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Full Length Research

AWARENESS OF OFFSHORE WORKERS IN SELECTED OIL AND GAS COMPANIES IN NIGER-DELTA, NIGERIA

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This study is an exploratory study aimed at assessing the level of fire safety awareness of workers in selected oil and gas companies operating within the Niger – Delta region of Nigeria. The population of this study consisted of workers from three International Oil and gas Companies (IOCs) and three National Oil and gas Companies (NOCs). Random and purposive sampling techniques were applied in data collection. The major instrument employed for effective data collection were questionnaires. The methodologies employed for data analyses were Kolmogorov-Smirnov (KS) distribution test, Normality test, and Kendal's w-statistic with XLSTAT 2016 version 4.6 as computer statistical tool to aid in data analyses. The resultant output from the application of Kolmogorov-Smirnov (KS) distribution test presented different distributions but with slight resemblance in general safety culture between workers in IOCs and NOCs with respect fire safety on offshore platforms. In conclusion, Kendal's w-statistic revealed a low level of awareness (< 50%) in general of all the sampled workers for IOCs and NOCs when it has to do with their general attitude to safety drills and onboard communication. It is therefore, recommended that, "facility-specific" training and retraining of different platform workers on the fire hazards peculiar to their job description should be done in a simple and understandable language fit for their level of education.

Key Words: Assessment, Fire Safety, Offshore workers, Niger Delta, Kendall's w-statistic.

INTRODUCTION

The oil and gas industry is a major contributor to the Nigerian economy. Presently, it accounts for about 90% of the nation's federal revenue (Nwosu et al., 2006). This industry is presently dominated by foreign interests and core operations spanning exploration, drilling and production, well intervention and general services are controlled by International Oil Companies (IOC's), National Oil Companies (NOC's) and Local Contractors (LOCS). According to International Energy Agency report on energy consumption in 2010, oil and gas provides the world's population of about 7 billion about 90% of its daily energy needs. According to Mearns and Yule (2009), considering the nature of the oil and gas industry and the complexity of its operations described it as a high risk industry. The oil and gas industry involves the interaction of technical,

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organizational, managerial, environmental and human factors, fall out of which can lead to accidents Cullen (2011).

The fire incidences that have occurred in the recent past in the Niger Delta region include the Chevron Funiwa Oil field within Oil Mining lease (OML) 86 located approximately 10km offshore in water depths of 40feet. This was caused by failure of surface equipment during drilling operations that led to loss of well control. This fire lasted for 46 days, 152 workers were successfully evacuated while 3 persons were killed. Another fire incidence was at Tebidaba - Clough creek line, onshore oil pipeline in Bayelsa State, where twelve people lost their lives with several others injured (Eziukwu, 2015). On the 6th of April, 2016, another fire broke out at a Chevron gas facility in Escravos, Warri South-West Local Council Area claiming lives and injuring many. The cause of most of these fire incidence was owed to negligence, vandalism and poor fire safety awareness (Oteh et al., 2012; Ogbonna and Nwaogazie, 2015). The US Marine Municipal Association reported that, about 15% of fires result from equipment failure while 85% are caused by factors related to human behavior (RMS, 2004). This study is aimed at assessing the fire safety culture of IOC and NOC offshore workers within the Niger Delta Region of Nigeria.

MATERIALS AND METHODS

Study Area

The study area was limited to the Niger Delta Region of Nigeria. The Niger Delta region is situated in the Gulf of Guinea within Latitude 40^0N to 60^0N and Longitude 50^0E to 80^0E, (Opafunso, 2007). ERML (1997) defines the Niger Delta region (about 29,900 square kilometers) as comprising the area covered by the natural delta of the River Niger and the areas to the east and west, which also produce oil. Its approximate northern boundaries are located close to the bifurcation of the River Niger at Abe, while the western eastern boundaries are around the Benin River and Imo River respectively (Emoyan et al., 2008). It is located in the Atlantic coast of southern Nigeria where River Niger divides into various tributaries. It is the second largest Delta in the world with a coastline spanning about 450 kilometers terminating at the entrance into Imo River. It has been described as largest wetlands in Africa. This region is bound by about seven States namely: Rivers, Delta, Akwa-Ibom, Edo, Bayelsa, Ondo and Imo States and very recently Lagos State making the entrance. The study population are selected oil and gas companies, comprising of three International Oil Companies (IOCs) and three National Oil Companies (NOCs). The companies of interest with respect to this study are located within Rivers, Akwa-Ibom and Bayelsa States. All fall within 65-90km from the Gulf of Guinea. However, the offshore plants lie in the Gulf of Guinea stretch, though at varied locations as shown in Figure 1.

