

DEVELOPING PRESENT AND FUTURE SKILLS FOR THE OIL AND GAS INDUSTRY IN NIGERIA: AN ASSESSMENT OF THE CONTRIBUTION OF PETROLEUM TRAINING INSTITUTE (PTI), EFFURUN, TO DEVELOPMENT OF MANPOWER

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Abstract

The oil and gas industry is evolving, in response to technological advancement, and the industry is embracing digital technology, in terms of automation and artificial intelligence in its operation. Today's workforce more than ever before, requires advanced skills to be able to perform efficiently in the industry due to this shift in technology. The aim of this paper is to highlight various roles and responsibilities that the Petroleum Training Institute (PTI), Effurun, Nigeria, plays in high technological training and skills, as well as human resources development for the oil and gas industry. The study relied on modern organizational theory, along with quantitative and qualitative data generating methods, based on Focus Group Discussions and interviews. Participants were drawn from five selected oil and gas companies in the Niger Delta region. An assessment of the contributions of PTI, in developing the required skilled manpower for the oil and gas industry in Nigeria, and beyond was provided in the study, based on findings of the focus group discussions. Insights into the effectiveness of PTI and identified areas for improvement in delivering high technological training skills, and producing competent workforce professionals, were highlighted. Weaknesses of the Institute, with identified areas for improvement, were also reported. Our recommendation is that the Institute should incorporate emerging technologies, sustainability practices, industry demands and other global perspectives into its curricula and training methodologies, to meet future industry and national oil and gas industry career challenges.

Keywords: Artificial Intelligence, Automation, Manpower, Oil and Gas Industry, PTI, Technological Advancement.

Introduction

The oil and gas industry in Nigeria has undergone significant growth and development; however, there have been challenges in terms of development of manpower and acquisition of necessary skills and expertise. Lack of requisite skills and technical expertise has hindered the participation of small and medium-sized enterprises (SMEs) in the oil and gas industry, which has been attributed to a low level of local content implementation. The introduction of the Marginal Field Development Initiative and the Local Content Act by the Federal Government of Nigeria aimed to address these challenges and promote the inclusion of SMEs in the oil and gas industry. Institutions, such as, the Petroleum Training Institute (PTI) in Effurun, Delta State, Nigeria, have played a crucial role, in addressing the need for skilled labour in the oil and gas industry¹. PTI is involved in teaching, research, and development, in various areas, including, petroleum research

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¹ Akinwale, Y., Akarabiri, J. (2018). Factors influencing technology and innovation capability in the Nigerian oil firms. International Journal of Business Innovation and Research. <https://doi.org/10.1504/IJBIR.2018.10009763>.

and development. The Institute has been instrumental in providing training and development opportunities for personnel in the power sector, both in the technical and managerial aspects². The development of the oil and gas industry in Nigeria has been driven by the exploration and exploitation of crude oil, which has become a major source of income for the governments and citizens³, but there is a need to improve efficiency of resource used in the industry⁴. Technological innovation, and acquisition of technology-using skills, as well as, knowledge, have been identified as key factors in promoting efficiency in the industry⁵. As the energy sector transitions towards renewable and sustainable energy sources, it is important to identify the relevant skill sets that will be needed in the future⁶. An earlier study conducted in Nigeria, aimed at identifying the skill sets of oil and gas students and professionals that would be relevant to advancing a renewable and sustainable energy future; Okonofua⁷, highlighted that, there was need for a coordinated approaches from the government, industry, and academia, to facilitate a highly sustainable transition.

The Nigerian government has recognised the significance of Petroleum Engineering education in the development of the oil and gas industry⁸; while higher institutions of learning, especially, universities and polytechnics, have been established to provide training in Petroleum Engineering and related courses, these institutions aim to develop locally qualified Nigerians to operate in the oil and gas industry⁹. The Federal Ministry of Education is also involved in curriculum reviews, to foster sustainability in the industry¹⁰.

As technology advances and the oil and gas industry becomes increasingly complex, it is essential for educational institutions to provide high-quality training and skills development programmes that meet the evolving needs of the sector. One such institution is PTI, located in Effurun, Delta State of Nigeria. Founded in 1973, PTI has established itself as a premier institution for technical education in the petroleum sector. The Institute offers a wide range of programmes and courses, including Engineering, Geosciences, Drilling Technology, Petroleum Marketing, and Industrial safety, etc. By focusing exclusively on the oil and gas industry, PTI aims to provide students with specialised knowledge and skills that are directly applicable to the sector's demands.

The effectiveness of PTI's training programmes can be gauged by the employability of its graduates in the oil and gas industry, and beyond, while Alumni success stories and job

² Abdulahi, D. M., Renakappa, S., Oloko, D. (2021). Barriers for implementing solar energy initiatives in Nigeria: An empirical study. *SASBE*, 3(11), 647-660. <https://doi.org/10.1108/sasbe-06-2020-0094>.

³ Okonofua, E. S., Babatola, J. O., Ojuri, O. O., Lasisi, K. H. (2020). Determination of Suitable Tph Remediation Approach Via Manova and Inferential Statistics Assessment. *Remediation*, 3(30), 75-87. <https://doi.org/10.1002/rem.21647>

⁴ Agri, E. M., Kennedy, N. D., Bonmwa, G., and Acha, O. F. (2018). Technology innovation and sustainable entrepreneurship development in Nigeria: Stakeholders' Impact Assessment in Central Nigeria. *JEMT*, 3(21), 1-16. <https://doi.org/10.9734/jemt/2018/25512>

⁵ Agri, Ibid.

