (1, N = 401) = 22.16, p = .000, which provides strong evidence that there is a relationship between offshore workers participation in risk assessment and education status. The result indicated that education of underwater operators plays a major role in worker's willingness to participate in risk assessment.

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Table 5: Relationship between offshore workers participation in risk assessment and educational status

Educational status		During the course of my work		
		I participated in a risk assessment	I have never participated in a risk assessment	Total
Secondary	Count	13	5	18
	% within Educational Status	72.2%	27.8%	100.0%
	% of Total	3.2%	1.2%	4.5%

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	Tertiary	Count	369	14	383
		% within Educational Status	96.3%	3.7%	100.0%
		% of Total	92.0%	3.5%	95.5%
Total		Count	382	19	401
		% within Educational Status	95.3%	4.7%	100.0%
		% of Total	95.3%	4.7%	100.0%

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Follow some standard journal for arrangement of Table

Table 6: Chi-square showing the relationship between offshore workers participation in risk assessment and educational status.

Comment [A38]: Identification of relationship between offshore workers participation in risk assessment and educational status by chi-square test

	Value	Df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	22.164[a]	1	.000		
Continuity Correction[b]	17.141	1	.000		
Likelihood Ratio	11.563	1	.001		
Fisher's Exact Test				.001	.001
Linear-by-Linear Association	22.108	1	.000		
N of Valid Cases	401				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is .85.
b. Computed only for a 2x2 table

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3.4 Relationship between worker participation in risk assessment and company type

The relationship of the correspondence analysis showing the relationship between worker participation in risk assessment and company type is shown in Figure 2. The result from Figure 2 showed that multinational oil and gas workers participated more in risk assessment than national/Local oil and gas work workers.

The chi-square test of independence result presented in Table 7 showed that there was no significance difference in the participation in risk assessment between the multinational and national oil and gas company workers χ^2 (1, N = 401) = 0.163, p = 0.686. The result from the chi-square test of independence provides strong evidence in stating that multinational oil and gas company workers do not significantly participate in risk assessment more than the national oil and gas workers. The result showed that participation in risk assessment in considered serious in the oil and gas industry irrespective of location of the oil and gas company.

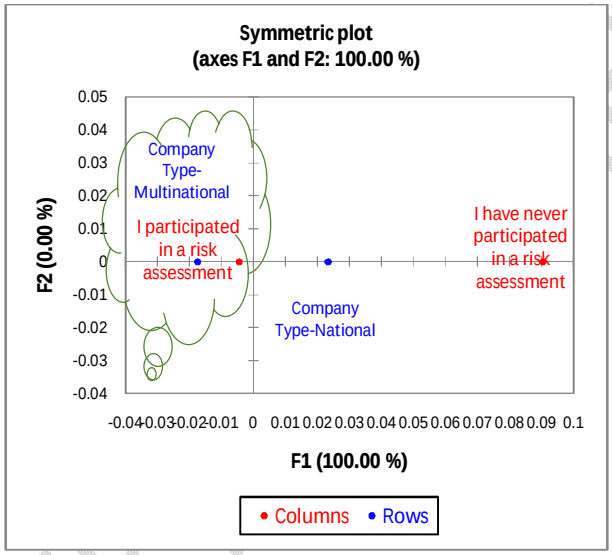

Figure 2: Correspondence Analysis of company participation in Risk Assessment

Table 7: Chi-Square test of Independent for company participation in risk assessment

Chi-square (Observed value)	0.163
Chi-square (Critical value)	3.841
DF	1
p-value	0.686
alpha	0.05

4. Discussion

4.1 **Worker's Participation in Risk Assessment**

The result of 401 underwater operators that responded to the research questionnaire showed an overall response of 382 operators who indicated that they have participated in risk assessment before

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which is 95.3% of the total responses. The result gives an insight into the participation of personnel in risk assessment, a recognition of the need to manage hazards in underwater operations and prevent their release through and early identification of the risks and control measures. Their participation is in line with Clause 5.4 of ISO45001:2018 which requires an organization to develop a process for workers to participate 'in the development, planning, implementation, performance evaluation and actions for improvement of the OH&S management system." In order to realize the intended objective of developing an effective risk assessment using the risk assessment matrix, Team diversity is important as each member brings individual contributions based on own competences and circumstances no matter how insignificant.