Data Collection

Data were collected using questionnaires, oral interviews and physical observations on the Training and Retraining (TRT); Fire Equipment and Installation (FEI); On-board Communication (OBC); Fire Emergency Response Practices (FER); Rig Design Layout (RDL); Human Behavioral Factors (HBF); Policies Standard and Compliance (PSC) of occupational safety and Drilling Rig Condition (DRC). The sample size estimation was with reference to Cochran (1963) as stated by Isreal (1992) was applied in this study. This is as presented in Equation 1;

$$n_o = \frac{Z^2 pq}{e^2} \quad (1)$$

Where n_o = sample size; Z = 1.96, which is the level of significance and corresponds to 95% confidence level; p = maximum variability in the population assumed to be aware of fire safety response; and q = 1- p. e = percentage level of precision (±5%)

For IOC and NOC, p was assumed to be 95%.

Therefore, sample size

$$n_o = \frac{1.96^2 \times 0.95 \times 0.05}{0.5^2} = 72.99 \approx 73$$

The above sample size was assumed as the minimum sample size for questionnaire distribution per company with respect to this study. Total questionnaire distributed with respect to this study were 570. Table 1 presents the questionnaire respondents' rate.

Data Analyses

The data generated were subjected to Kolmogorov-Smirnov (KS) distribution test at 5% significance level, Normality test, and Kendal's w-statistic. The

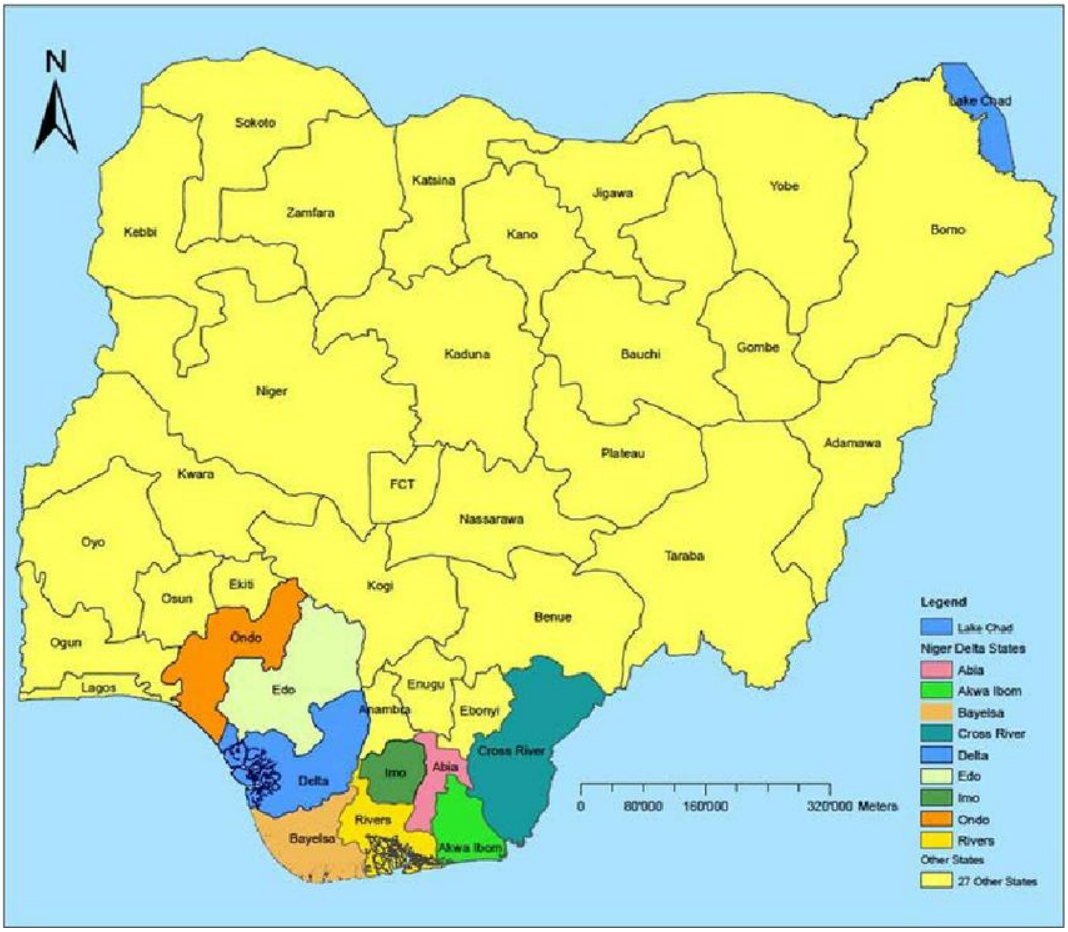


Figure 1. Map of Nigeria showing the Niger Delta region. **Source:** Aniefiok et al., 2013

Table 1. presents the questionnaire respondents' rate.

