



ISSUES IN GEOSCIENCE EDUCATION IN NIGERIA

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Introduction

Nigeria has proven oil and gas reserves of about 36 billion barrels and 187 trillion cu ft respectively and has the capacity to produce more than 2.6 million barrels per day. The country is the largest oil producer in Africa, 6th in OPEC and 11th in the world¹. Nigeria also has the 10th largest gas reserve in the world. The nation's oil and gas sector generates about 80% of government revenue and almost 95% of Nigerian foreign exchange.

Even with the vast mineral oil resources, it is not well with the Nigerian oil and gas industry. Not much has been done to develop the appropriate human capital and technology to enable the nation take its rightful place in the comity of oil and gas producers. More than fifty years after commercial production of petroleum started in Nigeria, the nation still depends on foreign multinational oil exploration and production companies and foreign service companies to run the industry. It is only just now that local indigenous companies are venturing into production of marginal field and even that is done with foreign technical partners with the locals playing mainly supporting roles. This paper examines the challenges in the development of the industry and proffers solution to dealing with the challenges.

At the Roots of the Challenges

The contribution of this sector to the nations gross domestic product (GDP) shown in Table 1 is relatively low. The GDP reflects the real value of any sector. Life is about uplifting the dignity of every citizen and not just a select few. This probably is part of the genesis of the Niger Delta crisis.

Egbogah² highlights the major challenges in the Nigerian oil and gas sector, which include:

- Funding
- Weak national manpower development
- Very low participation of competent Nigerians in the industry (Nigerian content)
- Niger Delta problems
- Weak regulation and policy enforcement
- No credible gas and energy policy
- Non-existence of research and development technology application, business development and marketing, hence no technology development.

Table 1: Contribution of various Sectors to our GDP (Billions of Naira)

<i>Sector</i>	<i>Year</i>		<i>Percentage Change</i>
	<i>2005</i>	<i>2006</i>	
Agriculture	231.46	248.05	7.2
Petroleum Industry	136.35	129.18	-5.2
Building and Construction	8.54	9.58	12.2
Wholesale and Retail	77.2	87.90	13.9
Services	85.48	93.03	8.8
Total	561.93	593.57	0.56
Non-Oil Sector	425.59	463.59	8.9

Source: Central Bank Report

¹ E. O. Egbogah, "Fifty Years of Petroleum Exploitation in Nigeria," Public Lecture presented at the First Emmanuel Egbogah Lecture Series on Petroleum Policy & Strategy at the University of Port-Harcourt March 27-29, 2006.

² Ibid

All these challenges have their roots in the poor human capacity development in Nigeria. Onyekonwu³ also discussed these challenges. We have not developed relevant institutions that will develop Nigerians that can fully exploit the opportunities in our oil and gas industry. Workers in the petroleum industry should of necessity be highly skilled.

In the oil and gas industry, there will be no business without the oil and gas reservoirs. Even in cases where you have the reservoirs and the reserves, you may not be able to recover the oil and gas. Therefore the starting point for this industry is acquisition of the requisite knowledge and technology. In modern terms, we can use the terminology “geosciences” to include knowledge obtained as a geophysicist, geologist and petroleum engineer. These professionals are faced with the challenges of finding the oil, characterizing the reservoir and ensuring that oil and gas are produced efficiently. Unfortunately, our tertiary institutions are not equipped to turn out graduates that can handle the challenges for some reasons that will be discussed.

History of Petroleum Engineering Education in Nigeria

Ashby defined the university as an institution every civilized society must develop to enable it acquire, digest and advance knowledge to enable it solve societal problems. Therefore, a strong tertiary institution is key to lasting competence and skill development. The players in the Nigerian petroleum industry have to understand that functional universities are needed, as that is where the real skill acquisition starts. Table 2 shows some activities in the industry and dates at which formal petroleum engineering education was started in Nigeria. It took about 40 years before the managers of the Nigerian petroleum industry and Government realized the need to start a formal institution where Nigerians in the oil and gas sector will be trained.

The Petroleum Engineering Department at the University of Ibadan (UI) was started with support and funding from the Canadian Government. In the seventies and early eighties Petroleum Engineering graduates from UI competed favourably with graduates from even the best petroleum engineering schools in the world.

Table 2: Basic Historical Information

Year	Activity
1937	Exploration
1948	University College Ibadan established with No Engineering Faculty
1958	First Shipment of Oil from Nigeria
1972	Post Graduate Diploma Programme in Petroleum Engineering started at University of Ibadan (UI)
1974	First BSc Graduates in Petroleum Engineering (Converted Science students)
Date	Nine universities offering Petroleum Engineering. graduate about 300 students every year.

