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Information Seeking Behaviour Of Petroleum Engineers In Niger Delta Region Of Nigeria: A Survey

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Information Seeking Behaviour Of Petroleum Engineers In Niger Delta Region Of Nigeria: A Survey

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Abstract:

The success of the petroleum industry at all levels depend largely on petroleum engineers' awareness and access to relevant information for making sound Exploration and Production decisions. This study investigated the information seeking behaviour of Petroleum Engineers in selected companies in the Niger Delta Region of Nigeria. A survey design was adopted using questionnaire as the instrument for collecting primary data from 250 petroleum engineers randomly selected from four oil companies. Data gathered were analysed using frequencies, simple percentages and mean score count. Results showed that petroleum engineers spent time seeking health and safety information, oil and gas E&P information, geochemical prospecting information and that the purpose they seek information is to operate safely and to improve on work roles/duties assigned to them. Recommendation is made that management of oil and gas companies libraries should make adequate provision of health and safety information for petroleum engineers to operate safely.

Key Words: Information seeking-behaviour, Petroleum Engineers, oil and gas libraries, Niger Delta Region

INTRODUCTION

Petroleum engineers are professionals who specialize in a field of engineering *that is* concerned with the activities related to the production of hydrocarbons, which can be either crude oil or natural gas. Their expertise is often called to bear on Exploration and Production commonly found within the upstream sector of the oil and gas industry. Petroleum Engineers are involved in virtually every stage of the exploration and production of oil and gas. Their major aim according to [Jeff \(2013\)](#) is to maximise hydrocarbon recovery at minimum cost while maintaining a strong emphasis on reducing environmental impact.

The major task of petroleum engineers is to manipulate scientific and engineering technology driven related information in handling production, management, distribution and

marketing of petroleum and natural gas products. This is in line with the central purpose of engineering which is to design technological devices or structures based on new concepts or modifications of existing ones. Petroleum Engineers are regarded as subject specialists that execute specialized tasks. According to [Hertzum & Pejtersen \(2000\)](#) engineers can be described as practising an applied science and can be characterised as subject specialists performing rather complex tasks.

Petroleum engineers are categorized into various professionals based on diverse areas they major in. Thus it will be imperative to have a brief look of at the various professionals and their major responsibilities. This exposition will create the chance to know the kind of information they work with and possibly how they go about seeking these information to meet their needs professionally.

Categories of Petroleum Engineers and their Duties and Responsibilities

Generally there are five main basic petroleum engineering professionals who are: Reservoir Engineers, Drilling Engineers, Production Engineers, Natural Gas Engineers and Petroleum Economists. Each of these various professionals specializes in different areas of exploration and production of oil and natural gas and they harness their technical know-how together to achieve the aims and objectives of the oil and gas industry.

Reservoir Engineers takes charge of assessing or ascertaining oil and natural gas deposits. Their primary duty is to determine the size of a reservoir and work out modalities on how to maximise the economic gains from extracting them. The ultimate responsibility of the reservoir engineer according to [UNSW \(2015\)](#) is to maximise the output of the reservoir without causing overproduction. They work together with geologists and geophysicists to find the reserves of oil and gas relying on the basic laws of physics and chemistry that affect the behaviour of liquid and vapour phases of oil, natural gas, and water in rock (Wikipedia, 2015). Surveillance Engineers, Simulation Modelling Engineers and Geothermal Engineers are all regarded as Reservoir Engineers.

Drilling Engineers is in charge of drilling well logs to produce oil or gas. They take responsibility of developing, planning, costing and supervising all operations required for drilling oil and natural gas wells. They are involved from the initial design of the well to testing, completion and, finally, abandonment. In the planning phases, the Drilling engineer would be involved in estimating the value of the reserves, estimating the costs to access them,

acquiring necessary property by lease, conducting a geological survey, designing a well bore plan, and providing a layout of the type of equipment required to reach the depth of the well (Wikipedia, 2015). Completion Engineers, Workover Engineers, Well Abandonment Engineers, Deepwater Drilling Engineer are all categories of Drilling Engineers.