Company	IOC –A	NOC – A	IOC - B	NOC - B	IOC - C	NOC - C
Questionnaire Distributed	110	80	110	80	110	80
Questionnaire Retrieved	99	44	89	44	103	44
% Response	90	55	81	55	94	55

Two sample Kolmogorov-Smirnov distribution test applied was to check and test the hypothesis proposed by this study (see Appendix A). With the null and alternative hypotheses being:

H_0: The two samples follow the same distribution with regards to fire safety awareness and practices.

H_a: The distributions of the two samples are different with regards to fire safety awareness and practices.

The applied normality test was to aid the choice for analytical process to be applied for further data analyses (Parametric or non-parametric). XLSTAT 2016 version 4.6 was the statistical tool employed as aid for data analyses in this study. Furthermore, Kendall's w-statistic which is a non-parametric statistic usually employed to assess the agreement among raters was applied to assess the level of awareness between IOC and NOC workers with

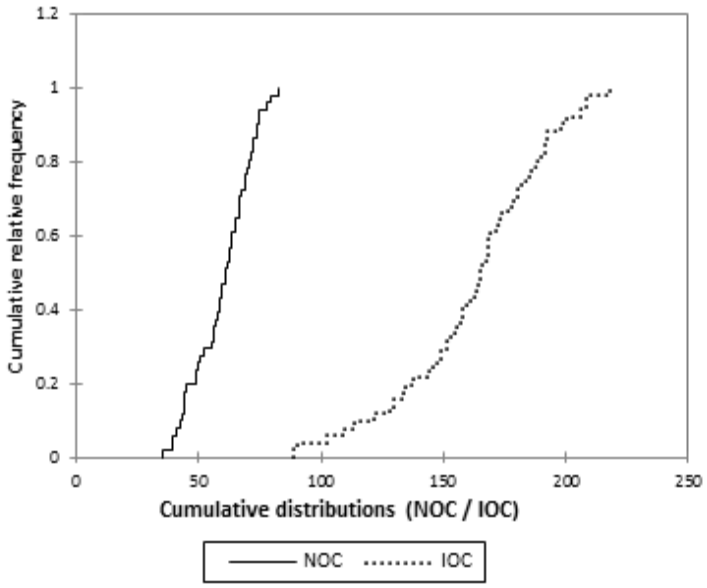


Figure 2. Comparison between sampled respondents (NOC versus IOC).

respect to fire safety practices and response. Its output (w, test statistic) ranges from zero which shows no agreement among the raters to unity which indicates complete agreement among the different raters. The intermediate values of w indicate high or low degree of unanimity among the respondents. The formulae employed in Kendall's coefficient of concordance (w) is given by Equations 1-4 (Ogbonna and Nwaogazie, 2015):

$$R_i = \sum_{j=1}^{m} r_{ij} \quad (2)$$

$$\overline{R} = \frac{1}{2} m(n+1) \quad (3)$$

$$S_d = \sum_{i=1}^{n} \left(R_i - \overline{R}\right)^2 \quad (4)$$

$$w = \frac{12 S_d}{m^2 n\left(n^2 - 1\right)} \quad (5)$$

where R_i = Total rank given to a parameter; $\overline{R}$ = mean value of the total ranks; S_d = sum of squared deviations; and w = Kendall's w – statistic.