⁶ Okonofua, Ibid.

⁷ Okonofua, Cited.

⁸ Amadi, A. H., Okafor, P. C., Ola, V. D., Umukoro, P. O., Oluigbo, C. V., Robinson, D., ... & Ajayi, I K. F. (2022). Pedagogy of petroleum engineering in Nigeria. *EJEDU*, 3(3), 257-263. <https://doi.org/10.24018/ejedu.2022.3.3.370>.

⁹ Iyeke, S. D., and Bello, K. O. (2019). Petroleum engineering education in Nigeria: Development challenges and prospects. *International Journal of Petroleum and Petrochemical Engineering*, 1(5). <https://doi.org/10.20431/2454-7980.0501004>.

¹⁰ Amadi, Cited.

placement rates serve as crucial indicators of the Institute's effectiveness. PTI's reputation for producing skilled and competent professionals has led to its graduates being sought-after by leading companies in the sector. Furthermore, feedback from employers regarding the competence and performances of PTI graduates provide valuable insights into the quality of training imparted by the Institute, which is crucial, as rising skills shortages have become one of the main problems facing the oil and gas industry in Nigeria. To meet the rising demand, oil and gas exploration and production need to increase significantly in the coming years, and this requires more Petroleum Engineers and Scientists, Production Engineers, Drilling Crews, and Geoscientists. The supply of Technical Staff is however, by no means sufficient to meet demands, and increasingly, there are delays, even, as contracts must be renegotiated¹¹.

Many organisations face growing difficulties in meeting their schedules, as they have found out that simply paying higher salaries is not sufficient to secure enough qualified personnel. It is thus, important to assess the on-going efforts of PTI to adapt to industry advancements and emerging trends, as the Institute is expected to have mechanisms in place to review and update its programmes, and to also incorporate technological advancements, industry best practices, and environmental sustainability considerations. By continuously evolving and aligning its programmes with industry requirements, PTI can ensure that its graduates remain competent and relevant in the ever-changing oil and gas sector. The aim of this paper, therefore, is to assess the effectiveness of PTI in equipping students with the necessary technological training and skills required for successful careers in the oil and gas industry.

Statements of Problem

Nigeria's oil and gas industry is a critical sector that contributes significantly to the country's economy; however, the industry faces challenges in terms of developing and maintaining a skilled workforce with the necessary present and future skills. This hinders the industry's growth, efficiency, and ability to adapt to changing technologies and market demands. One of the key institutions addressing this work-force issue is the PTI. PTI plays a crucial role in providing training and development opportunities for personnel in the oil and gas industry. Meanwhile, it is essential to assess the effectiveness of PTI's contributions to the development of manpower in the oil and gas industry. The problem statements revolve around the need to evaluate the extent to which PTI training programmes align with the present and future skills required in the oil and gas industry, for assessments that will help in identifying the gaps or areas of improvement in the training provided by PTI.

Additionally, it will determine the effectiveness of PTI in equipping graduates with the skills necessary to meet industry demands. Furthermore, the problem statements will also address the need to evaluate the impact of PTI training programmes on the overall development of manpower in Nigeria's oil and gas industry. This assessment examines whether PTI graduates are adequately prepared to contribute effectively to the industry and meet the industry's manpower needs. By conducting a comprehensive assessment of PTI's contribution to the development of manpower in the oil and gas industry, policymakers, industry stakeholders, and PTI itself, can identify strategies to enhance training programmes, and bridge any skill gaps.

¹¹ Financial Times (October 4, 2007). A shortage of skilled staff hits oil projects. *Financial Times*, London.

The proposed evaluation of this study will also provide insights into the future skills required in the industry and help PTI align its training programmes. In conclusion, the problem statement will focus on assessing the contributions of PTI Effurun, to the development of present and future skills, for the oil and gas industry in Nigeria. By evaluating the effectiveness of PTI training programmes and their impact on the industry's manpower development, stakeholders can identify areas for improvement, and ensure that the industry has the skilled work-force capable of meeting various evolving needs.

Literature Review

Technology can be defined as the systematic knowledge for the manufacture of a product, the application of a process or the rendering of a service, whether that knowledge be reflected in an invention, an industrial design, a utility model, or a new plant variety, or in technical information or skills, or in the services and assistance provided by experts for the design, installation, operation or maintenance of an industrial plant or for the management of an industrial or commercial enterprise or its activities¹². For Alleyne¹³, Petroleum Technology is the systematic and formulated knowledge about the industrial art, in the field of petroleum, which can change because of research that led to new discoveries. Petroleum Technology has two aspects: the tangible and the intangible. The intangible relates to knowledge, skill, and the ability to use knowledge to repair; maintain, and create modifications and innovations of the physical assets, which are imported; while the tangible aspect is the physical embodiment of technology - the equipment, tools, machinery, and plant.

According to Okwelum¹⁴ technology transfer is first and foremost a transfer of knowledge, but not just of a finished product that embodies high technology. A transfer occurs when a technological application that has been developed and applied by one organisation is utilised, and effectively applied by another organisation. For a transfer to be successful, the personnel of the recipient organisation must be capable of applying the knowledge transferred, by virtue of adequate education. In other words, education forms the bedrock upon which the drive for technology transfer can be predicated. It also requires continued education by way of in-service training and retraining. Furthermore, technology transfer does not lie solely with the industry, but through the processes of training, and adequate exposure to same. A transfer of only one aspect of technology does not meet the goal of technology transfer or solve the dependency syndrome.

