Supply Chain Sustainability Practices of Oil Servicing Firms in the Downstream Sector of Nigeria's Oil and Gas Industry

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Abstract

This study investigates the nature and context-based peculiarities of sustainability practices related to the supply chain of oil servicing firms operating in the downstream sector of Nigerian oil and gas industry. The supply chain management practices of oil servicing firms are crucial to the functioning of the downstream sector of the oil and gas industry. However, the literature on their supply chain sustainability is scant and scattered. To fully explore this field; therefore, survey data were collected from key practitioners in the industry and analysed using descriptive statistics. The results show that the supply chain management practices of oil servicing companies relating to designing, producing, marketing, delivering, and supporting the products of their clients rarely factor in the requirements of sustainability practices. Accordingly, this study points out strategic interventions that could help in greening the supply chain practices of oil servicing companies operating in the downstream sector of the Nigerian oil and gas industry

Keywords: *Sustainability Practices, Supply Chain Practices, Downstream Sector, Oil and Gas Industry, Nigeria*

INTRODUCTION

Nigeria's oil and gas industry plays a crucial role in the growth, development and survival of the Nigerian economy. Proceeds from the operations of the sector represent an average of 65% government revenues and nearly 95% of foreign exchange earnings accruing to the country throughout the last decade, 2009–2018 (Ikechukwu *et al.*, 2018). All annual budgets in Nigeria are pegged to the fortunes forecasted to flow into the coffers of the government from the sale of crude oil (Ajie *et al.*, 2018). However, despite this crucial role of the oil and gas industry to the Nigerian economy, the activities of firms in the sector have been blamed for the environmental degradation and recurrent ecological disasters that happened in Nigeria (Akpomuvie and Orhioghene, 2011; Prpich *et al.*, 2019). Thus, the oil and gas sector represents a double-edged sword, contributing positively to government revenues used in running the country and a source serious sustainability concern. Most of the sustainability concerns in the industry have been linked to supply chain operations of firms in the industry (Peng and Poudineh, 2017; Yeeles and Akporiaye, 2016). While researchers have conducted many pieces of research into the antecedents and consequences of supply chain sustainability practices of oil and gas firms operating in the upstream and midstream sectors of the oil and gas industry (Olujobi *et al.*, 2018), the literature features scant reports on the challenges arising from the supply chain management practices of firms operating in the downstream sector of the industry (Peng and Poudineh, 2017). Furthermore, the few studies available and hardly focus on sustainability issues in the downstream sector (Prpich *et al.*, 2019; Wan Ahmad *et al.*, 2016). Given these gaps in the existing literature, this study investigates the supply chain sustainability practices of oil servicing companies operating in the downstream sector of Nigerian oil and gas industry with a specific focus on the challenges they face and possible solution.

Results of this study may be of significance to stakeholders in Nigeria's downstream sector of the oil and gas industry such as the government, regulatory agencies and petroleum products marketers. By helping them better understand the challenges in the sector and possible intervention strategies for service delivery.

LITERATURE REVIEW

Streams of Supply Chain in the Oil and Gas Industry

The supply chains in the oil and gas industry is a complex of relationships involving a myriad of firms operating across the three broad streams in the industry. The supply chain reflects this triad, with some firms engaging solely in exploration (upstream), others in transportation (midstream), and others in distribution and marketing of the final products (downstream) (Alaba and Agbalajobi, 2014). The upstream sector is dominated by big multinational corporations such as Shell BP, Exxon-Mobil, Chevron (Frynas *et al.*, 2000; Madueme, 2010). The midstream sector boosts two offshore/inland jetties, strategic depots, pump stations, and hundreds of kilometres of multi-product pipelines and crude oil pipelines crisscrossing the country. The downstream sector consists of refineries and thousands of pump stations and millions of convenience stores.

In general, scholars have identified three streams in the industry with corresponding supply chains: namely, upstream, midstream, and downstream (Gardas *et al.*, 2019). The upstream consists of firms engaged in geological surveys and prospecting for oil as well as the drilling and production of crude oil. The midstream sect is comprised of companies firms that carry the crude oil from production sites to

refineries for processing into final products and to export terminals for sales abroad. The midstream companies achieve this through a system of tankers and pipelines. The downstream sector of the industry consists of firms engaged in refining, marketing, wholesaling and retailing of the final petroleum products across a chain of gas stations and convenience stores (Raut *et al.*, 2017). The adverse sustainability challenges following operational failures vary among these three streams, with the downstream sector responsible for about 37% of the adverse occurrences, while the midstream and the upstream are responsible for 11% and 3% respectively. Natural causes account for the rest of the adverse occurrences (Raut *et al.*, 2017). It is, therefore, imperatives to investigate the downstream sector with regards to its scorecard on supply chain sustainability practices.

Supply Chain Sustainability Practices

Supply chain sustainability practices have been defined as the management of human, material, information, and capital resources through cooperation among various supply chain management firms that committed to maintaining environmental, economic and social stability for long-term sustainability (Hong *et al.*, 2018). The interchangeable use of the terms "sustainability" and "environmental" is particularly relevant in the context of the oil and gas industry where the adverse consequences of oil firms' operations are first, and foremost environmental before these translate into social and economic dysfunctions. Integrating environmental concerns into the entire gamut of a firm's supply chain is the essence of supply chain sustainability. This study explores how oil servicing firms operating in the downstream sector of the oil and gas industry integrate environmental safeguards in their operations.

