



Society of Petroleum Engineers

SPE-189063-MS

Nigerian Content Development in the Oil and Gas Sector: The Role of the Nigerian Academia

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This paper was prepared for presentation at the Nigeria Annual International Conference and Exhibition held in Lagos, Nigeria, 31 July – 2 August 2017.

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Abstract

The oil and gas production process is driven by technology. The impact technology plays in the process is such that the oil and gas industry ranks as one of the largest employers of PhDs and also one of the largest investors in Research and Development activities. These have resulted in the industry being also one of the industries with the largest number of expatriates. Countries with large oil and gas deposits have oftentimes relied on International Oil and Gas companies for the exploration of their deposits with the hope that the knowledge and technology will be transferred over time. This has not been the experience in a number of these countries and has caused them to develop deliberate programs and local content development policies to encourage and engage the local populace in the oil and gas production process. For the local content policies to be maximized, local companies must invest in research and development efforts to create value and develop relevant technology as this is the only way they can maximize the oil and gas related contracts. Investment in Research and development is a highly capital intensive and time consuming process and as such it is out of the reach of the local companies. This paper discusses the role of the academia in the development of technology and the local content. It also presents some strategies that can be deployed to engage the Nigerian Academia in the development of the local content in the oil and gas sector in Nigeria.

Introduction

The oil and gas industry is one of the highest income generating industries in the world with several of the richest countries having over 80% of their revenue coming from the oil and gas industry.[1][2][3]. The industry provides opportunities for a wide array of businesses, service industries, technology providers and operators. The industry also has several byproducts which can also serve as spinoffs to several other associated industries such as the petrochemicals, fertilizers, plastics etc. In recognition of the key role of the oil and gas industry to the economy of these oil producing nations, several policies have been initiated by these countries to ensure they are able to maximize the benefits of the oil and gas reservoirs available to them. This is further fueled by the finite nature of the reserves as they are expected to run out sometime in the future. Countries such as the UAE, have successfully migrated to tourism by converting Dubai to the tourist capital of the world thereby minimizing their reliance on the revenue from oil and gas [4] [5].

Negative Impact of Oil discovery on sectors of National Economies

The oil industry due to the high volume of cash flows it generates over a short period of time, has been shown to have capacity to create a negative effect on other sources of revenue especially in nations that have high quantities of the reserves. Nigeria was known to be an agricultural country with world famous groundnut pyramids in the north, cocoa in the west and several other agricultural produce from different parts of the country[6][7][8]. However, the discovery of oil and the revenue generated by it, caused a shift in focus to the oil and gas sector so much that the other revenue earning sectors were gradually ignored. The oil industry in spite of its capacity to spin off several other industry from its byproducts also has the characteristic of being able to generate huge revenues in its unprocessed form. Producing countries thus focus on exporting the crude oil for the short term revenues from the sale of the crude oil. While this has its advantage of providing a quicker cashflow, it has a multiplier effect in that the country ends up not developing any capacity for refining or processing the crude oil, the country is also deprived of the spinoff industries that would have been created as a result of the byproducts of the refining process. This ultimately makes the country dependent on the international price of the crude oil and whenever international politics and economics affects the price of crude oil, these countries suffer severe economic down turns. Countries such as Saudi Arabia and other Middle East countries which earn high volume of revenues from oil have over the years provided subsidies on several amenities for this citizens but they are now forced consider a withdrawal of some of these subsidies due to the drop in crude oil prices in the international market. [9][10]

