# Human Error and Organisational Learning in Nigerian Maritime Industry:  A Survey of Exxon-Mobil Nigeria

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**Abstract:** *There is a growing array of studies examining the role of human error in maritime safety. However the relationship between human error and organizational learning as it applies to shipping industry in developing nations like Nigeria is under-researched. This paper investigates human error by linking it to learning practices, with Exxon–Mobil Nigeria as the focus. The research approach was survey, collecting data from 50 staff onboard a deep sea floating oil vessel. Findings show that human errors (particularly, negligence of watch keeping, careless ship positioning, poor preparation to departure, poor preparation and response to adverse weather, and negligence of lookouts) are the major causes of marine accidents in Nigerian navigational waters. Open communication between workers and the employers, feedback on human errors, and entrenchment of safety culture have been found as appropriate organizational learning practices capable of reducing human errors and minimizing accidents at sea.*
**Keywords:** *Human errors, organizational learning, oil tank fire and explosion, vessel grounding*

## I.    Introduction

In virtually all walks of life, errors are committed daily. Be it in manufacturing, services, construction, and aviation or maritime, people are prone to making costly mistakes that may have devastating consequences on lives and physical assets. Human errors may be described as consequences of illogical actions, or conscious violation of basic principles and laws. Rothblum (2000) defined the human error as one of the following: incorrect decision, an improperly performed action, or a lack of action (inaction). In the context of this study, human error is understood as behaviorally- related acts of omission or commission arising from people, structure, and processes that may lead to injury, deaths or damage either to vessel, cargoes, or the marine environment. Human errors have been given much attention in maritime research as the single most dominant factor for marine casualty (Bruce, 2005). A report by deputy director, seafarers and labour policy division of a London-based International Maritime Organization, Eun Won, Yu attributed 90.3% of the causes of marine accidents in the last five years to human –related errors, while the remaining 9.7% is that of non-human errors.

It is worth stating that though mistakes are bound to be made by shipping crews, mistake alone cannot be regarded as the single cause of error –related accidents. Other factors such as inexperience crew, language differences, ill-trained crew, and undue work pressure may be significantly related to marine accidents. Even though the effects of human errors are destructive (loss of time, faulty products, damage to cargoes, and death), it sometimes results in constructive outcomes (behavioural change, innovation, and efficiency) if appropriate learning takes place.

In the past, the causes of marine accidents were mostly attributed to technological breakdown while the human element was overlooked (Hanninen, 2008). However, with continuous improvement in vessel design, technical infrastructure, and stringent global regulatory oversight, the incidences of technical failures has diminished, and human error has become more apparent determinant of marine accident (Dogarawa, 2012; Barsan, Surugiu, and  Dragomir, 2012). It is important to understand that the extent to which an expedition is said to be accident free is dependent upon the interaction between human and technical, managerial, environmental factors (Hanninen, 2008). Consistent with this line of thought, Barnett, (2005) has argued that major marine accidents are rarely caused by the single direct action or inaction of vessel crew. A contribution of various factors including managerial, technical, and geographic factors is related to marine safety.

Determining how the root cause of human error relates to marine accidents may not be sufficient to remedy the situation; the step taken by organizations in their learning capacity and processes is of equal significance. Thus, shipping firms must organize and implement learning processes towards investigating accidents and improving on hassle-free tour rates. Consequently, organizational learning is viewed as 'the gradual change in organisational behaviour which occurs when individual learns collectively together by gathering relevant information, converting the information to knowledge that is useful to the system when

combined with experience (Bruce, 2005). It is also defined by Robbins, (2009) as a process in which members of an organization detect errors or anomalies and correct it by restructuring organizational theory of action, embedding the results of their inquiry in organizational maps and images.

It is equally important to examine what constitute the human errors that cause accident in shipping, and there is a growing array of literature examining the nature and composition of human errors, however its relationship with organizational learning as it applies to shipping industry in developing nations like Nigeria is under-researched. This study therefore, contributes to knowledge by examining in context of Nigeria, the relationship between human causes of marine accidents and organizational learning practices.