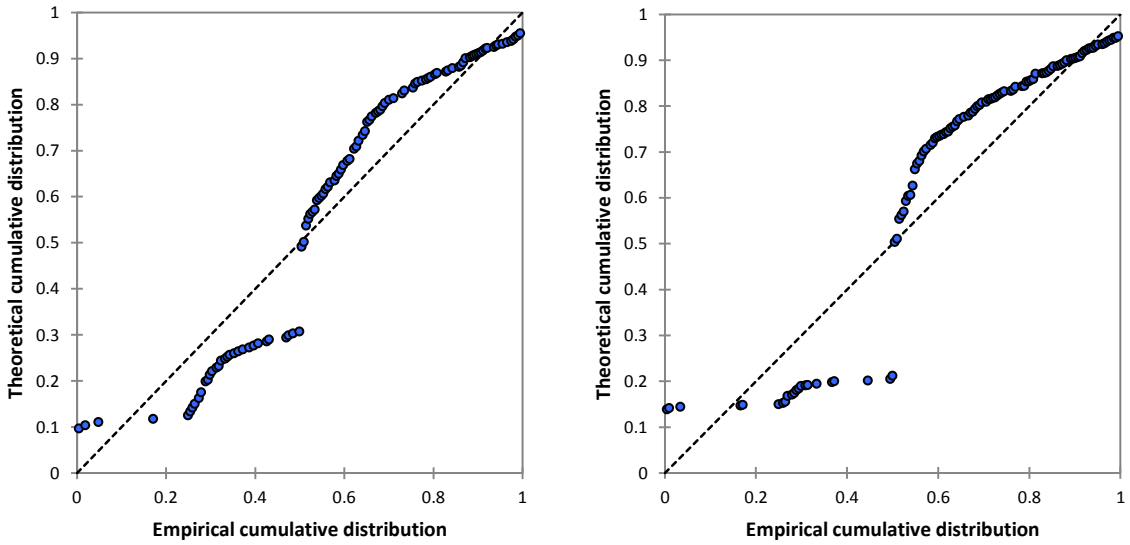
RESULTS AND DISCUSSION

Results

With reference to the data analyses, Figure 2 present the output from the application of KS. The dotted line presents analyzed data from IOC while the continuous line for NOC. This has to the with the hypotheses being tested whether NOC and IOC possess the same distribution as regards to fire safety awareness based on the questionnaire parameters (TRT, FEI, OBC, FER, RDL, HBF, PSC, DRC; see Appendix A). Figure 2 shows that with respect to the general awareness level of fire safety, the perception of offshore workers from NOC and IOC follows a different distribution (see Appendix A and Figure 2). Figures 3 (a and b) are normal probability plots from the outputs from the normality test on the data sets (IOC and NOC). This is to determine if the collected data sets are normally distributed or not. Hence, if they are parametric or non-parametric in nature. As viewed in Figure 3a – b, the dots represent the collected data and tend not to follow the straight dotted line but rather follow a somewhat irregular pattern hence non-parametric in nature. This is for both data set for IOC and NOC. Furthermore, Figure 4 present the output from Kendall's w-statistics (a non-parametric analysis) with respect to the assessment of the respondents on fire safety (see Appendix B).

DISCUSSION

Despite the difference in the distribution of the two data sets (NOC and IOC) they tend to have slightly the same pattern of safety culture (see Figure 2). This can be seen from Figure 4 where the level of fire safety culture among the workers in the NOCs and IOCs tend to peak and centered around the general design layout of offshore rigs (work environment). Also, the least the level of fire safety culture among the workers in the NOCs and IOCs was with respect to the onboard communication system (see Figure 4). However, at 5% significant level the difference in data distribution of IOC and NOC are statistically significant (see Appendix A). From Figure 4, the low level of awareness of fire safety culture among sampled offshore workers with respect to general Onboard Communication system (OBC) could be attributed to the observation gathered from personal interaction of the



a) P – P plot (NOC) b) P – P plot (IOC)

Figure 3. Normal Probability Plot Test.