Production Engineers focus more on the everyday production of oil and gas as compared to most of the others who focus on finding more oil and gas in new and existing reservoirs (Hjelle and Montenereo, 2011). The Production Engineers are responsible for the process of bringing hydrocarbon to the surface and preparing them for processing. Production Engineers are involved in designing and selecting all required equipment that will get the well log to produce oil and gas after it is drilled. They coordinate the installation, maintenance and operation of the mining and oilfield equipment, and manage the boundary between the well and the reservoir using perforations, sand control, artificial lift, and downhole control.

Natural Gas Engineers specializes in the exploration and production of natural gas. They are solely responsible for the extraction, processing, and transportation of *natural gas* or petroleum products. Natural Gas Engineers applies their knowledge of petroleum engineering to the development of natural gas resources. An oil and gas engineer is involved in the process of extracting oil and natural gas from reservoirs. In all these stages, an oil and gas engineer uses petrophysics knowledge to ensure that all drilling operations are conducted accurately and efficiently, while complying with laws and environmental standards.

Petroleum Economists involves the application of the techniques of economic analysis at every stage in the development of oil and gas exploration and production projects. They achieve this by coordinating the basic factors of oil and gas economics that affects production which includes: the level of knowledge about the oil or gas field, the location, type and number of wells, market conditions, and the effect of tax/royalty systems. By analysing factors like these, Petroleum Economists are able to assist in making investment decisions, such as deciding whether or not to drill an exploration well or whether or not to develop an entire gas production project (UNSW, 2015).

The Relevance of Information to Petroleum Engineers

Every single action and decision guiding the operations of petroleum engineers are embedded in policy documents which contain series of professional information. Oil and gas companies are extremely information intensive operations and they rely on truly vast amounts of information, e.g. seismic data, geological models, reservoir models, simulations, drilling logs, production measurements, intervention reports and process parameters, for their everyday operations ([Hjelle and Monteiro, 2011](#)). The importance of information to Petroleum Engineers is highly irrefutable. The continuous survival of the exploration and production industry depends largely on the interplay of the forces of demand and supply of adequate and relevant oil and gas information. This is because information is the hub in which the wheel of every oil and gas exploration and production activities rotates. Thus, the success of the petroleum industry at all levels depend largely on petroleum engineers' awareness and access to relevant information for making sound decisions. The oil and gas industry strives to provide engineers and other professionals with as much information as possible for them to make sound decisions ([Hjelle and Monteiro, 2011](#)).

Oil and gas information is one of the most strategic resources of development in the industry. Information is the key input to the modern exploration and production business in the present era of competitive open market economy ([Mahapatra \(2006\)](#)). Petroleum engineers are not just consumers of information but they generate information a lot because of the high level of productive activities involve in petroleum and natural gas exploration and production. [Mahapatra \(2006\)](#) rightly opined that the scientists and engineers working in oil exploration and production are also producers and users of information as in other areas of science and technology. There is high demand for a vast amount of information by petroleum engineers for capacity building in the industry. The amount of information oil and gas workers need according to [Hjelle and Monteiro \(2011\)](#) is staggering not to say prohibitive for careful data analysis. Consequently, information has become an important element to support oil and gas operations decision making and policy implementation. Information is the key input to the modern exploration and production business in the present era of competitive open market economy ([Mahapatra, 2006](#)). Access to oil and gas information by petroleum engineers is therefore vital in responding quickly and effectively to the challenges of the upstream sector. This shows that information is highly needed by petroleum engineers to succeed in every given responsibility. This creates the need to indentify the kind of information which they need and how they obtain the needed information.