At present, no petroleum engineering school is sufficiently equipped to train any student at more than 40% level. Most engineering students in Nigerian universities go through university training without using personal computers. The resources for good petroleum engineering and geosciences education are not available.

³ M. Onyekonwu, “Good Reservoir Management: A Key Success Factor in Oil and Gas Business,” Inaugural Lecture No. 61 of the University of Port-Harcourt delivered on 24th day of April 2008.

Table 3 shows typical costs of single user software needed in reservoir management studies and no petroleum engineering or geosciences school in Nigeria has functional software. Many companies claim to have donated this or that, but a closer look shows that they donated obsolete equipments and outdated soft wares. For example, a multinational company donated to a university petroleum engineering department a mercury PVT cell that was scrapped overseas because of its environmental hazards. Of course, it did not work! Invariably, the universities are turning out graduates who are not well prepared to face the challenges of the industry. In cases where current software are donated, the universities are not able to pay for the annual renewal cost of the software. There is therefore no continuity or sustainability. Support for quality education is not a one-off thing.

Table 3: Cost of Some Reservoir Management Software

Software Trade Name	Application of Software	Cost of Software	Annual Renewal Cost
Eclipse	Dynamic Modeling	\$335,413	\$67,082
Petrel	Geologic Modeling	\$286,528	\$57,305
MBAL	Material Balance	\$32,000	\$3000
PROSPER	System Analysis	\$30,000	\$3000
SAPPHIR	Welltest Analysis	\$40,000	\$4000

Model of Support for Geosciences Education

I will show a model of support by telling a story of how I personally benefited from an excellent support of my University in the USA. In the early eighties, a black-oil simulator, one of the best tools for reservoir management, was sold for more than one million dollars. A USA company, Scientific Software Inc, donated one (multi-users license) to our school, Stanford University, and we used it to learn the rudiments and the practical aspects of simulation. This knowledge made a difference not only in my life, but in the lives of the students that passed through me later. With the basic knowledge, we have moved to higher levels of sophistication in reservoir simulation.

About 1983, the Department of Energy (DOE) USA worried about the high cost of simulators commissioned few young men to develop a black-oil simulator. The task was accomplished in 1984 and copies of the simulator were distributed to students with full documentation at no (zero) cost! I also got the free simulator and returned home to Nigeria with it. We used that simulator, to teach staff at Integrated Data Services Limited, a subsidiary of NNPC, on how to undertake reservoir studies. The seed sowed by Scientific Software Inc and DOE has yielded so much fruit that it is imperative that such efforts should be emulated.

Where are the companies in Nigeria? How much do they invest in Nigerian universities? The efforts some of them make do not yield and cannot yield effective, positive or sustainable results because it is all public relations gimmick. Supporting education is not and ought not to be a public relation affair. It is serious business with very high rate of return. We encourage the companies to invest in education rather than wait until their arms are twisted by government.

Effort in Support of Geosciences Education: Case of Petroleum Technology Development Fund (PTDF)

The PTDF effort remains the best effort by the Government to address the problem of competence development in the oil and gas industry. The PTDF is an agency of government with the mission of effective development of petroleum technology and management in the oil and gas industry. The Federal Military Government established this Agency in 1973 through Decree 25. In 1990, the decree was amended as the PTDF Act. However, the PTDF was not quite effective until the Nigerian Government set up the PTDF Management Committee in September 2000. Even when it became

operational, its management was politicized and the agency was not properly focused to be able to effectively meet its mandate.

There is great improvement today. PTDF has established professorial chairs in the universities and this includes the Gas Chair at University of Port-Harcourt. PTDF has also upgraded many facilities in science and engineering faculties. They are equally involved in the award of both local and overseas scholarships. The organization started late and therefore should increase their activities by at least a factor of five if they are to make the desired impact. Other recommendations for PTDF are as follows:

- The PTDF should adopt the University of Port-Harcourt Institute of Petroleum Studies Model by financing programmes run jointly by overseas institutions and our local universities instead of sending so many of our graduate students overseas for training.
- The local scholarship programme should be upgraded to benefit more students because invariably more than eighty percent of our workforce will be trained locally.
- Professional bodies like Society of Petroleum Engineers (SPE) and Nigerian Association of Petroleum Explorationists (NAPE) should be more involved in the work of the organization. The bodies will deliver the Agency from the hands of fraudulent and ignorant equipment suppliers.
- Frequent change of the Executive Secretary of the PTDF is unhealthy and tends to negatively impact its organizational competence effectiveness.

From our evaluation, we can say that PTDF can actualize her mission with knowledge and proper management of resources.