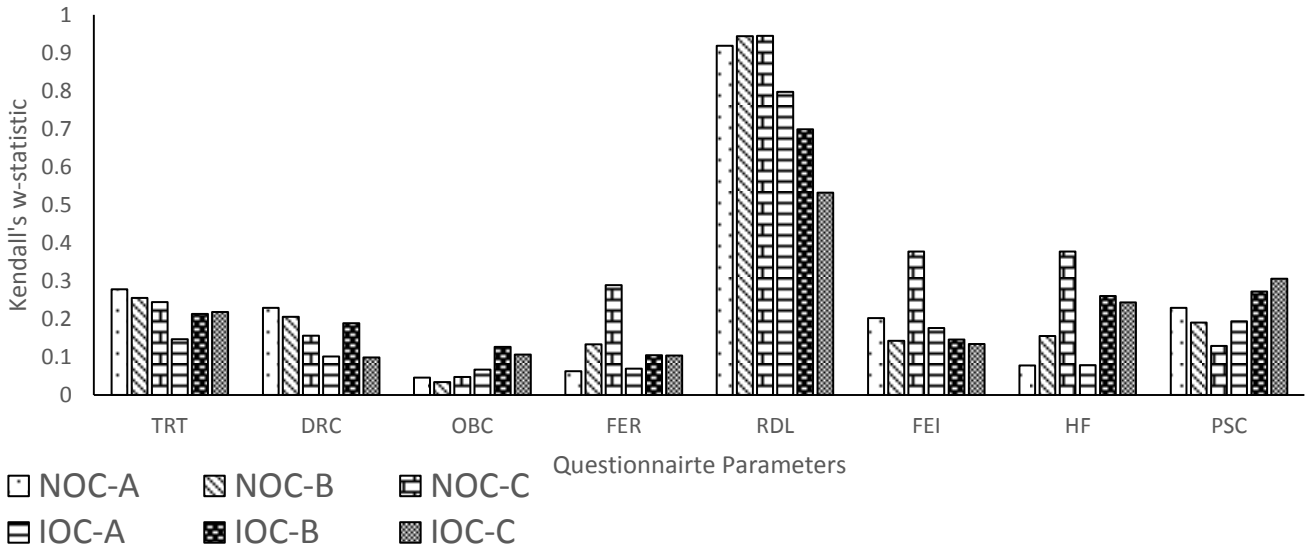


Figure 4. Plot of Kendall's w-statistic output.

respondents during questionnaire administration; respondents agreed that there are channels actually opened to the workers for reporting unsafe work conditions noticed on platforms but majority of these communication channels were mostly reserved for higher ranking workers on the platform like supervisors, team leads and managers.

In general, the level of fire safety awareness among the sampled offshore workers recorded from this study were majorly below 50% (see Appendix B). Most workers agreed that they have basic knowledge on how to operate or actuate fire emergency response installations like fire extinguishers and emergency shutdown devices.

However, majority could not ascertain whether or not these devices were compatible with what was obtainable on an offshore platform. In terms of emergency response time, most workers also agreed that it was difficult to maintain the composure to completely go through the process of notifications due to the fear of impending doom. Also, from the responses gotten, it was further gathered that the human attitude towards safety drills were surprisingly below average (see Figure 4). Some argued that this could be as a result of low morale stemming from issues relating to workers' wages, allowances and purported disengagement, looming retrenchment of workers, etc.

More specifically, training and retraining data gathered showed that, there was a generally low awareness level (see Figure 4 and Appendix B). This is in spite of the fact that there was training and retraining activities on fire emergency response across the workforce as evidenced by their responses and records cited. This might have been so for a number of reasons: i) Competency status of the workers was not assessed before training needs were determined and designed for the workers. This would lead to trainings that will not meet their objectives; ii) It is also likely that the fire response trainings were not job location specific; and iii) The educational levels and language or systems of training were somewhat not within the level of majority of the workers as most of the workers on the platforms have educational levels of SSCE/O-level. The degree holders on those platforms are usually supervisors, and managers. This is in agreement with the work of Ogbonna and Nwaogzie (2015) who carried out an assessment of fire safety preparedness of workers within Rivers State in Nigeria. Their result recorded an awareness level that borders between 50 – 65% and this has to do with workers' attitude to fire safety and their knowledge gap in the subject matter.

CONCLUSION

The following conclusion are drawn from this study, firstly, the perception of offshore workers from NOCs and IOCs with respect to the general awareness level of fire safety follows a different distribution. Secondly, the respective workers in NOCs and IOCs offshore platforms tend to have slightly the same pattern of safety culture despite the difference in the distribution of the two data sets and lastly, the general level of fire safety awareness among the sampled offshore workers were majorly below 50% this include onboard communication, training and retraining, and general worker's attitude toward safety drills. This could be attributed to the level of education of the workers being that most of the sampled workers were senior secondary school certificate and ordinary diploma holders.

RECOMMENDATIONS

The recommendation proposed by this study with respect to the outcome of the data collected and analyzed include the need for "facility-specific" training and retraining of different workers on the platforms on the fire hazards peculiar to their job description. Also, the communication channels for reporting unsafe working conditions should be open and accessible to all level of workers but within the chain of command and operations. Furthermore, the language of training should be within the educational level of the offshore workers for effective output from training programs engaged for the workers.

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APPENDIX A

Summary statistics for collected data for NOCs and IOCs

Variable	Observations	Minimum	Maximum	Mean	Std. deviation
NOC	51	35.3333	82.3333	59.9150	11.8599
IOC	51	88.6667	218.3333	162.0588	30.2450

Two-sample Kolmogorov-Smirnov test

D	0.5000
p-value	< 0.0001
alpha	0.05

Test interpretation:
H_0: The two samples follow the same distribution.
H_a: The distributions of the two samples are different.
As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis H_0, and accept the alternative hypothesis H_a
The risk to reject the null hypothesis H_0 while it is true is lower than 0.01%.

APPENDIX B

Table B1. NOC - Kendall's statistic output with respect to workers' Training and Retraining.