The transfer of petroleum technology from the international oil companies to Nigeria is one of the most complex issues confronting the nation in the oil and gas sector. Although State participation in the industry has been achieved, the management and technical knowledge of the industry is still controlled by the international oil companies. The issue, therefore, is whether the nation should rely on the oil companies, being the principal experts and custodians of Petroleum Technology, for the conveyance of Petroleum Technology to her or whether it should make efforts, devise programmes, and create arrangements, which compel transfer of technology.

¹² Omorogbe, Y. (2003). Oil and Gas in Nigeria, (Lagos: Malthouse, 2003) at 158-159.

¹³ Alleyne (cited in Atsegbua, L. 2004). Oil and Gas law in Nigeria: Theory and Practice, 2nd Ed. Benin: New Era Publications.

¹⁴ Okwelum, C.O (2002) Critique of manpower development in oil and gas sector of Nigeria. International Journal of Law and Politics & Humanities Research (Published by Cambridge Research and Publications), IJHSS ISSN-1640-7277, Vol. 25 No. 4.

Technology transfer is ordinarily not in the interest of the owner organisation, thus, its quest has the potentials of giving rise to an adverse relationship between the economic power of the multi-nationals, and the political sovereignty of developing nations, not only because the ultimate goal of technology transfer is the control of all the phases of the industry, which no doubt is at cross purposes with the ultimate goal of the multi-national oil companies, but because the owner must have invested in terms of money, research, resources, time, and energy, to develop a technology which may not be adequately compensated; whereas, the recipient state or organisation may hanker to acquire a technology with ease, and as some may advocate, may steal the technology¹⁵.

According to Alegimenlen¹⁶, another reason for monopoly in technological acquisition is traceable to the sophisticated and capital-intensive nature of technology, which changes rapidly and becomes obsolete quickly because of the fast-growing and changing nature of the industry, and the need to find new ideas to deal with the changes. In their work on *Oil and Class Struggle*, Nore and Turner¹⁷ canvassed that oil companies should resist technology transfer as part of their efforts to avoid displacement in the industry. The companies, according to the authors, strive to block entry into the downstream operations, by creating obstacles to transfer technology, as a transfer of petroleum technology seems not profitable to the oil companies, nor does it further their main concern, which is to extract oil, in making profit. Moreover, the national companies are viewed in the light of potential competitors, and disrupters of market shares and profits in the industry, thus the multi-nationals are reluctant to transfer technology, managerial skills, and their development policies; thereby, making the host-nations technologically dependent.

- i) According to Atseugba,¹⁸ the clamour for technology transfer is actuated by the desire of the host-state to fulfil the principles of permanent sovereignty, and control of the oil industry by the State. Meanwhile, a nation that cannot boast of its operational technology, to run its oil industry cannot effectively assert its sovereign rights over its mineral resources. As a matter of fact, at the base of the sovereign rights of a state over its mineral resources is technology, and it is also fundamental to note that, the responsibility for transfer of technology does not lie on oil companies, since it does further their interests. In the light of the fact that the international oil companies would not readily transfer petroleum technology to the host-state, which needs same for its economic growth and political autonomy under market economy dictated by the invisible hands of demand and supply, the host-state has to recourse to legal regimes and regulations, to compel transfer of technology from the international oil companies to the host-state.

As postulated by Shell, a leading player in the Nigerian oil and gas industry, oil technology is driven by five imperatives, to:

- (i) maximise long term production;
- (ii) access new hydrocarbon reserves;
- (iii) drive down unit costs;
- (iv) reduce negative impact on the society and the environment, and

¹⁵ Okwelum, Ibid.

¹⁶ Alegminelen, O. A. (1999). Issues in the acquisition of petroleum development technology for third world states, OPEC review Vol. XV No. 2.

¹⁷ Nore, P and Turner, T. (1980). *Oil and Class Struggle*. London: Zed Press, 199-200.

¹⁸ Atsegbua, L. (2004). *Oil and Gas Law in Nigeria: Theory and practice*, 2nd Ed Benin: New Era Publications.

- (v) use the most appropriate technologies.

In these five directions, the oil industry technology must be actuated to benefit from the heavily funded world-wide technology research efforts, and the best-practice process sharing, to attain world-class performances. Atseugba¹⁹ however, affirmed that the best way to bring technology is, to bring people into Nigeria to work for a long time. Similarly, Nathaniel²⁰ concentrated on developing Nigeria's oil and gas industry's technological capabilities, and among other things, the study's goal was to pinpoint, and examine the factors that influence the development of technological capabilities in Nigeria's oil and gas sector. The study's approach included a thorough literature search that was augmented by interviews conducted, as well as industrial and organisational visits. According to the obtained report, creating partnerships and alliances is crucial for the growth of the oil and gas sector, particularly, when the necessary funding and local technical expertise are few.