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4.2 Demographic Variable: Married and Unmarried Workers

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The demography result of participants in respect to marital status showed that more offshore workers were married. A total of 368 out of the 401 offshore workers indicated that they were married which accounted for 91.77% of the total respondents. A total of 33 out of the 401 offshore workers indicated that they were not married which accounted for 8.23% of the total respondents. The high percentage of offshore workers that are married could be attributed to the fact that most offshore workers are financially stable to take on the financial responsibilities that come with marriage. Secondly, a common industry slogan for safety is for workers to "work safely and return home to their families safely". Because more married workers participated in the research, it is believed that their safety consciousness and behaviors is driven by the desire to returning home safely to their families hence they would be more committed and critically carry out risk assessments relating to their work as a means to preventing accidents from happening. Oil and Gas organizations will benefit from ensuring this section of workforce being part of workers participating as team members of a risk assessment in the oil and gas.

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4.3 **Safety and Gender**

The result also showed that majority of offshore workers are fully aware of the hazards present in underwater operations and the possible consequences likely to be faced should these hazards be released. 351 out of 365 male respondents indicated that they have participated in risk assessment which accounted for 96.2% of male offshore workers that have participated in risk assessment, while 31 out of 36 female respondents indicated that they have participated in risk assessment which accounted for 86.1% of female offshore workers that have participated in risk assessment. The result from the study showed that there was a significant relationship between the offshore workers

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participation in risk assessment and gender χ^2 (1, N = 401) = 7.34, p = .007, which provides sufficient evidence that there is a relationship between offshore workers participation in risk assessment and gender. The result indicated that male offshore workers are more likely to participate in risk assessment than female offshore workers. This can be attributed to having more male workers in the oil and gas industry than females (Women's Human Rights Report, 2019). The study did not separately investigate how females and males perceived the risk of working offshore, several studies have shown that it is important that both genders participate in risk assessments as each gender has a unique contribution based on their different levels of unease. In their study of the impact of gender on risk perception and the implications for EU member states' national risk assessment processes, Brown, *et al.* (2021) found that "females judged involuntary risks as being more likely, having a greater impact, or being higher overall risk rating than their male counterparts." Even then, when it came to rating the impact of fire, the pattern did not apply. Hitchcock, J.I (2001), quoting Davidson and Freudenburg's review of 75 studies which analyzed gender differences in rating environmental and safety risks concluded that women more often rate these risk as being more concerning than men. For example, it was shown that women are more apt to express greater concern over "local facilities and/or nuclear and other technologies that are often seen as posing risks of contamination." While 'risks tend to be judged lower by men than by women, Finucane, M.L. *et al.* (2000) explained that the difference observed in the population studied in the United States is in terms of sociopolitical factors rather than biological factors. It can be safely concluded that the role of women in risk perception is important and must not be neglected when constituting a risk assessment Team. m

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4.4 Safety and Work Experience

Furthermore, the findings from the study showed that there was significant relationship between offshore workers participation in risk assessment and years of work experience χ^2 (3, N = 401) = 22.00, p = .000, which provides strong evidence that there is a relationship between offshore workers participation in risk assessment and years of work experience. The result indicates that the more years of experience, the more workers are likely to have participated in risk assessment. The industry needs to leverage on the strength of the result and this group of the workforce to achieve integrity of the risk assessments to be carried out and applied. Bradford, W (2012) reported that "the high-risk environments of the Oil and Gas industry can make for a pretty unforgiving workplace for the inexperienced worker, with the possibility for small mistakes to multiply into huge and disastrous consequences." Leaving risk assessments with a Team of inexperienced workforce in the industry