In the light of the above, the objective of this paper is to describe the nature and forms of accidents prevalence in Nigerian waterways, characterize the human errors causes of marine accident, and examine the learning practices adopted as policy measures to minimize human error-related accidents in Nigeria. The rest of the paper is divided into the following: Section 2 considers theoretical and conceptual issues, section 3 provides the methodological blue print for the research, section 4 discusses results of data analysis and findings, and section 5 concludes the paper and draw implications for managerial actions.

## II. Theoretical framework and literature review

There is no unison amongst researchers on the definition of error and what constitute human errors in marine environment (Hansen, 2006). Generally, human error can be described as one of the following: an incorrect decision, an improperly performed action, or a lack of action (inaction). Merriam-Webster dictionary of contemporary English defined errors as unintended deviations from goals, standards, a code of behavior, the truth, or from some true value. In a study of positive effects of error on performance of firms in two European nations, Dyek, Frese, Baer and Sonnentag (2005; 1229 ) defined action errors as "unintended deviations from plans, goals, or adequate feedback processing as well as an incorrect action that results from lack of knowledge"

Scholars have also not reached a consensus on the types of human error causes of marine accident; however, the following dimensions of human errors are noticed in the literature: including economic pressure, i.e the pressure to meet up with scheduled economic activity or business objective. This pressure is always exerted on the master by either the management or the owner of the business. It may be time-related pressure, or the need to make economic gain at the expense of competition.

Pressure can also be exerted by expectation of timely berthing for cargo transfer or offloading, which may compel the vessel to run into difficult water terrain (Bruce, 2005). Poor judgment and wrong decisions by the captain also constitute human error in the marine environment. Vessel overload is a decisional error capable of impairing and reducing maneuverability leading to collision or grounding (Kazalanı and Akten 2006). It should be noted that errors are also made originally by the equipment manufacturers; this may hinder smooth sailing, lead to wrong judgment, and increases risk of capsize or foundering. For instance, the steering selector switch may have been installed in a wrong position, rectifying the fault while ship is on motion delay the making of crucial turn which may eventually sink or ground a ship (Dyek, Frese,Baer and Sonnentag, 2005).

Kazalanı and Akten (2006) consider human errors to include lack of adequate knowledge and experience, technical inability, bad look-out, not paying proper attention to procedures and rules, carelessness in commanding a ship, misinterpretations of radar information, fatigue and lack of alertness, overworking, tiredness, insufficient rest periods, etc. It is therefore, necessary to find out whether these same human errors are the causes of accident in Nigerian maritime waters.

Anyanwu (2014) observed that human error was a predominant factor in capsizing of vessels. He asserts that vessels may capsize when they hit high and steep breaking waves from the side which will subject them to severe rolling or pitching, gale and loss of stability. Mokhtari and Didani, (2013) carried out an empirical survey of the role of human error in marine incidents. 1,816 marine accidents were investigated in five Iranian shipping companies. The authors found 17 factors responsible for occurrence of human error in these accidents, out of which four factors were the most influential-negligence, poor training, inadequate tools, and lack of skill and experience. To reduce human errors and minimize accidents they recommended appropriate training of human resources, proper implementation of national and international laws and regulations, maintenance of vessels and the equipment on board, improved port facilities, and utilities for marine search and rescue.

The literature also classifies human errors into two components, namely: operational errors and handling mistakes (Onwuegbuchunam, 2013). Operator errors are faults of omission or commission on the instance of the ship operating crew. According to Euu Won, Yu, deputy director of seafarers and labour policy division they include: poor preparation for departure, insufficient checking of waterways, careless fixing of ship's position, negligence of lookouts, faulty crew judgment, and improper handover, violation of collision regulation, and non observance of safe working practices on board. On the other hand, handling mistakes relates to technical faults by ship designer. It may include handling mistakes of engine room machinery, bad handling of firearms, old and faulty electric cable that may increase risk of fire outbreak etc.