Effort in Support of Geosciences Education: Case of Institute of Petroleum Studies (IPS) University of Port-Harcourt

This is equally the best effort by an international oil company to address the manpower problems in geosciences. The Institute was established in 2003 as a bold effort to remedy the skills gap between the theory of the classroom and the practical needs of the oil and gas industry in Nigeria. It is a collaborative graduate school between the *Ecole du Pétrole et des Moteurs* (IFP School), Paris, France, and the University of Port Harcourt in partnership with the Nigerian National Petroleum Corporation and TOTAL E&P Nigeria Limited Joint Venture, in pursuit of TOTAL's sustainable development initiative. Key components of the programme are as follows:

- Conducive learning environment/Effective Quality Control
- Forty percent of course lecturers from IFP School, 40% for Nigerian universities and 20% from oil and gas industry
- Standard industry software used in learning
- Joint degree awarded by the IFP School and University of Port-Harcourt
- Extensive field and hands-on work
- Full access to Computer: One Student per PC/e-Library
- Modular course structure, Weekly Examinations
- International Degree, Equivalence between CGPA and European Credit Transfer System (ECTS); International Certification: NREP (HSE) and IWCF Certification/Industry Software Competence Certificates
- Active Industry Intervention in Programme life cycle
- Exposure to High Intensity and Diversity of Lecturers/Mentorship

In just seven years, the IPS has redefined teaching and research that have attracted accolades and awards from within and outside the country. The Institute has transformed into a true teacher-scholar environment in which faculty members and students appreciate how scholarship can motivate the learning process. The IPS has immensely expanded her training programmes, facilities and innovation; and in so doing has been able to turn out highly – motivated professionals that are equipped with cutting-edge competencies, technical expertise, multidisciplinary skills, professional ethics, cost efficiency and the necessary team skills for quality performance in a competitive environment. The students are industry-ready on graduation.

This model of encouraging and funding collaboration between local universities and overseas institutions is recommended for all sectors as it yields cost-effective results and enhances the building of in-country capacity. It is much better than sending many of our students to UK as presently done by PTDF.

Effort in Support of Geosciences Education: Case of Service Company-Trainer Model

The level of human capacity underdevelopment in the oil and gas industry is overwhelming. This model requires that every service company should operate an active training-arm where young graduates and even competitors are trained. Laser has Engineering and Resources Consultants operates this model with tremendous success. Laser renders reservoir management and other services and has been granted license by the National Body of Technical Education (NBTE) to run a Petroleum Geosciences Center. Facilities at the Center are world-class and the trainees are exposed to current technology and methodology.

Conclusions and Recommendations

Increasing population and desire for better life implies more energy usage. Petroleum will continue to be the dominant fuel source in the next century. This implies that the petroleum industry will continue to be relevant. As Nigeria is endowed and well positioned to participate in this industry, we must put everything together to optimize the value that can be obtained from this industry to our nation. Reforming the Nigerian petroleum industry is good, but the starting point is reforming our oil and gas related laws and supporting our educational institutions.

In view of this, Nigeria must develop human capacity in the universities and conduct research to solve the peculiar problems of our industry. Nigerians must develop to fully participating in the industry. Everything should be done to prevent the devastating environmental impact of the industry. The host communities must be engaged as stakeholders at all times.

Regarding the university the following to improve in teaching, learning and capacity building are urgently necessary:

Staff Development

- About 30% of PTDF overseas scholarship should be awarded through the universities to young graduate assistants in the university.
- All training in the oil and gas industry should be domiciled to give university lecturers opportunity to participate (as co-consultants, students, etc)
- University staff should be attached to projects (Field Development, Gas-to-Liquid, Power, etc) at inception to understudy new technology and pass relevant knowledge to students.
- University lecturers should be used and supported as consultants in dealing with challenges in the industry.

- There should be opportunity for sabbatical leave in the industry even on short time basis or study fellowship.

Facility Development

- Geosciences departments should be “adopted” by oil and gas companies for nurturing
- Software marketers **must** donate software to selected Nigerian universities
- More of PTDF-type of facilities’ upgrade is needed. Oil and gas companies should support such upgrades.
- Endowment of research laboratories
- Stipulated minimum level of research sponsorship by major stakeholders in the oil and gas industry.

Others

- Adjunct professorial chairs endowed for retired/active company staff with proven knowledge and competence.
- Organized industrial placement for students.
- Establishment of fully equipped geosciences “café” to enable students and consultants have access to the software at minimum cost.
- Guaranteed jobs for qualified Nigerian entrepreneurs.
- Easy access to data for teaching and research.
- Endow more professorial chairs.