Export Focused Exploitation of the Oil and gas Reserves

The export focused exploitation of the oil and gas reserves in most oil and gas producing nations has resulted in the over reliance on foreign multinational oil and gas companies with the technical expertise for the management of their oil and gas industries in these countries. The key operational models of the IOCs with export focus include, the extraction of the oil from the reservoirs, the transporting of the crude oil through extensive pipeline networks, flow stations and booster stations to the export terminals for transfer to oil tanker vessels. The involvement of the citizens was thus limited to managing the flows stations, monitoring the crude oil transfers and the pipelines either for leaks or intruders. There was little investment in the development of the local capacity for the acquisition of the required technical skills. These IOCs had a large number of expatriate staff in the countries they operated from, major projects and key design phases of these projects were managed from abroad or their home countries, the procurement, materials and equipment used were manufactured from their home countries or abroad and in some cases even the low level manpower for these projects were brought in from their home countries thus ensuring a maximum repatriation of the foreign exchange earned from the business. This model of operation resulted in a sustained lack of capacity by the citizens of those countries with the oil and gas reserves and an over reliance on the expatriates for the exploration of the oil and gas reserves. This ultimately placed the economies of these nations in the hands of the IOCs. In a bid to minimize the impact of the IOCs on their economies, several steps were taken to forcefully reduce the dominance of these IOCs in their oil and gas business. Some of these policies included the naturalization of the IOCs. This happened in Nigeria with BP being naturalized, it also happened in some other Middle Eastern countries [11] [12] [13]. Other schemes employed included the production sharing arrangements, the Joint Venture agreements and the Licensing agreement [14] [15] [16]. All these efforts were aimed at increasing the stake of the country and its citizens in the oil and gas business. This was also aimed at ensuring that the IOCs do not continue to maximize the profit from the oil and gas reserves to the detriment of the national interest.

Local Content Policy in Nigeria

The key objectives of the local or Nigerian content policy includes the provision that Nigerian independent operators shall be given first consideration in the award of oil blocks, oilfield licenses and all projects for which contract is to be awarded in the Nigeria oil and gas industry. It also includes the provision for the exclusive consideration of Nigerian indigenous service companies which demonstrate ownership of equipment, Nigerian personnel and capacity to execute such projects in land and swamp operating areas of the Nigerian oil and gas industries.[17][18]

These provisions which are two among several others is aimed at stimulating the growth of the indigenous companies by providing opportunity for increased participation in the oil and gas business in Nigeria. The oil and gas business being a multibillion dollar a year business requires several forms of investment ranging from design and fabrication services, maintenance services, technology upgrade services among others. A number of Nigerian companies are currently actively participating in the design and fabrication space while others are involved in the service rollout business such as laying of pipeline networks and other infrastructure services. [19][20][21] While this is appreciable and commendable, there is very little activity in the technology development and innovation space and this space is responsible for innovation, inventions and intellectual property. From the review done of global oil and gas service companies, one of the characteristic which cuts across all of them is their continuous investment in research and development. This investment is responsible for the development of new tools, new technologies and new methodologies which are monetized and converted to new streams of income. Some of these companies have moved on to set up new divisions based solely on the outcome of their research and development efforts.

The figure 1 shows the location of major oil and gas related research centers around the world