Dogarawa, (2012) evaluates marine accidents in northern Nigeria by examining the causes, prevention and management of marine accidents. The survey method was the approach; questionnaires were administered through individual and group interviews with boat owners, boat drivers, boat users, boat builders, boat engine mechanics, local government officials, maritime workers union, the marine police, traditional regulators and staff of the federal government agencies for maritime affairs. The study found that marine transportation marred by dilapidated jetties, ill-equipped marine police, non-functional ferries and boat, and overloading. This is prone to cause accidents in marine waters.

There are many types of marine accidents and their effects on marine life and property differ from one another. Some of the examples reviewed in maritime literature include collision or contact, grounding, breakdown of the ship underway, capsize, foundering, stranding, and fire or explosion (Mokhtari and Didani, 2013). In areas where shipping traffic exists, collision is bound to be frequent occurrence unless appropriate learning and caution mechanism are put in place. Collision is a major type of maritime accidents. It can be explained as the impact of ship against ship through body contact. Seafarers and passengers are also faced with risk of fire outbreak on board. It sometimes results in total loss of the ship and / or her cargo. Marine fires pose great risk for life, cargo and the environment.

## III. Materials, Measures and Methods

The survey approach was used in this study. It is a design that allows generalization to be made from large population by drawn samples. Survey design was used because it is economical, enhance rapid data collection and ensure the understanding of the characteristics of the population under study (Saunders, Lewis, and Thornhill, 2009). The quantitative nature of the study in attempting to describe the dynamics of human errors in marine accidents and organizational learning practices in Exxon Mobil Nigeria made the use of descriptive survey most appropriate strategy. Situated in Lagos, Exxon-Mobil is one of the largest oil producing companies in Nigeria with floating oil vessels within the Nigeria deep territorial waters. The company operates a joint venture agreement with the Federal Government of Nigeria, through the Nigerian National Petroleum Corporation (NNPC)- an agency that coordinate all oil exploration and marketing activities in Nigeria.

The survey approach highlighted earlier involves using semi-structured questionnaire to gather primary data from on board employees of Exxon-Mobil. Data collection was therefore, from primary sources using the questionnaire and augmented with pieces of information from periodicals, journals and other internal materials from the firm. Items in the questionnaire were drawn from the extensive review of maritime safety literature. For instance, those that measure human error came from (Onwuegbuchunam, 2013; Euu Won, Yu; Mokhtari and Didani, 2013), and measures of organizational learning (communication, initiative, innovation, and change) was adapted from Dyek, Frese, Baer and Sonnentag (2005).

The targeted population consisted of all seagoing employees including engineers working at Exxon – Mobil oil prospecting floating vessel in Nigeria, and a random sample of sixty two (62) respondents made up the study participants. Respondents profile shows forty two (42) junior level engineers, marine deck personnel and seamen, 6 shift supervisors, 5 top level managers, and 7 auxiliary contract employees. Among the 62 respondents, 12 either could not complete their questionnaire on schedule or were not accurate in answering the questions as required. Thus, the remaining 50 copies of the questionnaire were found useful for data analysis. Data was analyzed and presented using frequency counts, percentages, and chart. Data processing was enhanced through the use of statistical packages for social science (SPSS).

## IV. Results and Discussion
### 4.1 Respondents' profile

Table 1 shows socio-demographic characteristics of respondents, it is indicated that 47 male and 3 female respondents participated in the study adding up to 50 respondents. From the 47 male respondents, 7(14%) were between 20-30 years, 28(56%) were between the ages of 31-40, 10(20%) respondent was between age 41-50, and 2(4%) were 51-60years old. Similarly, Out of the 3 female participants in this study, 1(2%) was between the age of 20-30years, and were 2(4%) were between the ages of 31-40. Other age groupings had no female respondent. This implies that the study was made up of more male than female respondents, and majority of respondents (both male and female) were between 30-40years. The low percentage of female maritime workers in the company raise crucial concern as workplace safety issues has been shown to be amenable to gender sensitivity.