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will have consequences which have to be avoided. In addition, the more years of work with a strong participation in risk assessment gives the confidence that their conclusions as shown in this survey are correct, can be relied on and be used in setting the standards in the risk assessment. This agrees with Boix, P and Vogel, L (1999) that workers' experiences are fundamental to enabling strategies for the improvement of health. Their experiences can be used when risk assessing and developing preventive and protective measures. Penrose, K. (2021) discussing the benefits of work experience noted that "experienced workers have increased self-understanding, maturity, independence and self-confidence." Having this category of personnel involved in underwater operations risk assessment is undoubtedly, beneficial in assuring the integrity of the outcome and controls. It is therefore important for more attention to be given to those with fewer years of experience to build their competences while ensuring full participation of experienced workers in carrying out underwater risk assessments as a means of preventing accidents among underwater operations workers.

Also, a significant relationship was observed between workers participation in risk assessment and educational status χ^2 (1, N = 401) = 22.16, p = .000, which provides strong evidence that there is a relationship between offshore workers participation in risk assessment and education status. More workers with tertiary education participated in the risk assessment. The result indicated that education of underwater operators plays a major role in worker's willingness to participate in risk assessment. The oil and gas industry relies mostly on the workforce with tertiary education qualification as this group of people can demonstrate better technical knowledge of the industry. Maratha, et al (2017) reported a statistically significant relationship between education, number of years worked among others with the level of knowledge on occupational health hazards. The results therefore, provide an indication of the reliability of the outcome of risk assessments to be carried out involving this category of workers. They know exactly what risk assessment is and the impact of a poor risk assessment.

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4.5 **Comparative analysis of National/Local and Multi-national Companies on Safety Participation**

Another outcome of research showed that while more workers of multinational companies participated in risk assessment compared to workers of national companies carrying out underwater operational activities, the chi-square test of independence result showed that there was no significance difference in the participation in risk assessment between the multinational and national oil and gas company workers χ^2 (1, N = 401) = 0.163, p = 0.686. The result from the chi-square test of independence provides strong evidence in stating that multinational oil and gas company workers

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do not significantly participate in risk assessment more than the national oil and gas workers. The result showed that participation in risk assessment is considered serious in the oil and gas industry irrespective of location of the oil and gas company. The drive for this may be attributable to leaning from incidents, reported losses due to accidents in the sector (El Bouti and Allouch, 2018) and stringent regulations guiding the Nigerian oil and gas industry especially offshore operations. For example, the Mineral Oil Safety Regulations (MOSR), 1997 licensee or lessee to carry out a comprehensive risk analysis of the projects in accordance with API recommended practices including other internationally accepted procedures. The regulation also requires to be put in place a "scheme for risk analysis, system for implementation and follow up of result" while laying out the requirement for Offshore Management System. As part of Worker Safety Reporting, MOSR (1997) places the responsibility for ensuring sufficient safety and risk awareness training and certification to workers prior to deployment to offshore on the Manager. The goal is to prevent injuries. It may be safe to say therefore that regulations has been a useful tool in ensuring that both International and National Oil and Gas companies involved in underwater operations carryout risk assessments as part of operations. The culture of participating in risk assessments in underwater oil and gas operations irrespective of the type of company is important in preventing accidents with their consequential outcomes.

5. Conclusion

The result showed that there was significant relationship between the offshore workers participation in risk assessment and gender. This provides sufficient evidence that there is a relationship between offshore workers participation in risk assessment and gender. It also showed that there was significant relationship between offshore workers participation in risk assessment and years of work experience. Again, this provides strong evidence that there is a relationship between offshore workers participation in risk assessment and years of work experience.

Furthermore, the study showed that there was significant relationship between offshore workers participation in risk assessment and educational status, which provide strong evidence that there is a relationship between offshore workers participation in risk assessment and education status. Each group has significant contributions which organizations have to utilize in setting up underwater risk assessment teams as may be required. A good mix will provide for an effective identification of hazards and mitigation measures thus preventing incidents with their negative consequences on personnel, assets, environment and company reputation.

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There was not significant relationship between multinational oil and gas company workers involved in underwater operations participating in risk assessments and national company workers participating in risk assessment.

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