In their own research work, Mohamed and Barjoyai²¹ investigated the effects of technology transfer in the oil and gas industry of the Libyan economy from 1996 to 2010. To better understand how technology transfer affected the overall economy during the time, both quantitative method (based on focus group discussions and interviews with some of the major stakeholders in the oil and gas business), and qualitative method (time series data of several important economic indicators in the oil and gas industry), were employed. NVivo9 software was used to analyse the qualitative data, while the Statistical Package for Social Science (SPSS) software was utilised to analyse the quantitative data. It was discovered from the study that, the Libyan oil and gas industry, and various other sectors of the national economy were negatively or favourably impacted by technological transfer.

Gaps in the Literature

Many of the cited works only discussed theories and concepts relating to technology transfer, but there is a scarcity of empirical studies providing concrete data and analysis on the actual transfer processes and outcomes in the Nigeria's oil and gas industry. More empirical research is needed to understand the effectiveness of technology transfer initiatives and their impact on the development of the Nigerian oil and gas industry.

Also, while some studies mentioned PTI in their literature reviews, there is limited exploration of its specific contributions to developing manpower and facilitating technology transfer in the oil and gas sector. Further investigation is therefore needed into PTI's programmes, partnerships, and success stories that could provide valuable insights into its critical role in addressing skill gaps and supporting the oil and gas industry's development in Nigeria.

Some of the studies researched also briefly touched on the socioeconomic impacts of technology transfer, there is also the need for more comprehensive research on how technology transfer influences employment, income distribution, local business development, and overall economic growth in Nigeria's oil and gas sector. Understanding

¹⁹ Atsegbua, Cited.

²⁰ Nathaniel, C. O. (2008). Technological Capacity Building in the Nigeria's Oil and Gas Industry. *Proceedings of the 19th Annual International Information Management Association, San Diego, CA*

²¹ Mohamed, M. M. A and Barjoyai, B. (2013). The effect of technology transfer on human resource development in oil and gas industry. *Human Resource Management Research*, 3(3): 91-94.

these impacts is crucial for assessing the effectiveness and sustainability of technology transfer initiatives.

The study by Sambo²² highlights the importance of information literacy skills for students of PTI. However, there is limited discussion on how these skills relate to technology transfer and workforce development in the oil and gas industry. Exploring the integration of information literacy training with technical education could enhance students' ability to adapt to new technologies and contribute effectively to the industry.

This research is therefore geared towards addressing these gaps in literature and it would provide a more comprehensive understanding of the challenges and opportunities associated with technology transfer and skills development in Nigeria's oil and gas industry, particularly in relation to the role of training and research which PTI does in providing competent manpower for the oil and gas industry in Nigeria, presently and in the future.

Theoretical Framework

Human capital theory of Schultz²³ is the theoretical foundation for majority of research works in the field of education^{24 25 26 27}; thus, human capital theory also served as the theoretical foundation for this study. According to Armstrong²⁸, a company's human capital consists of the knowledge, abilities, and skills of its employees, having assumed that education or training has the potential to stimulate economic growth, technological advancement, and productivity because it transfers useful knowledge, dexterities, and skills for better lifetime earnings. From a different angle, Klein, and Cook²⁹ claimed that investing in people is a sort of human capital that stimulates social transformation. Hands-on human capacity can as such, be improved by education, training, experience, health care, and other factors, just like other types of human capital³⁰.

Human capital theory's basic assumption is that individuals who make up oil and gas companies each have a unique set of skills and competencies that must be identified, developed, and maintained. Based on this present study's application of the afore-

²² Sambo, A.S., Enite, A., Urhefe, C. and Lawal, M (2022). Influence of information literacy skill on Petroleum Training Institute (PTI) students 'use of electronic resources: Library overview. https://researchgate.net/publication/363474870_Influence_Of_Information_Literacy_Skills_On_Petroleum_Training_Institute_Pti_Student_Sambo_et_al_INFLUENCE_OF_INFORMATION_LITERACY_SKILLS_ON_PETROLEUM_TRAINING_INSTITUTE_PTISTUDENTS%27_USE_OF_ELECTRONIC_RESOURCES

²³ Schultz, T.W. (1975). *Investment in human capital: The role of education and of research*. New York: Free Press.

²⁴ Becker, G. S. I. (1964). Human capital. Columbia University Press.

²⁵ Schultz Ibid.

²⁶ Robert, B. (1991). Economic growth in a cross section of countries. *Quarterly Journal of Economics*, 106(2), 407-414.

²⁷ Ladipo, M. K., Akhemonkhan, L. A. and Raimi, L. (2013). Technical vocational education and training (TVE) as a mechanism for sustainable development in Nigeria (SD): Potentials, challenges, and policy prescriptions. Presentation at CAPA International Conference held in Bangui, The Gambia, June 3-8.

²⁸ Armstrong, M. (2009). *Armstrong's handbook of human resources management practice* (11th Ed.) Kogan Page.

²⁹ Klein, P. O. and Cook, M. L. (2006). T. W. Schultz and the human capital approach. *Review of Agricultural Economics*, 28: 344-350.

³⁰ Akhemonkhan, I., Raimi, L. and Dada, J. O. (2014). Impact of quality assurance on technical vocational education and training in Nigeria. *Afro Asian Journal of Social Sciences*, 5(5/2), 1-25.

mentioned principle, oil workers must have the necessary expertise to run the businesses of the oil and gas industry, especially, given that, it is the backbone of the Nigerian economy. On the other hand, Bontis³¹ stated that human capital reflects the human aspect of the firm; their knowledge, abilities, and skills provide the company with a distinguishing advantage over its rivals; suggesting that, competence is an ability that every organisation needs to fulfil its aims. According to McKinsey and Company³², businesses need the appropriate and pertinent skills required by that sector of the economy to survive, and additionally, reflected the human capital, or possibly, the human resources that comprise the Nigerian oil and gas companies. Monday³³ also conducted a study on local content policy. Human capital development, and sustainable business performance in the Nigerian oil and gas industry. In the study, he concluded that local content policy had achieved significant success in enhancing the development of human capital, which in turn positively influenced business performance of indigenous companies in the oil and gas industry in Nigeria.