Statement of the Problem

Information is the most valuable and most highly demanded resource of the oil and gas industry because the petroleum engineers largely depend on it to succeed. The role information plays in the oil and gas industry is highly irrefutable. Virtually every process of the exploration and production of oil and gas requires highly vast amount of technical data/information which the petroleum engineers need for capacity building in the industry. This implies that information is the most valuable and most highly demanded resource of the oil and gas industry. The amount of information oil and gas workers need according to [Hjelle and Monteiro \(2011\)](#) is staggering not to say prohibitive for careful data analysis. Access to oil and gas information is therefore vital in responding quickly and effectively to the challenges of the oil and gas industry. Obtaining sufficient information by the petroleum engineers in the Niger Delta region in carrying out their exploration and production activities is becoming problematic every day. This is mainly due to the ambiguities posed by information explosion as a result of constant research and development activities on global best practice in the petroleum and gas industries by petroleum and gas scientists. The million dollar question is how best they will navigate through needed information found in diverse media to support decision making. While acknowledging this great challenge, [Endsley \(2000\)](#) observed that the problem with today's systems is not a lack of information but finding what is needed. Failure to obtain desired information by petroleum engineers will greatly affect their productivity and also the growth and development of the entire industry due to the significant role information plays in the discharge of their responsibility. An in-depth understanding of the information needs and seeking behaviour of oil and gas workers hopefully would identify the information products and services required for the continuous survival of the entire oil and gas industry. In light of the above, a study of this nature could be of great research and this is the motivation for the present study.

Objective of the Study

The study seeks to:

1. Identify the types of information petroleum engineers spend time to seek
2. Identify the purpose petroleum engineers seek information
3. Identify the ways petroleum engineers seek desired information
4. Identify the information sources consulted by petroleum engineers

5. Identify the problems facing petroleum engineers in accessing desired information.

Significance of the Study

Findings hopefully will assist oil and gas libraries/research institutes and other relevant information agencies in collection building towards providing adequate information services and designing effective information systems that could meet the information needs of oil and gas workers. Oil companies will also benefit from the findings by providing adequate fund for their libraries in providing the required information resources/services that will keep petroleum engineers abreast of recent trends and development. Also, significant contribution will be made to researchers on the body of literature on information needs/seeking behaviour.

Review of Literature

There appears to be limited studies carried out on the information seeking behaviour of petroleum engineers. [Nkereuwem \(1984\)](#) carried out an analysis of information use by scientists and engineers in the Petroleum Industry in Nigeria. A total of 324 scientists and engineers were surveyed using questionnaire to test hypothesis developed. Data was analyzed using frequencies, simple percentages, mean scores and correlation coefficient. The study found that scientists used libraries more frequently than engineers because libraries mainly used could not meet their information needs. [Mahapatra \(2006\)](#) studied the information needs of scientists and engineers in electronic environment in the Indian exploration and production industry. A total of 586 scientists, technologists and engineers habits on the use of electronic information resources/documents were surveyed. Questionnaire was used for data collection and analyzed using frequencies, simple percentages and graphical illustration. The need for current information on handling oil exploration and production was reported as their most important information need. The study reported that the information needs of scientists, engineers and technologists are based on the knowledge about existing sources of information and how easily accessible such sources are to them via electronic facilities.

[Joseph \(2008\)](#) studied the information and communication behaviour of petroleum geologists in the contiguous United States. The study investigated the technological changes that have impacted on the ways petroleum geologists seek and communicated information as it affects their operations in the petroleum industry. The study found that the digital

environment have contributed to sweeping changes in the petroleum industry that affect the ways petroleum geologists seek and communicate information in all areas of their work. [Hjelle and Montereo \(2011\)](#) presented a paper on the Tactics for Producing Actionable Information. A total of 30,000 Production and Reservoir Engineers in Eastern Europe was surveyed. Survey design with a combination of observation, interview and questionnaire was used to gather data from the respondents. The study found that Production and Reservoir Engineers rely heavily on vast amounts of information, e.g. seismic data, geological models, reservoir models, simulations, drilling logs, production measurements, intervention reports and process parameters, for their daily operations.

[Marcella, Pirie and Rowland, \(2013\)](#) studied the information needs and information seeking behaviours of oil and gas industry workers in the context of health, safety and emergency response: a discussion of the value of models of information behaviour. 375 oil and gas workers including petroleum engineers within the United Kingdom were surveyed using questionnaire and interviews as the main instrument for collecting primary data. Their study found that information behaviour models helped researchers to make sense of the data from applied, practice-based studies of information needs and use in the oil and gas industry. And most recently, [Abimbola and Emem \(2014\)](#) investigated the effect of gender on utilization of information resources by Engineers in Petroleum Industries in South-South, Nigeria. A total of 1572 engineers were surveyed using questionnaire as the main instrument for data collection. Findings revealed that Engineers' gender has significant influence on their utilization of information resources available and that female engineers utilize information more than their male counterparts. The study recommended that all engineers should be adequately sensitized on the significance of information in enhancing their productivity in their respective fields. But no study appears to have been carried out on the information seeking behaviour of petroleum engineers from a general point of view. In light of the above, a study of this nature is invaluable.