QUESTIONNAIRE PARAMETER	NOC –A			NOC -B			NOC - C		
	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$
W.TRT-1	59	66.5	56.25	64	63	1	60	66.5	42.25
W.TRT-2	50	66.5	272.25	41	63	484	45	66.5	462.25
W.TRT-3	52	66.5	210.25	43	63	400	53	66.5	182.25
W.TRT-4	54	66.5	156.25	67	63	16	52	66.5	210.25
W.TRT-5	45	66.5	462.25	51	63	144	53	66.5	182.25
W.TRT-6	41	66.5	650.25	42	63	441	44	66.5	506.25
TOTAL			1807.5			1486			1585.5
W	0.278166079			0.254804738			0.244001282		

Table B2. NOC - Kendall's statistic output with respect to Drilling Rig Condition.

QUESTIONNAIRE PARAMETER	NOC -A			NOC –B			NOC - C		
	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$
W.DRC-1	55	66.5	132.25	66	63	9	68	66.5	2.25
W.DRC-2	55	66.5	132.25	68	63	25	67	66.5	0.25
W.DRC-3	75	66.5	72.25	82	63	361	82	66.5	240.25
W.DRC-4	72	66.5	30.25	79	63	256	74	66.5	56.25
W.DRC-5	84	66.5	306.25	79	63	256	70	66.5	12.25
W.DRC-6	38	66.5	812.25	46	63	289	40	66.5	702.25
TOTAL			1485.5			1196			1013.5
W	0.228611735			0.205078376			0.155973068		

Table B3. NOC - Kendall's statistic output with respect to On – Board Communication.

QUESTIONNAIRE PARAMETER	NOC -A			NOC -B			NOC - C		
	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$
W.OB-1	71	66.5	20.25	69	63	36	68	66.5	2.25
W.OB-2	65	66.5	2.25	62	63	1	60	66.5	42.25
W.OB-3	64	66.5	6.25	63	63	0	52	66.5	210.25
W.OB-4	76	66.5	90.25	67	63	16	67	66.5	0.25
W.OB-5	78	66.5	132.25	75	63	144	72	66.5	30.25
W.OB-6	73	66.5	42.25	63	63	0	71	66.5	20.25
TOTAL			293.5			197			305.5
W	0.045168323			0.033779632			0.047015069		

Table B4. NOC-Kendall's statistic output with respect to workers' Fire Emergency Response.

QUESTIONNAIRE PARAMETER	NOC -A			NOC -B			NOC - C		
	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$
W.FER-1	62	66.5	20.25	58	63	25	56	66.5	110.25
W.FER-2	62	66.5	20.25	59	63	16	62	66.5	20.25
W.FER-3	60	66.5	42.25	55	63	64	52	66.5	210.25
W.FER-4	56	66.5	110.25	54	63	81	38	66.5	812.25
W.FER-5	74	66.5	56.25	67	63	16	71	66.5	20.25
W.FER-6	54	66.5	156.25	39	63	576	40	66.5	702.25
TOTAL			405.5			778			1875.5
W	0.062404617			0.133403827			0.288630971		

Table B5. NOC-Kendall's statistic output with respect to Rig Design Layout.

QUESTIONNAIRE PARAMETER	NOC –A			NOC -B			NOC - C		
	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$
W.RDL-1	65	95	900	48	90	1764	55	95	1600
W.RDL-2	71	95	576	47	90	1849	51	95	1936
W.RDL-3	66	95	841	64	90	676	64	95	961
W.RDL-4	36	95	3481	41	90	2401	42	95	2809
W.RDL-5	75	95	400	71	90	361	75	95	400
W.RDL-6	61	95	1156	65	90	625	69	95	676
W.RDL-7	67	95	784	77	90	169	78	95	289
W.RDL-8	68	95	729	73	90	289	76	95	361
W.RDL-9	86	95	81	79	90	121	82	95	169
TOTAL			8948			8255			9201
W	0.918033908			0.943653251			0.943990835		

Table B6. NOC-Kendall's statistic output with respect to Fire-fighting Equipment and Installations.

QUESTIONNAIRE PARAMETER	NOC -A			NOC -B			NOC – C		
	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$
W.FEI-1	68	76	64	64	72	64	54	76	484
W.FEI-2	76	76	0	72	72	0	67	76	81
W.FEI-3	66	76	100	69	72	9	64	76	144
W.FEI-4	46	76	900	46	72	676	40	76	1296
W.FEI-5	72	76	16	67	72	25	61	76	225
W.FEI-6	62	76	196	71	72	1	66	76	100
W.FEI-7	60	76	256	58	72	196	53	76	529
TOTAL			1532			971			2859
W	0.202086			0.142712			0.377131		

Table B7. NOC-Kendall's statistic output with respect to Human Factor.