Kingston and Frank-Igwe³⁴ conducted a study on the negative effects of petroleum gaming on Nigeria's institutional and legal regimes. The central goal of the paper was to unmask the fundamental reasons for the ineffectiveness of all the Nigerian laws that are supposed to regulate and control the oil and gas enterprises. The paper presented the game theory effect, which weighed the parties' rational choices that led to perpetual loss in position of the Nigerian government, to the effect the loser in the game were compelled to lower standards, and weaken her laws, to accommodate the winners' investment preferences. It argued that the irrational choice of the Nigerian government, which created laxity in the laws to accommodate the oil companies, was a race to the bottom, with consequential permanent damages to the growth and development of the national economy. Among others, the paper highlighted the effect of weak regulatory regimes on oil profit, royalty receipts, and environmental protection. It was thus, recommended that, Nigeria should develop local manpower, and task the universities, to produce Indigenous personnel capable of replacing the foreign expertise in the oil and gas sector.

Agwu and Ogiriki³⁵ discussed Human Resource Development (HRD) and organisational performances in the Nigeria Liquefied Natural Gas Company limited, Bonny, Rivers State, Nigeria. HRD was viewed as the integrated use of training and development, organisational development, and career development, to improve individual, group, and organisational effectiveness. It was also assumed that HRD practices directly or indirectly enhance business performance, through improvement in employees' skills, attitudes, and behaviour. The research question of the study of Agwu and Ogiriki³⁶ further addressed the extent of the relationship between HRD practices (training and development), and

³¹ Bontis, N., Dragonetti, N. C., Jacobson, K., and Roos, G. (1999). The knowledge toolbox: A review of the tools available to measure and manage intangible resources. *European Management Journal*, 17(40). 391-402.

³² McKinsey and Company (2001). *The war for talent*. McKinsey & Company.

³³ Monday, J. (2015). Local content policy, human capital development and sustainable business performance in the Nigerian oil and gas industry. *The Journal of Men's Studies*. <https://doi.org/10.5539/JMS.V5N1P75>.

³⁴ Kingston, P., and Frank-Igwe, U. (2019). The negative effects of petroleum gaming on Nigeria's institutional and legal regimes. *Energy Policy & Economics Journal*.

³⁵ Agwu, M., and Ogiriki, T. (2014). Human resource development and organizational performance in the Nigerian Liquefied Natural Gas Company Limited, Bonny. *The Journal of Men's Studies*. <https://doi.org/10.5539/JMS.V4N4P134>.

³⁶ Agwu and Ogiriki Ibid.

increased employees' motivation, commitment, and organisational productivity in the Nigeria Liquefied Natural Gas Company Limited, Bonny. Other findings from the analysed data of the study indicated that, significant relationship existed between HRD practices (training and development) and increased employees' motivation, commitment, and organisational productivity in the Nigeria Liquefied Natural Gas Company Limited, Bonny. It was therefore, recommended among others, that there should be review of current training and development procedures, regular appraisal of employees' job skill requirements, regular staff training and development, regular improvement of employees' conditions of service, and sustenance of current team building efforts and incentive schemes.

Akinwale³⁷ investigated the factors influencing technology and innovation capabilities in Nigerian indigenous oil and gas firms. Primary data were collected using questionnaires, to elicit information from 150 indigenous oil firms. Results of the ordered logit regression showed that, the extent of the firm's Research and Development (R&D) captured by in-house R&D and R&D fund allocation were significant at 10% level of significance. Also, work experience of staff, qualification of staff, and size of technical staff, which captured human and knowledge capital of firm were significant in influencing the firms' technology capabilities. Acquisition of advanced machinery, firm's size, and age, as well as training, were also significant in influencing technology capabilities of indigenous oil firms. The study however, suggested that both government and industry should ensure improvement in extensive training, R&D, and education of the workforce, to enhance local capabilities in oil and gas field development.

Methodology

This present study adopted a survey design, which involves collection of information from primary sources and Focus Group Discussion (FGD), as key methodology. FGD is an organised informal discussion with the intent of acquiring in-depth data on a particular topic, as a means of achieving full participation by respondents and full control of the data-gathering process by the researcher. The usefulness of the FGD in this present study, as Gibbs³⁸ earlier described it, was to draw upon the respondents' attitudes, feelings, beliefs, experiences, and reactions about the matter under investigation. In determining the participants in the FGD, a non-probability criterion-based purposive sampling was used to select 25 participants, to achieve symbolic representation and diversity. The selection was based on specified characteristics such as, being a graduate from any programme at PTI or playing supervisory role to graduates of PTI, in any of the selected oil companies in the Niger Delta Region.