Materials and Method

A survey research design was adopted for the study. The population consist of 250 petroleum and gas engineers purposively sampled from four oil and gas companies currently operating in four States within the Niger Delta region of Nigeria. A questionnaire titled: *Petroleum Engineers Information Seeking Behaviour Questionnaire (PEISBQ)* was used as the main instrument for data collection. The questionnaire developed was given to two

experts in Library and Information Science and one licensed Petroleum Engineer from the Nigerian Society of Petroleum Engineers for face and content validation. Their suggestions and corrections made were carefully integrated in the final instrument for data collection. The 250 petroleum engineers were purposively sampled across the four companies based on their availability and accessibility for the purpose of data management. The questionnaire was issued to the respondents in their respective companies while in their offices with the help of one research assistant each who are staff of the companies in charge of duty roster and collected after three working days. Out of the 250 questionnaire distributed, 200 was returned and found suitable for data analysis (showing 80% rate of response). Data gathered was analyzed using frequencies, simple percentages and mean score count.

Table 1: Population and Questionnaire distribution of respondents

S/N	COMPANIES	No Distributed	No Returned	% Returned
1	NNPC Uyo, Akwa Ibom State	45	40	16
2	CHEVRONTEXACO Yenagoa, Bayelsa State	70	55	22
3	AGIP Port Harcourt, Rivers State	60	44	17.6
4	SPDC Warri, Delta State	75	61	24.4
	Total	250	200	80%

Results

Respondents were asked to indicate the types of information they spend time seeking on a four-point rating scale (Strongly Agree =4, Agree 3, Disagree 2, Strongly Disagree 1). Table 2 presents a summary of the replies that were received.

Table 2: Mean score Distribution of the types of information Respondents' spends time seeking

sn	What are the types of information you spend time seeking?	SA		A		D		SD		Mean	DECN
		f	%	f	%	f	%	f	%		
1	Oil and gas E&P information	95	47.5	59	29.5	40	20	6	3	3.3	Agree
2	Seismic prospecting information	220	77.1	30	10.6	12	4	23	8.0	3.5	Agree
3	Geological lab analysis information	208	72.9	16	5.6	31	10.8	30	10.6	3.4	Agree
4	Geochemical prospecting information	236	82.9	09	3.2	23	8.0	17	5.9	3.6	Agree
5	Petrochemical refining/extraction information	75	26.4	91	31.9	74	25.9	45	15.7	2.6	Agree
7	O&G project supervision information	177	62.2	29	10.2	59	20.7	20	7.1	3.2	Agree
8	Health and safety information	285	100	-	-	-	-	-	-	4.0	Agree
9	Welfare/promotion information	276	96.8	9	3.2	-	-	-	-	3.9	Agree
10	Training/development information	208	72.9	11	3.8	46	16.1	20	7.1	3.4	Agree

Results in Table 2 revealed that the respondents agreed on all items as the types of information they spend time to seek. However, the types of information they mostly seek is health and safety information 100%, oil and gas information 98.2%, personal welfare and promotion information which is ranked 96.8%, Geochemical prospecting information 82.9% and surveys/seismic prospecting information 77.1%.

Table 3: Respondents opinion on the purpose they seek information

S/N	For what purpose do you seek information as petroleum engineer?	f	%
1	To improve on work roles/duties and responsibilities assigned to me	42	21
2	To operate safely	67	33.5
3	To be updated on recent trends/development in the O&G industry	15	7.5
4	To execute a specific task assigned to me	28	14
5	To respond to emergency/difficult situations	32	16
6	To learn how to use modern ICTs in handling exploration/production	5	2.5
7	To prepare reports	11	5.5
	Total	200	100

As is evident from Table 3, a very high proportion of the respondents 67(33.5) seek information for the purpose of operating safely. However, the other three purposes, to improve on work roles/duties and responsibilities assigned, to respond to emergency/difficult situations and to execute a specific task received significant percentages of 42%, 16% and 14% respectively.