**Table 1: Age of the respondents classified by their sex**

| | | | 20-30yrs | 31-40yrs | 41-50yrs | 51-60yrs | Total |
|---|---|---|---|---|---|---|---|
| | | | | Age of respondent | | | Total |
| Respondent's Sex | **Male** | Frequency | 7 | 28 | 10 | 2 | 47 |
| | | Percent | 14% | 56% | 20% | 4% | 100.0% |
| | **Female** | Frequency | 1 | 2 | 0 | 0 | 3 |
| | | Percent | 2% | 4% | 0.0% | 0.0% | 100.0% |
| **Total** | | Frequency | 8 | 30 | 10 | 6 | 50 |
| | | Percent | 16.0% | 60.0% | 20.0% | 12% | 100.0% |

**Source: Author's compilation from field survey, 2015**

Table 2 and Figure 1 show distribution of respondents according to work position. Results indicate that 6% of respondents were managers in the oil prospecting firm, 12% were supervisors, 8% were crew engineers, and 6% were specialist/advisors. Similarly, 36% of participants in the survey were onboard operators/technician, 4% are mechanic, 6% were deck foreman on shift, 16% were crane operators and 10% were marine deck personnel working in the Exxon- Mobil floating vessel. Thus, many work positions were considered while carrying out the study. As the study cut across different job specification and position, the credibility and generalization of findings is enhanced.

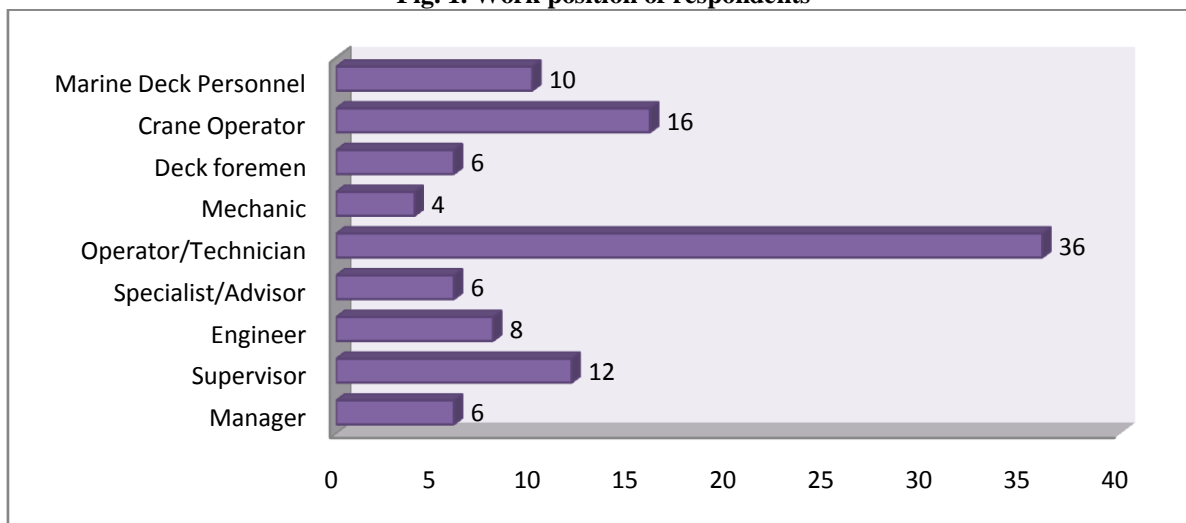**Fig. 1. Work position of respondents**



**Table 2. Work position of respondents**

| Job position | Frequency | Percentage |
|---|---|---|
| Manager | 3 | 6 |
| Supervisor | 6 | 12 |
| Engineer | 4 | 8 |
| Specialist/Advisor | 3 | 6 |
| Operator/Technician | 18 | 36 |
| Mechanic | 2 | 4 |
| Deck foremen | 3 | 6 |
| Crane Operator | 8 | 16 |
| Marine Deck Personnel | 5 | 10 |
| Total | 50 | 100 |

**Source: Author's compilation from field survey, 2015**

**4.2 Nature and forms of accidents in Nigerian maritime waters**

Using Exxon Mobil Nigeria, we sought to find out the various forms of accidents that occur in Nigeria waters. They are ordered according to percentage of occurrence as shown on Table 3 and figure 2.