Focus Group Discussions were held with five groups of five respondents, each based on the five selected oil companies, which have engaged graduates of PTI. The purpose of the FGD was to elicit information on views of participants on evaluating the effectiveness of the PTI in providing high technological training and skills for the oil and gas industry, with futuristic agenda. Findings derived could possibly create an enriched learning environment that promotes skill acquisition and prepares students at the PTI for successful careers in the oil and gas industry. The data collected from the FGD(s) were analysed

³⁷ Akinwale, Y. O. (2018). Empirical analysis of inbound open innovation and SMEs performance: Evidence from oil and gas industry. *SAJEMS*, 1(21). <https://doi.org/10.4102/sajems.v21i1.1608>.

³⁸ Gibbs, A. (1997). Focus groups. *Social research update*. (On-line). Issue Nineteen. University of Surrey. <https://www.soc.surrey.ac.uk/sru/SRU19.html>.

using content analysis technique, known as NVIVO – a Computer Assisted Qualitative Data Analysis (CAQDAS) package. The software facilitated the construction of a coding index for identifying key words, phrases, themes, and patterns that emerged from the discussions.

Table 1: The profile of participants in the Focus Group Discussions

Oil Company	FGD Code	Location of FGD	Gender of Participants
Agip Oil	Agip 1	Port Harcourt	M
	Agip 2	Port Harcourt	M
	Agip 3	Port Harcourt	F
	Agip 4	Port Harcourt	F
	Agip 5	Port Harcourt	M
Nigerian Petroleum Development Company (NPDC)	NPDC 1	Benin City	M
	NPDC 2	Benin City	F
	NPDC 3	Benin City	F
	NPDC 4	Benin City	M
	NPDC 5	Benin City	M
Chevron	Chevron1	Warri	M
	Chevron 2	Warri	M
	Chevron 3	Warri	M
	Chevron 4	Warri	F
	Chevron 5	Warri	F
ExxonMobil	Mobil 1	Uyo	F
	Mobil 2	Uyo	M
	Mobil 3	Uyo	M
	Mobil 4	Uyo	M
	Mobil 5	Uyo	M
Shell Petroleum Development Company (SPDC)	SPDC 1	Port Harcourt	F
	SPDC 2	Port Harcourt	F
	SPDC 3	Port Harcourt	M
	SPDC 4	Port Harcourt	M
	SPDC 5	Port Harcourt	M

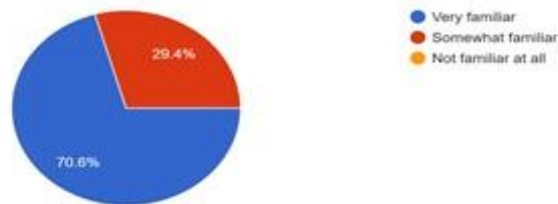
Data Analysis and Discussion of Findings

a. Results

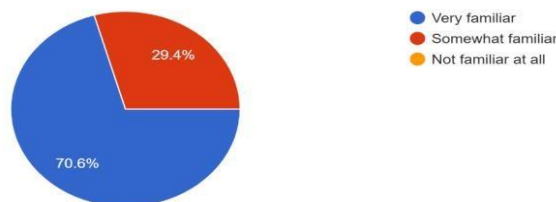
After processing the results arising from the discussions of each Focus Group, the views presented to the interlocutors, were synthesised statistically for each question. It was specified that any opinion expressed was not circumvented in this study, and the findings were consistent with the succession of questions in the interview guide.

How familiar are you with the PTI?

1. How familiar are you with the Petroleum Training Institute (PTI), Effurun?
17 responses



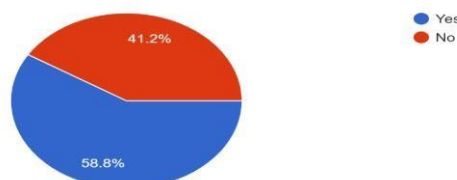
1. How familiar are you with the Petroleum Training Institute (PTI), Effurun?
17 responses



To this question, 70.6% answered that they were familiar with PTI, while 29.4% said that they were not familiar with the Institute. According to some discussants, PTI is a recognised Institute that provides technical and vocational education in various areas, including Engineering, Petroleum Technology, and related fields. Some also noted that while PTI offers programmes that are relevant to the oil and gas industry, it is not exclusively focused on training manpower specifically for that sector. Opinions of the discussants regarding their familiarity with the PTI varied.

Have you attended any training programme or course offered by PTI, Effurun?

2. Have you attended any training programs or courses offered by PTI, Effurun?
17 responses



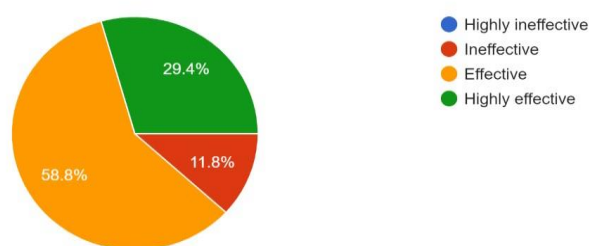
More (58.8%) of the participants declared that they have attended some form of training programme or course at PTI, while 41.2% of the participants said they had not attended

PTI for any course or programme. Some participants had positive opinions about PTI because it offers specialised training in the petroleum industry, which enhanced their career prospects. They also appreciated the practical knowledge and skills gained during their tutelage at PTI.

If you have attended training programme at PTI, please rate the effectiveness of the training programme in providing high technological training and skills for the oil and gas industry?

3. If you have attended training programs at PTI, please rate the effectiveness of the training in providing high technological training and skills for the oil and gas industry.