Table 4: Respondents opinion on the ways they seek desired information

S/N	What are the ways you seek information as petroleum engineer?	f	%
1	Asking immediate colleagues/expatriates about the information	71	35.5
2	Consulting the company intranet/IS about the information	27	13.5
3	Consulting/visiting the company library to get the information	7	3.5
4	Browsing the information via PC/Laptop/Smartphone/PDAs	30	15
5	Going through policy documents/contractor/suppliers manual for technical specifications	15	7.5
6	Consulting personal collections such as lecture notes	41	20.5
7	Consulting professional bodies/research institutes about the information	9	4.5
	Total	200	100

In Table 4 respondents were asked to indicate ways they used for seeking desired information. Majority of the respondents 71(35.5) seek information by asking immediate colleagues/expatriates about the information while 41(20.5%), 30(15) and 27(13.5%) respondents seek information by consulting personal collections, browsing the internet via PCs/Laptops/Smartphones/PDAs and consulting the company intranet/IS about the information respectively for this purpose.

Table 5: Respondents opinion on the sources of information they consult

S/N	What information sources do you consult when seeking information?	f	%
1	Company library/research institutes information resources	4	2
2	Petroleum and gas conference proceedings/seminars	12	6

3	Petroleum and gas trade literatures	21	10.5
4	Interpersonal communication with colleagues/expatriates	66	33
5	Petroleum and gas journal publications/Newspapers/Magazines	7	3.5
6	Petroleum and gas text/ebooks	2	1
7	ICTs Systems/Company intranet or Online databases via internet	30	15
8	Thesis/dissertations/research projects	4	2
9	Manufacturers/Suppliers/Standards/Specifications/Guides/Models	23	11.5
10	Professional Association/organizational standards and regulations	11	5.5
11	Television (TV)/Radio Programmes	-	-
12	Maps and Atlases/Technical Drawings	20	10
	Total	200	100

Table 5 revealed that majority 66(33%) of the respondents rely on interpersonal communication with colleagues/expatriates, ICTs Systems/Company intranet or Online databases via internet 30(15%), Manufacturers/Suppliers/contractors Manuals/Guides/Models 23(11%), Petroleum;gas trade literatures 21(10.5%) and Maps/Atlases/technical drawings as the major source they consult when seeking desired information.

Table 6: Respondents opinion on the problems they faced accessing desired information

S/N	What are the problems you faced in accessing desired information?	f	%
1	Lack of awareness on existing information sources	20	10
2	Reliability or credibility of an existing information source	54	27
3	Difficult company information access policy	10	5
4	Lack of information search skills	15	7.5
5	Lack of internet services in remote working sites	30	15
6	High cost of accessing certain technical information	25	12.5
7	Delays in accessing desired information from existing systems	35	17.5
8	Distance between company information centre and work sites	5	2.5
	Total	200	100

Table 6 revealed that the major challenge facing respondents' access to desired information is reliability or credibility of an existing information source 54(27%), this is followed by delays in accessing desired information from existing systems 35(17%), lack of internet services in remote working sites 30(15), high cost of accessing certain technical information 25(12.5%) and lack of awareness on existing information sources 20(10%).

Discussion of Findings

The types of information petroleum engineers spend time seeking

The study revealed that the types of information petroleum engineers spend time seeking mostly is health and safety information, oil and gas information, personal welfare and promotion information which is ranked, Geochemical prospecting information and

surveys/seismic prospecting information. [Srivastava \(1995\)](#) found that the basic information needs of petroleum engineers are geological/geophysical/geochemical information, drilling information, reservoir and production information, safety and environment information, petrochemical refining information etc.