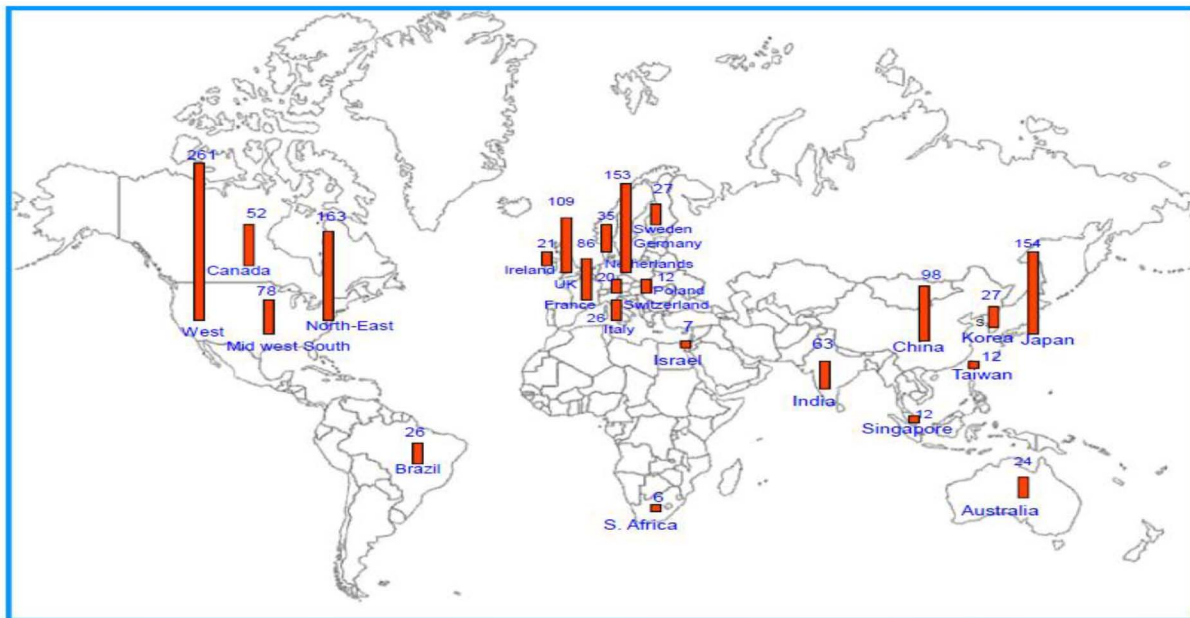


Figure 1—location of major oil and gas related research centers around the world

Most IoCs and major oil and gas companies in recognition of the role of the academia in the evolution and advancement /survival of their businesses, set up research centers close to the universities so as to maximize the resource available in the academia while others sponsor research endeavors in these universities. The figure 1 shows the global distribution of Oil and Gas Research and Development centers.

Characteristics of some Oil and Gas service companies

The [table 1](#) shows the characteristics of some of the most popular oil and gas service companies. Looking at the data in [table 1](#), it is clear that all these huge multinational Oil and Gas servicing companies all started small and were all started either by an individual or by a family. These companies relied on the fact that they were all operating in niche environments and even though competition was a bit low at that time, they needed to adopt creative strategies to keep them profitable and to ensure that they continued to grow with the changing phases of the industry.

Table 1—Characteristics of some Oil and Gas service companies

Oil and Gas service company	Year Founded	Founders	background of founders	Foundation product	country of origin	Revenue	Number of employees	Secret of sustainability
Schlumberger	1926	Conrad and Marcel Schlumberger	Physicist and Engineer	Research in Electrical Resistivity Well logging	France	over \$35 Billion	over 100,000	Innovation, Research and robust business practices
Halliburton	1919	Earle P Halliburton	Business man and Inventor	Oil well cementing technology	USA	over \$32 Billion	70,000	Innovation, Research and robust business practices
Baker Hughes	1907 and 1987(due to a merger)	R.C Baker and Howard Hughes	inventors and innovators of oil and gas related tools and improved drilling equipment	Services for Oil drilling, reservoir evaluation and reservoir engineering	USA	over \$22 Billion	35,000	Innovation, Research and robust business practices
FMC	1883	John Bean	Chemist and inventor	piston pumps and insecticides	USA	over \$3 Billion	5,500	Innovation, Research and robust business practices
Welltec	1994	Jorgen Hallundbaek	Was a Graduate Student when he got the idea	Well Tractor	Denmark	over DKK 2 Billion	1000	Innovation, Research and robust business practices

A review of the operational strategies of these companies shows that, they all started as small companies and were built around a product, or service. One of the key strategies employed by these companies which has enabled them to continue to thrive is their continuous investment in research and development. Other characteristics include: Their involvement in

1. The development of Technologies
2. The development of tools and innovations
3. The development of products with which they offered services

As the companies grew, they formed strategic alliances and acquired or merged with other technology based companies to increase their reach and enhance their competitiveness

Role of Academia in Technology Development

The academia is the womb that carries the industry. Its products in the form of graduates provide the workforce of the industry while its research findings form the basis for new companies and the evolution of existing companies. This relationship is shown in [figure 2](#).