**Table 3. Perception of respondents on types of marine accidents in Nigerian waters**

| Dimensions | Frequency | Percent |
|---|---|---|
| Fire and explosion on crude oil tankers and vessels | 14 | 28 |
| Grounding or Sinking | 10 | 20 |
| offshore oil rig mishaps | 6 | 12 |
| Collision between ships | 5 | 10 |
| Foundering | 3 | 6 |
| Flooding | 3 | 6 |
| **Total** | **50** | **100** |

**Source: Author's compilation from field survey, 2015**

**Fig.2 . Perception of respondents on types of marine accidents in Nigerian water ways**
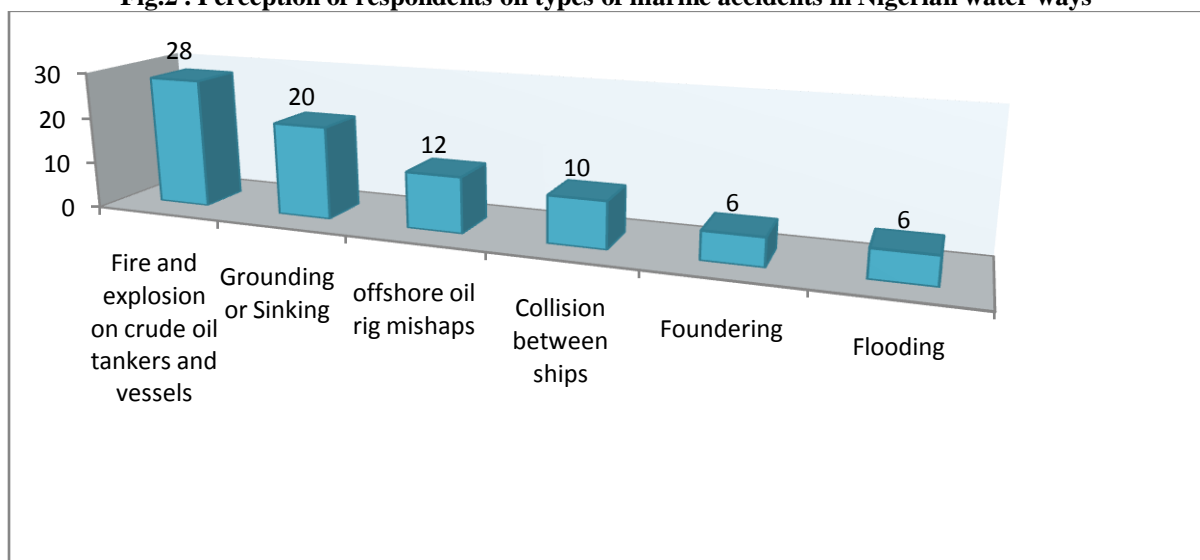


Among the common types on marine accidents in Nigeria are: fire and explosion involving oil tankers, grounding or sinking of marine vessel, offshore oil rig accident, founding, collision, and flooding. In order of frequency of occurrence, Table 3 and figure 2 shows that fire and explosion on crude oil tankers and vessels (28%) ranked the highest. This is followed by grounding or sinking of ship below sea level (20%), offshore oil rig accidents (12%), collision involving fishing and oil vessels (10%), foundering and flooding related accidents shared 6% respectively in that order. This implies that oil tanker fire and explosion is rampant incidents that has claimed lives, damage property and cause environmental degradation in Nigerian territorial waters. Thus, the major cause of accidents on cargo tankers and oil vessels is explosions. This may be due to the highly inflammable nature of materials transported by oil tankers at sea. Management of shipping operations must therefore, understand the causes of fire explosion to guard against continuous accidents.