17 responses

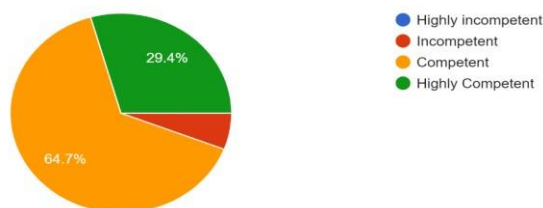


To assess the effectiveness of a training programme at PTI, it is important to consider feedback from its past students and industry professionals who can provide insights into the quality of education, relevance of the curriculum, practical training opportunities, and the overall career preparation in readiness for employment in the oil and gas industry. Just 29.4% of participants agreed that PTI was highly effective in providing high technological training and skills for the oil and gas industry, while 58.8% said PTI was effective in career preparation. A total of 88.2% of participants agreed on the effectiveness of PTI in providing high technological training and skills for the oil and gas industry, while 11.8% of participants did not view training at PTI as being effective. Some of the discussants also highlighted the programme's track record of producing skilled professionals who have successfully transitioned into the industry and contributed significantly to their respective roles. In their views, the training programme at PTI effectively equipped individual student with the necessary knowledge and skills to excel in the technology-driven oil and gas industry.

How will you rate the level of technological competence of PTI graduates at your establishment?

5. How would you rate the level of technological competence of PTI graduates at your establishment?

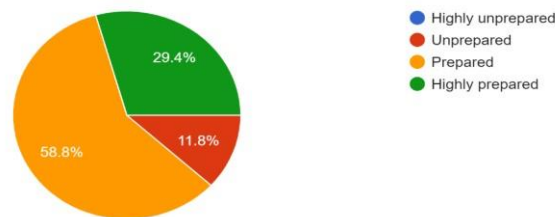
17 responses



PTI aims to equip its graduates with the necessary knowledge and skills to excel in their chosen career fields. In attempting to investigate the technological competence of PTI graduates at their workplaces, 94.1% of participants believed the level of technological competence of PTI graduates was high; thereby, giving positive ratings about the technological competence of PTI graduates, and only 5.3% stated otherwise.

In your opinion, how well are PTI graduates prepared for the future technological requirements of the oil and gas industry?

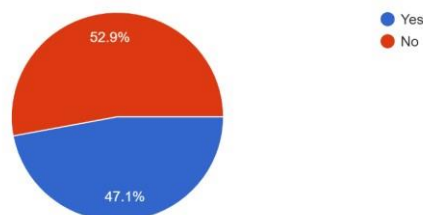
6. In your opinion, how well are PTI graduates prepared for the future technological requirements of the oil and gas industry?
17 responses



Most (88.2%) of the participants considered PTI graduates as well-prepared for future technological requirements of the oil and gas industry, and just 11.8% presumed the PTI graduates as not well-prepared for future technological requirements of the oil and gas industry. One of the ways of assessing how well PTI graduates are prepared for the future technological requirements of the oil and gas industry is to evaluate whether the curriculum of PTI covers the latest technological advancements and industry trends in the oil and gas sector. Practical training is essential for students to develop the skills required for the oil and gas industry, and in that regards, some of the discussants also noted that PTI offers hands-on training opportunities, access to modern laboratories, and industry-standard software and equipment.

Have you observed any specific area or specialisation on emerging technologies relevant to the oil and gas industry where PTI graduates are deficient?

7. Have you observed any specific area or specialization on emerging technologies relevant to the oil and gas industry where PTI graduates are deficient?
17 responses



As a result of emerging technological trends in the oil and gas industry globally, it is important to note that the oil and gas industry is vast and continuously evolving, and there are emerging technologies that are relevant to the oil and gas industry. In this present study as well, 52.9% of participants opined that PTI graduates were deficient or lack knowledge in certain areas or emerging technologies relevant to the oil and gas industry; however, 47.1% believed PTI graduates were not deficient. The specific areas of deficiency may vary though, based on individual skill sets, and the curriculum of the PTI

Effurun programmes. In addition, there seemed to be lack of expertise in data analytics and interpretations. Some participants felt that PTI graduates were not adequately equipped with the necessary skills to analyse and interpret large datasets generated by emerging technologies, such as, sensor networks and IoT devices. Some of the participants believed that graduates should receive more training in data analytics, to optimise production and decision-making processes.

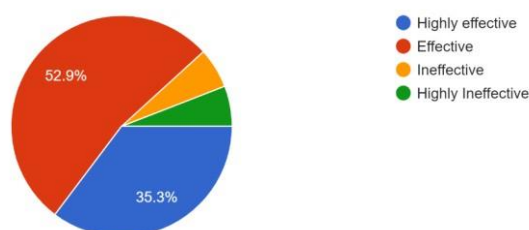
If your answer to 6.6 is Yes, please specify.

There are a few areas where emerging technologies are increasingly important in the oil and gas industry, which were also attested to by some of the participants, during the focus group discussions. Based on the submissions of some of the participants, emerging technologies relating to electronic data processing, like data acquisition and monitoring, digital twin technology, cloud computing, big data, artificial intelligence, data science, machine learning, etc., do have significant relevance and impact on PTI graduates, as valuable skills that can significantly enhance their career capabilities in the oil and gas industry. The discussants further claimed that information technology plays a vital role in the oil and gas industry, by enabling efficient operations, improving safety, and optimising exploration and production activities.