QUESTIONNAIRE PARAMETER	NOC -A			NOC -B			NOC – C		
	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$
W.HF-1	53	66.5	182.25	52	63	121	70	66.5	12.25
W.HF-2	73	66.5	42.25	69	63	36	76	66.5	90.25
W.HF-3	63	66.5	12.25	60	63	9	68	66.5	2.25
W.HF-4	51	66.5	240.25	36	63	729	43	66.5	552.25
W.HF-5	69	66.5	6.25	65	63	4	69	66.5	6.25

Table B7. Contd.

W.HF-6	62	66.5	20.25	61	63	4	56	66.5	110.25
TOTAL			503.5			903			773.5
W	0.077486374			0.154837603			0.119038153		

Table B8. NOC- Kendall's statistic output with respect to safety Policies, Standards and Compliance.

QUESTIONNAIRE PARAMETER	NOC -A			NOC -B			NOC - C		
	R_i	$\overline{R}$	$\left(R_i-\overline{R}\right)^2$	R_i	$\overline{R}$	$\left(R_i-\overline{R}\right)^2$	R_i	$\overline{R}$	$\left(R_i-\overline{R}\right)^2$
W.PSC-1	54	57	9	49	54	25	49	57	64
W.PSC-2	45	57	144	42	54	144	46	57	121
W.PSC-3	34	57	529	32	54	484	40	57	289
W.PSC-4	43	57	196	58	54	16	56	57	1
W.PSC-5	38	57	361	38	54	256	42	57	225
TOTAL			1239			925			700
W	0.228812386			0.190332482			0.129272534		

Table B9. IOC - Kendall's statistic output with respect to workers' Training and Retraining.

QUESTIONNAIRE PARAMETER	IOC - A			IOC - B			IOC - C		
	R_i	$\overline{R}$	$\left(R_i-\overline{R}\right)^2$	R_i	$\overline{R}$	$\left(R_i-\overline{R}\right)^2$	R_i	$\overline{R}$	$\left(R_i-\overline{R}\right)^2$
W.TRT-1	207	192.5	210.25	176	168	64	151	161	100
W.TRT-2	184	192.5	72.25	168	168	0	163	161	4
W.TRT-3	179	192.5	182.25	141	168	729	126	161	1225
W.TRT-4	200	192.5	56.25	178	168	100	186	161	625
W.TRT-5	161	192.5	992.25	108	168	3600	121	161	1600
W.TRT-6	112	192.5	6480.25	102	168	4356	92	161	4761
TOTAL			7993.5			8849			8315
W	0.146804632			0.213373307			0.218310707		

Table B10. IOC - Kendall's statistic output with respect to Drilling Rig Condition.

QUESTIONNAIRE PARAMETER	IOC - A			IOC - B			IOC - C		
	R_i	$\overline{R}$	$\left(R_i-\overline{R}\right)^2$	R_i	$\overline{R}$	$\left(R_i-\overline{R}\right)^2$	R_i	$\overline{R}$	$\left(R_i-\overline{R}\right)^2$
W.DRC-1	221	192.5	812.25	194	168	676	185	161	576
W.DRC-2	213	192.5	420.25	174	168	36	183	161	484
W.DRC-3	199	192.5	42.25	191	168	529	187	161	676

Table B10. Contd.

W.DRC-4	184	192.5	72.25	154	168	196	154	161	49
W.DRC-5	237	192.5	1980.25	217	168	2401	201	161	1600
W.DRC-6	146	192.5	2162.25	105	168	3969	180	161	361
TOTAL			5489.5			7807			3746
W	0.100817418			0.188247871			0.098351402		

Table B11. IOC - Kendall's statistic output with respect to On – Board Communication.

QUESTIONNAIRE PARAMETER	IOC - A			IOC - B			IOC - C		
	R_i	$\overline{R}$	$\left(R_i-\overline{R}\right)^2$	R_i	$\overline{R}$	$\left(R_i-\overline{R}\right)^2$	R_i	$\overline{R}$	$\left(R_i-\overline{R}\right)^2$
W.OBC-1	227	192.5	1190.25	207	168	1521	185	161	576
W.OBC-2	187	192.5	30.25	144	168	576	129	161	1024
W.OBC-3	180	192.5	156.25	167	168	1	158	161	9
W.OBC-4	228	192.5	1260.25	206	168	1444	192	161	961
W.OBC-5	161	192.5	992.25	127	168	1681	126	161	1225
W.OBC-6	190	192.5	6.25	170	168	4	145	161	256
TOTAL			3635.5			5227			4051
W	0.066767779			0.126037097			0.106359191		

Table B12. IOC-Kendall's statistic output with respect to workers' Fire Emergency Response.