**4.3 Human errors that causes marine accident in Nigerian Navigational waters**

Table 4 and figure 3 shows respondents' opinion on the human errors that causes marine accident in Nigeria. Among the factors identified, Negligence of watch keeping (30.0%) occupies topmost position of errors that causes accidents in Nigerian maritime environment. This is followed by careless fixing of ship's position (20%), poor preparation to departure (18%), poor preparation and response to adverse weather 10%, and negligence of lookouts (10%). It is also observed that undue pressure, and faulty navigational aids sharing 2% each occupied the bottom position in the list of errors. Moreover, this finding may have suggested that pressure and lack of navigational aids are not potent factors to significantly cause marine accidents. One important conclusion from the findings is the significance of the top four human errors (Negligence of watch keeping, poor preparation to departure, poor preparation and response to adverse weather, and negligence of lookouts). For instance, negligence of watch keeping frequently occurred as a result of work fatigue, and work overload and has been fingered in many shipwrecks causing injury to crews, damage to property and loss of vessels.

**Table 4. Human errors that causes marine accident in Nigeria**

| Dimensions | Frequency | Percent |
|---|---|---|
| Negligence of watch keeping | 13 | 26 |
| Careless fixing of ship's position | 10 | 20 |
| Poor preparation to departure | 9 | 18 |
| Poor preparation and response to adverse weather | 5 | 10 |
| Negligence of lookouts | 5 | 10 |
| Inappropriate anchorage/mooring | 2 | 4 |
| Complacency of safe working practices on board | 2 | 4 |
| Inappropriate manning level | 2 | 4 |
| Undue pressure from the master | 1 | 2 |
| Faulty navigational aids | 1 | 2 |
| **Total** | **50** | **100** |

**Source: Author's compilation from Field Survey, 2015**

**Fig. 3. Human driven causes marine accident in Nigeria**
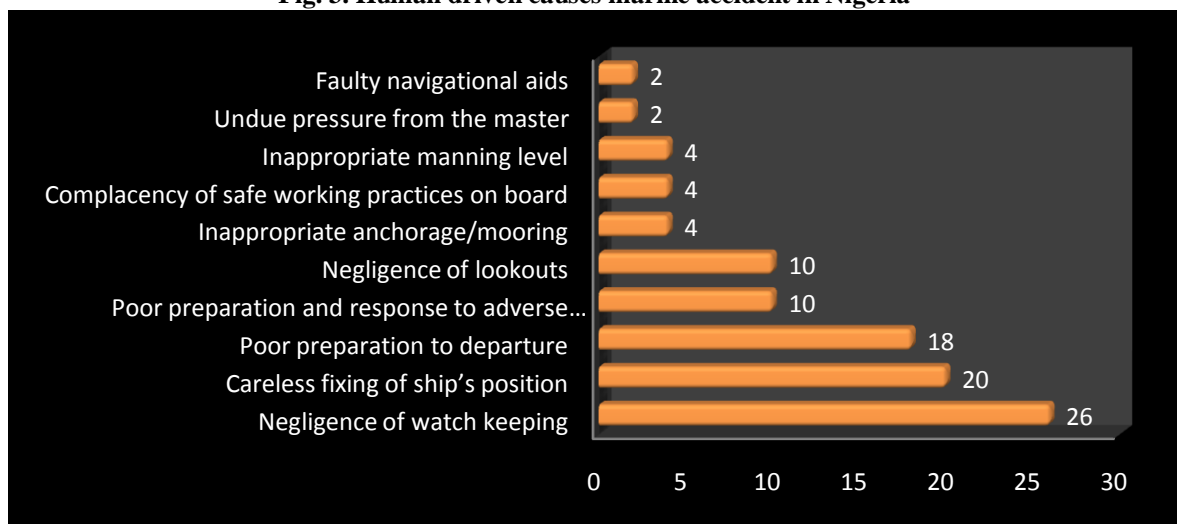


4.4 **Organisational learning measures to reduce human error-related marine accidents**

Results on Table 5 and figure 4 shows organizational learning practices capable of reducing human errors and marine disaster. By the results, it can be stated that openness to communication (32.0%) was given highest priority by respondents. This espouses the need to adequately keep open various lines of formal and informal communication between workers and the employers. From the results, openness and communication is followed by feedback on breach of safety practice (20%), support for safety implementation by management (12%), and support for the injured (12%). The importance of top management support in enhancing safety compliance can never be overemphasized. Management support is needed in terms of training on safety, safety culture learning, safety innovation, compensation for the injured and ensuring team building and intervention in unsafe acts and behavior. Management support and dedicated participation enhances employee safety consciousness at sea and at shore.