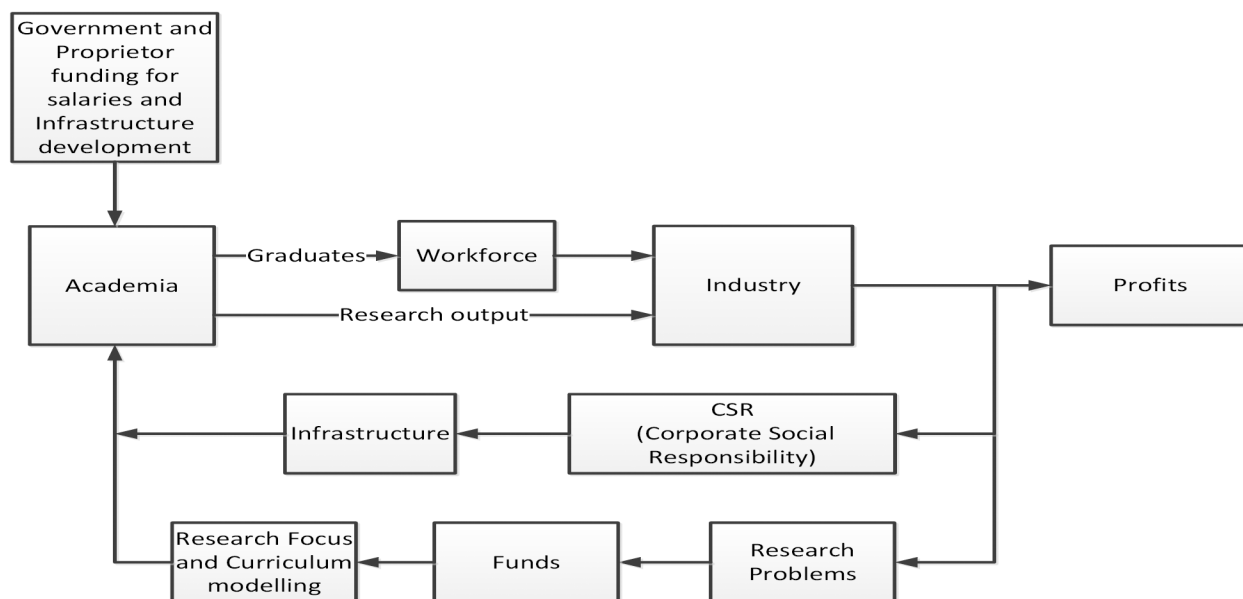


Figure 2—Industry academia relationship

Innovation

Innovation is the key to survival both in the academia and especially in the industry. The industry in view of its time bound approach at executing its tasks is often times not positioned for innovation. The oil industry as a demand driven industry focused on deliverables is often times averse to change and innovation as some of these changes may involve a shutting down of facilities and plants or the reassignment of specialized staff for such assignments. This position puts the industry at a risk of extinction and makes it very vulnerable to policy and price changes. For innovation to take place, the following parameters must be available.

1. Funds
2. Time
3. Research Problems
4. Research Capacity
5. Capacity for Testing
6. Commercialization.

The [table 2](#) shows the relative availability of these requirements for innovation between the industry and the academia.

Table 2—relative availability of these requirements for innovation between the industry and the academia

No	Characteristic	Industry	Academia
1	Funds	Unlimited	Limited
2	Time	Limited	Unlimited
3	Research capacity	Limited	Unlimited
4	Research challenges	Unlimited	limited
5	Capacity for testing research results	Unlimited	Limited
6	Capacity for Commercialization of research findings	Unlimited	Limited

From table 2, all the parameters required for innovation are spread between both the academia and the industry and thus for innovation to take place, both institutions must work together to maximize the strengths of each for the benefit of both.

Due to the operational nature of the oil and gas industry and from the characteristics in table 2, The oil and gas industry has the funds required for research, it also has the research problems/challenges and a capacity to both test and commercialize the results of the research but does not have the time or research capacity while the academia has the time and research capacity but doesn't have the funds, the research challenges nor the capacity for testing and commercializing the research findings. There is therefore a need for collaboration between the academia and the industry to enable a mutually beneficial relationship between the two institutions where the academia can spend its research capacity undertaking industry relevant research which is relevant and applicable to the challenges of the industry. The outcomes of this research can then be validated on the industry projects or tested within the industry labs

Strategies for Engaging Academia in Increasing Nigerian Content

The engagement of the academia in the Oil and Gas business has capacity to generate value to the oil and gas industry in the sense that the faculty involved in R&D can develop new tools, chemicals and systems which will serve as veritable replacement to the imported solutions. These local solutions which are often times customized to our environment, have the potential of better performance, high availability and low cost. It also has the potential of serving as an income generating stream for the company as it can be exported. The figure 3 shows the model for engaging the academia in the R&D efforts of companies in Nigeria.