QUESTIONNAIRE PARAMETER	IOC - A			IOC - B			IOC - C		
	R_i	$\overline{R}$	$\left(R_i-\overline{R}\right)^2$	R_i	$\overline{R}$	$\left(R_i-\overline{R}\right)^2$	R_i	$\overline{R}$	$\left(R_i-\overline{R}\right)^2$
W.FER-1	168	192.5	600.25	198	168	900	155	161	36
W.FER-2	180	192.5	156.25	168	168	0	158	161	9
W.FER-3	165	192.5	756.25	140	168	784	133	161	784
W.FER-4	153	192.5	1560.25	117	168	2601	114	161	2209
W.FER-5	172	192.5	420.25	161	168	49	132	161	841
W.FER-6	176	192.5	272.25	167	168	1	152	161	81
TOTAL			3765.5			4335			3960
W	0.069155294			0.104528567			0.103969982		

Table B13. IOC-Kendall's statistic output with respect to Rig Design Layout.

QUESTIONNAIRE PARAMETER	IOC - A			IOC - B			IOC - C		
	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$
W.RDL-1	165	275	12100	157	240	6889	176	230	2916
W.RDL-2	220	275	3025	203	240	1369	170	230	3600
W.RDL-3	181	275	8836	144	240	9216	179	230	2601
W.RDL-4	165	275	12100	178	240	3844	198	230	1024
W.RDL-5	198	275	5929	197	240	1849	179	230	2601
W.RDL-6	190	275	7225	141	240	9801	115	230	13225
W.RDL-7	192	275	6889	174	240	4356	191	230	1521
W.RDL-8	190	275	7225	172	240	4624	192	230	1444
W.RDL-9	233	275	1764	201	240	1521	192	230	1444
TOTAL			65093			43469			30376
W	0.796976632			0.698769583			0.531681795		

Table B14. IOC-Kendall's statistic output with respect to Fire-fighting Equipment and Installations.

QUESTIONNAIRE PARAMETER	IOC - A			IOC - B			IOC - C		
	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$
W.FEI-1	167	220	2809	146	192	2116	142	184	1764
W.FEI-2	176	220	1936	150	192	1764	146	184	1444
W.FEI-3	176	220	1936	183	192	81	176	184	64
W.FEI-4	184	220	1296	156	192	1296	155	184	841
W.FEI-5	176	220	1936	158	192	1156	155	184	841
W.FEI-6	192	220	784	171	192	441	156	184	784
W.FEI-7	198	220	484	178	192	196	170	184	196
TOTAL			11181			7050			5934
W	0.176009676			0.145709576			0.133540623		

Table B15. IOC-Kendall's statistic output with respect to Human Factor.

QUESTIONNAIRE PARAMETER	IOC – A			IOC - B			IOC - C		
	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$	R_i	$\overline{R}$	$(R_i - \overline{R})^2$
W.HF-1	204	192.5	132.25	135	168	1089	134	161	729
W.HF-2	173	192.5	380.25	153	168	225	147	161	196
W.HF-3	149	192.5	1892.25	97	168	5041	95	161	4356

Table B15. Contd.

W.HF-4	172	192.5	420.25	159	168	81	151	161	100
W.HF-5	208	192.5	240.25	188	168	400	178	161	289
W.HF-6	158	192.5	1190.25	105	168	3969	101	161	3600
TOTAL			4255.5			10805			9270
W	0.07815439			0.260537753			0.243384275		

Table B16. IOC- Kendall's statistic output with respect to safety Policies, Standards and Compliance.

QUESTIONNAIRE PARAMETER	IOC – A			IOC - B			IOC - C		
	R_i	$\overline{R}$	$\left(R_i - \overline{R}\right)^2$	R_i	$\overline{R}$	$\left(R_i - \overline{R}\right)^2$	R_i	$\overline{R}$	$\left(R_i - \overline{R}\right)^2$
W.PSC-1	146	165	361	133	144	121	124	138	196
W.PSC-2	121	165	1936	107	144	1369	99	138	1521
W.PSC-3	117	165	2304	79	144	4225	70	138	4624
W.PSC-4	147	165	324	130	144	196	123	138	225
W.PSC-5	103	165	3844	85	144	3481	82	138	3136
TOTAL			8769			9392			9702
W	0.193256553			0.271759915			0.30567188		