**Table 5. Measures to reduce human error-related marine accidents.**

| Dimensions | Frequency | Percent |
|---|---|---|
| Openness and communication | 16 | 32 |
| Feedback and communication about safety errors. | 10 | 20 |
| Management support for safety implementation | 6 | 12 |
| Management support for the injured | 6 | 12 |
| Culture of learning/improvement | 4 | 8 |
| Crew training and staffing | 4 | 8 |
| Teamwork within units | 2 | 4 |
| Intervention in unsafe acts | 2 | 4 |
| **Total** | **50** | **100** |

**Source: Author's compilation from field survey, 2015**

**Fig. 4.  Measures to reduce human error-related marine accidents.**
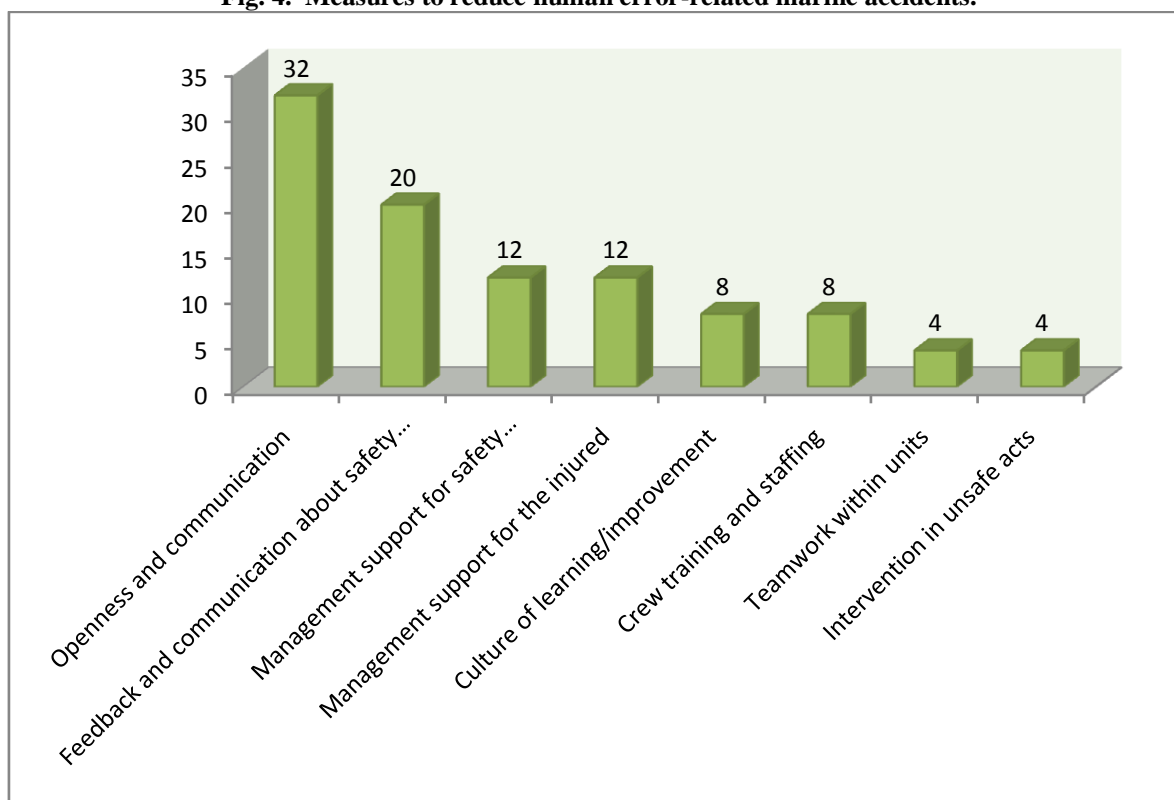


## V.    Conclusion

The driving force of this paper was to examine human error and organisational learning practices in maritime industry in Nigeria. The focus was Exxon-Mobil incorporated, an international offshore oil prospecting firm based in Nigerian coastal region. The study considered three specific objectives by identifying the nature and forms of accidents prevalence in Nigerian waterways, characterizing the human errors causes of marine accident, and examining the learning practices adopted as policy measures to minimize human error-related accidents in Nigeria.