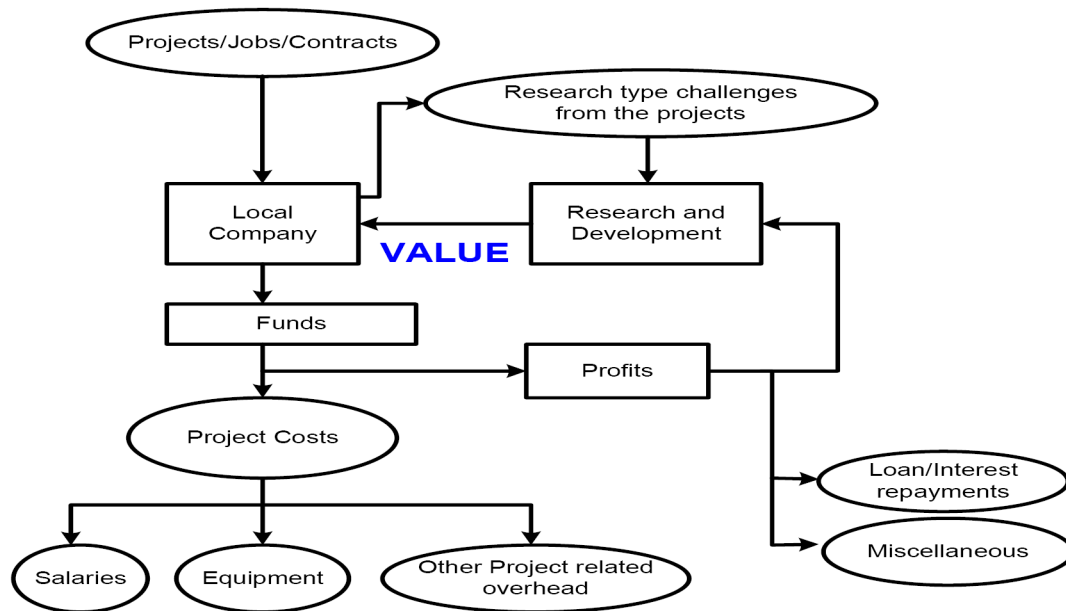


Figure 3—Model for academia engagement with the industry [22]

The model for engaging the academia in the industry include any of the following or a combination of any of the following. The overriding goal is to get the academia fully exposed to the research problems. The strategies include

1. Focused sabbatical fellowships
2. Membership of project teams at the design review stages
3. Participating in design stages of key projects. This is a subtle way of facilitating technology transfer
4. Evaluation and assessment of design contribution from the academia
5. Engaging equipment manufacturers to develop and produce design results from the academia

Benefits

The benefits of the engagement of the academia in the Industry include

1. This program will reduce to a very large extent the costs associated with bringing expatriate for executing the jobs in the industry and it will build local capacity
2. It will result in the development of intellectual property which can also develop into standalone companies or exportable systems or services.
3. The faculty continues to engage in relevant research resulting in publications in high impact journals. This will ultimately improve the global ranking of Nigerian Universities
4. This program will improve the research activity in Nigerian Universities and help to refocus the type of research undertaken in the universities.
5. This will improve the quality of PhD graduates produced in the country as the PhD students will be able to access the labs in the industry and focus on industry related research.
6. This will increase the funding available to the academia to recruit high quality graduate students who will be dedicated to the research.
7. The program will increase the research capacity of faculty in Nigerian Universities and increase their engagement in research leaving little room for issues such as strikes etc.

Conclusion

The local content policy is a creative approach aimed at getting local companies engaged in the Oil and Gas business. Their involvement will create a ripple effect on the economy as it will result in more jobs and reduce capital flight. Scenarios where local participation is limited to infrastructure, fabrication, installation and services leaves very little room for the maximization of the desired benefits of the policy. For the local companies to maximize the policy, they must be able to develop products, equipment and tools which can be converted to intellectual property and exported to other countries. Global service companies all started as sole proprietorships but have been able to thrive and become worldwide multibillion dollar companies because they have been able to continue to innovate and remained relevant in the business space. Innovation as we have seen is a critical tool and it is driven by research and development. Local companies may not have the required funds to invest in research and development to the level of the global companies but they can utilize the creative approaches presented in this paper to engage the academia. The unique advantages of the academia can thus be utilized by these companies in developing new technologies which can be perfected in their processes and thus become value adding sources of revenue to the company. For the local content policy to be maximized, local companies must in addition to fabrication, infrastructure and service contracts be able to develop new and relevant technologies and for this to happen, the Nigerian academia must be involved.

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