The purpose petroleum engineers seek information

The result also revealed that petroleum engineers seek information for the purpose of operating safely, to improve on work roles/duties and responsibilities assigned, to respond to emergency/difficult situations and to execute a specific task. The oil and gas industry is noted to be the world riskiest industry due to the high level disasters that that has rocked the petroleum industry such as the Deepwater Horizon disaster in 2010 that caused the Gulf of Mexico oil spill and the 2012 Bonga Field Oil disaster in Nigeria, petroleum engineers seek information to operate safely. According to [Marcella, Pirie and Roland \(2013\)](#), safety is a topic that has been accorded a very high priority in the oil and gas industry in recent years most especially the Gulf of Mexico disaster in 2010 that placed the industry under the scrutiny of global media and political attention. As such the need to operate safely by staff including petroleum engineers is the overriding purpose for seeking information. Dalzell (2004) in accordance with this posited that staff must have access to sufficient information to do their job safely, concluding that knowledge is the greatest risk reducer.

The ways petroleum engineers seek desired information

The result also revealed that petroleum engineers seek information by asking immediate colleagues/expatriates about the information, consulting personal collections, browsing the internet via PCs/Laptops/Smartphones/PDAs and consulting the company intranet/IS about the information they need. [Marcella; Pirie, and Rowland \(2013\)](#) rightly observed that as with most information seeking behaviour including petroleum and gas workers, individuals tend to place great trust in informal sources, such as peers, and the ubiquitous recourse of surfing the Internet. Petroleum engineers discuss a lot when seeking desired information. During one of the reservoir management meetings a group of petroleum engineers met in a room with 6 workstations, all facing three projection screens on a wall trying to figure out what was going on a production challenge ([Hjelle and Montereio, 2011](#)).

The information sources consulted by petroleum engineers

The result revealed that petroleum engineers rely on interpersonal communication with colleagues/expatriates as the major source they consult when seeking desired information, closely followed by ICTs Systems/Company intranet or Online databases via internet, Manufacturers/Suppliers/contractors Manuals/Guides/Models, Petroleum and gas trade literature and Maps and Atlases/technical drawings. Interpersonal communication with colleagues remains the best and highest source of information to petroleum engineers especially reservoir and production engineers. They discuss a lot with one another by describing available data and information about a given tasks at hand. Reservoir description is a dynamic process which is repeated as soon as receiving the new information (Tayyebi, Chenani and Kashkooli, 2014). The leading reservoir engineer wanted to know from his colleagues how long it would take to get the damaged production equipment repaired or replaced, then the production coordinator informed that according to the last information he had, it would take several months (Hjelle and Montereio, 2011).

Problems faced by petroleum engineers accessing desired information

The result revealed that the major challenge facing petroleum engineers' access to desired information is reliability or credibility of an existing information source, delays in accessing desired information from existing systems, lack of internet services in remote working sites, high cost of accessing certain technical information and lack of awareness on existing information sources. The perceived value of oil and gas information to the petroleum engineers is related to the perceived credibility of the source they consult. Whatever suffers credibility and trustworthy, they will never go near such sources due to the sensitive role information plays in their work. In addition, if the information contains errors and/or inaccuracies that entail it cannot be trusted at face value (Hjelle and Montereio, 2011). According to Abdulsalami (2013) the problems engineers faced while seeking information are incomplete information, lack of relevant information and lack of time to search for desired information, the distance between work place and the information centre.

Conclusion

Due to high risk involve in E&P as commonly recorded across diverse operational regions recently, petroleum engineers spend time seeking health and safety information in order to do their job safely and this is the focal point of the main purpose they seek information. It can also be concluded that the major way petroleum engineers seek information is by asking immediate colleagues/expatriates about the information through

face-to-face communication, telephone conversation, videoconferences, e-mail or through social media. They also browse the internet and consulting the company intranet/IS about the information. These equally defined their source selection when seeking desired information. However, the major challenges petroleum engineers faced when seeking desired information is how credible and reliable is the source of information they consult in making critical decision. Since the major source of information they consult is interpersonal communication, they placed high premium on the reliability of the source. This is true because information seeking behaviour is often defined by the source people sought relevant information from.

Recommendation

1. The management of oil and gas companies libraries/information centres should make adequate provision of health and safety information for petroleum engineers to operate safely.
2. Company libraries/information centres should provide trade literatures, maps/atlas/technical drawings, reference sources and provide internet services that will make them to access online databases as these forms their major information sources.
3. Instructors or senior colleagues/expatriate responsible for providing information should strive to provide reliable and credible information that will not hinder their access to desired information.

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