A lot of interesting findings arises from the analysis of data to aid the conclusion of this study. To start with, the study has established that the common types on marine accidents in Nigeria includes fire and explosion involving oil tankers, grounding or sinking of marine vessel, offshore oil rig accidents, founding, collision, and flooding. Among these categories of marine accidents, fire and explosion on crude oil tankers and vessels was the most frequent. Fire and explosion involving oil tanks and vessel is inimical to the growth of maritime industry as a whole, it is capable of destroying lives and property on board, destabilizing aquatic environment causing imbalance to floras and faunas, leading to oil spillages and environmental pollution. Among the identified human errors in this study such as negligence of watch keeping, careless fixing of ship's position, poor preparation to departure, poor preparation and response to adverse weather, and negligence of lookouts. It is also found that undue pressure, and faulty navigational aids were insignificant in causing marine accidents in Nigerian waters.

This study made significant contributions to marine safety management literature by identifying various intervention and initiative managers can bring on board to ensure safety and organizational learning practices. For instance, it has been found that adequate lines of formal and informal communication between workers and the employers in the organization is vital to reducing marine accidents, minimizing injuries and dead at sea, reducing environmental degradation, and enhancing safety culture. In addition, from the study we conclude that maintaining a system of feedback on safety errors and support for safety implementation by management leads to drastic reduction of marine incident.

## References

[1].    Anyanwu, J. O. (2014), Maritime Tanker Accident on Coastal Areas in Nigeria. Global Journal of Researches in Engineering: Industrial Engineering. Volume 14 Issue 2
[2].    Barnett, M. L. (2005). Searching for the Root Causes of Maritime Casualties – Individual Competence or Organisational Culture? WMU Journal of Maritime Affairs, Vol. 4, No.2, 131–145

[3]. Barsan, E., Surugiu, F. and Dragomir, C. (2012), Factors of Human Resources Competitiveness in Maritime Transport. International Journal on Marine Navigation and Safety of Sea Transportation, 6, 126-130.

[4]. Bruce, B. (2005). Learning for Change: Principles and practices of learning organizations. Swedish mission council.

[5]. Dogarawa, L. B. (2012). Marine Accidents in Northern Nigeria: Causes, Prevention and Management. International Journal of Academic Research in Business and Social Sciences, Vol. 2, No. 11.

[6]. Dyck, C. V. Frese, M. Baer, M. and Sonnentag, S (2005). Organizational Error Management Culture and Its Impact on Performance: A Two-Study Replication. Journal of Applied Psychology, Vol. 90, No. 6, 1228–1240.

[7]. Hanninen, M. (2008) Analysis of human and organizational factors in marine traffic risk modeling (Literature review). Helsinki University of Technology, Department of Applied Mechanics.

[8]. Hansen, F. D. (2006). Human Error: A Conceptual Analysis. Journal of Air Transportation, Vol. 11, No.3, 61-77.

[9]. Kazaları, G and Akten, N. (2006). Shipping accidents: a serious threat for marine Environment. Journal of Black Sea/Mediterranean Environment, Vol. 12: 269-304

[10]. Mokhtari, A. H and Didani, K. (2013). An Empirical Survey on the Role of Human Error in Marine Incidents. The International Journal on Marine Navigation and Safety of Sea Transportation. Vol. 7, No. 3 , 363-367

[11]. Onwuegbuchunam, D. E. (2013). An Analysis of Determinants of Accident Involving Marine Vessels in Nigeria's Waterways. Management Science and Engineering. Vol. 7, No. 3, pp. 39-45

[12]. Rothblum, A. M. (2000). Human Error and Marine Safety U.S. Coast Guard Research & Development Center.

[13]. Robbins, S. & Judge, P. (2009). Organisational behaviour, London: Prentice Hall.

[14]. Saunders, M. Lewis, P and Thornhil, A. 2009. Research Methods for Business Students. New York, Prentice hall Inc.