It was however, documented that, most of the equipment required for effective training were not functional, while some new ones were not put to use, due to lack of manpower to operate them; which made PTI graduates of several years ago, being much better, as they had access to necessary equipment, and very skilled personnel to train them. It was therefore, suggested that, while there may be insufficient knowledge on the afore mentioned at PTI, Effurun, it is essential to recognise their potential benefits, and consider ways to incorporate these skills into the curricula. Improving industry attachment programmes (internships or practical training), as well as expertise in industry skills like, technological skills on Compressed Natural Gas (CNG) also considered as indeed, being able to enhance the quality of graduates from PTI, Effurun.

How effective has PTI products been in incorporating practical hands-on training with modern technologies in your establishment?

9. How effective have PTI products being in incorporating practical hands-on training with modern technologies in your establishment?
17 responses



A key finding in the present study as well is that, incorporating practical hands-on training into modern technologies have had tremendous benefits for PTI graduates. This was exhibited in the obtained data. At least, 88.2% of the participants agreed that PTI graduates effectively incorporated practical hands-on-training with modern technologies in their places of work. A small fraction (11.8%) of the participants however claimed that PTI

graduates did not effectively incorporate practical hands-on-training with modern technologies in their places of work. According to post-training assessments of PTI graduates, some shortcomings were observed concerning competence in emerging technologies and industry trends in respect of keeping up with the rapidly evolving oil and gas sector. Suggestions were thus provided on PTI-industry collaborations and partnerships, to ensure that curricula and training align with the latest industry needs.

In your opinion, what areas or technologies should PTI focus on to better prepare its graduates for the future technological demands of the oil and gas industry?

In response to suggestions on areas of technological advancements that PTI Effurun could focus on, to better prepare its graduate for future technological demands of the oil and gas industry; new global technological innovations and digitalisation, were mostly listed. Preferences were given to digital skills, data analytics and science, sustainability, and artificial intelligence, industry-based techniques on petrochemicals, renewables, decarbonisation, and assets surveillance and protection. Moreover, ethical modes of conducting examinations were among the suggestions provided in this study; but, at the same time, there were tremendous calls for proper funding of PTI, by all concerned stakeholders, particularly with regards to competent staff, curricula, infrastructures, and equipment, in order to make PTI an internationally recognised hub for oil and gas in West Africa, and Africa in general. There were also, specific calls for highly relevant short and long-term courses.

Additional key findings that emerged from the Focus Group Discussions were that PTI's curricula and training programmes are designed to cater specifically for the needs of the oil and gas industry, with a wide range of courses covering Drilling Operations, Production Engineering, Petroleum Geosciences, Refining, and Petrochemical Engineering, Health Safety and Environment, etc. By focusing on industry-relevant subjects however, PTI ensure that its graduates are equipped with the necessary skills and knowledge to meet the demands of the oil and gas industry. It was as well reported that PTI placed strong emphasis on practical training and hands-on experiences. The Institute provides state-of-the-art facilities and equipment that allow students to gain practical experience in various industry-related tasks, while the practical exposures are vital in preparing individual graduate for the real-world challenges they would later encounter in their careers. PTI's commitment to practical training is expected to bridge the gap between theoretical knowledge and practical applications; thus, enhancing employability of its graduates.

The oil and gas industry is continually evolving, due to technological advancements, environmental concerns, and changing market dynamics; so, PTI recognises the need for ongoing learning and adaptation. The Institute emphasises students and faculty members' research and innovations that addresses industry challenges and explore new technologies; thereby, encouraging students to stay updated with the latest industry trends and emerging technologies, with focus on continuous learning that equips graduates.

Conclusion

The oil and gas industry plays a critical role in the global economy, and the need for a skilled workforce is paramount to its success, and as the industry evolves, the demand for high technological training and skills becomes increasingly important. The Focus Group Discussion in this study provided an assessment of the contributions of Petroleum

Training Institute, Effurun in developing the required skilled manpower for the oil and gas industry in Nigeria, and beyond. By analysing factors such as, curriculum relevance, industry collaboration, faculty qualifications, facilities, alumni success, and continuous learning; provides further insights into the effectiveness of PTI Effurun. The study also identified areas for improvement in the delivery of high technological training skills by the Institute. The study also showcased areas of weaknesses of the Institute with the potentials for improvement.

Ultimately, the findings of this study will help inform Top Management of PTI on strategies to enhance the Institute's contribution to the growth and development of the manpower of the oil and gas industry in Nigeria, and beyond.

Recommendations

Recommendations based on this study included a comprehensive digital deployment for teaching and learning at PTI, to measure up to global competition in technological skill and knowledge production. The Institute is also expected to incorporate emerging technologies, sustainable/sustainability practices, industry demands and other global perspectives into its curricula and training methodologies, for futuristic career challenges. The Institute should, therefore, focus on training students in areas like renewable energy, carbon capture, and digitalisation, to ensure her graduates remain competitive in the evolving global career market of the oil and gas industry. By staying responsive to the evolving industry landscapes, PTI can ensure its graduates are well-prepared for the future challenges and opportunities in the oil and gas sector. It is also recommended that the Institute is due for another upgrade in all ramifications by the Petroleum Technology Development Fund to enable the Institute to continue to meet its mandate of providing competent technological manpower for the oil and gas industry now and un the future.