Oil Servicing Firms in Nigeria

The firms operating in the downstream sector of the Nigerian oil and gas industry render facilitative services to firms and agencies involved in crude oil exploration and production (Martins and Pato, 2019). These firm seldom engage in these two broad activities. However, they provide the major players in the midstream and upstream sectors with supply services among others. Thus, their competitive advantage is closely aligned to how well they sustainably manage the entire supply chain. The local content initiative of the Federal Government of Nigeria has given a tremendous fillip to the emergence and development of domestic oil servicing firms with the count in the hundreds (Ihua *et al.*, 2009). Activities in the downstream sector mostly consist of the supply and distribution of refined petroleum products from refineries to storage facilities and finally to the end-consumers. Adendorf *et al.* (2012) state that refined petroleum products are transported through a combination of pipelines, rail, road and sea to retail outlets where consumers across geographical locations can acquire these products to meet their energy needs. This suggests the need for adequate storage facilities and efficient distribution networks for an effective supply chain for petroleum products. This study is based on data collected from these firms with headquarters or offices in Abuja, Nigeria.

METHODOLOGY

The survey method was used in collecting primary data for the study (Funkhouser *et al.*, 2017). Random sampling technique (Robert, 2019) was used in selecting ten oil serving firms with a presence in Abuja, Nigeria based on a framework obtained from Department of Petroleum Resources. From each of the ten selected firms, five employees who work in the operation departments were purposely selected to take part in the study because they understand the focus of the research study. Purposive nonprobability sampling method was used (Kohler et al., 2019). A structured questionnaire designed to collect information on the supply chain sustainability practices of the oil servicing firms was administered on the respondents. The questionnaire contained nine closed-ended questions. A Likert rating

scale was used in item measurement (Matas, 2018), having the most effective five-point response anchors (Xu and Leung, 2018): Not at all important = 1 and Extremely important = 5.

A total of 50 questionnaire copies was administered, of which 44 useable ones were retrieved (Females = 10). Respondents' demographics are shown in Table 1. The data thus garnered were checked for correctness, coded and then tabulated to facilitate easy entering for processing. The resulting quantitative data were after that analysed using descriptive statistics including frequency and percentage distributions. Measures of location (mean, median and mode) were also calculated for the relevant variables and distributions, and the results used as a basis for comparison.

Table 1: Respondents Demographics

Description	Variable	No. of Respondents	Percentage (%)
Gender	Male	34	77.3
	Female	10	22.7
Age Group (years)	20-29	8	18.2
	30-39	21	47.7
	40-49	13	29.5
	Over 50	2	4.5
Educational Qualifications	Secondary	2	4.5
	Tertiary	25	56.8
	Postgraduate	17	38.6
Employment Duration	1 - 5 years	24	54.5
	6 - 10 years	18	40.9
	11 - 15 years	2	4.5
Organisational Position	Top management	9	20.5
	Middle management	23	52.3
	Lower management	10	22.7
	Support staff	2	4.5

RESULTS

Results of the study reveals that the challenges facing the downstream sector of the Nigerian oil industry include low capacity utilization of domestic refineries (rated of extreme importance ay 81%, meaning having adverse impact on the operations of the sector), and frequent pipeline vandalization (rated 61%) which necessitated heavy reliance on road haulage for products movement across the country. This unsustainable practice has been earlier noted by Ehinomen and Adeleke (2012), and it persists. Pipelines are most suited for transporting petroleum products. Inappropriate pricing of petroleum products and subsidy schemes being implemented by the government is another challenge facing the sector which 70.5% of the respondents claim is of extreme importance. Additionally, more than half of the respondents (56.8%) found price distortion in the local market, mainly due to price controls, as a significant challenge variable.

On the issue of infrastructure, 75.0% of the respondents believed that low storage capacity at jetties and storage depots constitute a significant challenge in the supply and distribution of petroleum products. This response was in agreement with the views expressed on storage depot in the reviewed literature (Adendorf *et al.*, 2012). Further, inadequate power supply very (adverse at 81.8%), frequent equipment breakdowns (adverse at 79.5 %), and inefficiency in the product transportation system (adverse at 75%) were highlighted as significant challenges. Another problem relates to the market structure characteristic of the downstream sector in which the state oil company enjoys an unfettered monopoly. The refineries, the entire pipeline network and majority of the storage depots are owned by the government and operated through its argent, the Nigerian National Petroleum Corporation (NNPC). One third less than the whole body of respondents also reported that the uncertainty engendered by the market structure also frequently precipitate panicky buying by consumers, especially when demands are not met due to supply variability. This response was consistent with the reverse bullwhip effect reported in Jeong and Hong (2019) and Ojha *et al.* (2019). The bullwhip effect is a phenomenon where outgoing orders to suppliers have higher variation than incoming orders from customers which

distorts demand, and the distortion was amplified as it moves upstream (Sirikasemsuk and Luong, 2017).

The ease of doing business in the downstream sector of the oil industry has also been blamed for some of the supply chain sustainability challenges the bedevilled the sector. 77.3% of the respondents agreed that business procedures (e.g. lead-time for order and delivery) cause supply bottlenecks, just as 68.2%, 77.3% and 72.7% of the respondents agreed that deficiencies in information sharing in the supply chain, market data for products demand and demand forecasting of products respectively induce supply variability in the downstream supply chain. These responses again confirm the perennial problem of a bullwhip and reverse bullwhip effects in the sector as further reported in Al-Akhal (2018) and Alvarado-Vargas and Kelley (2019). Finally, 81.8% of the respondents agreed that the supply chain structure of the downstream sector causes variability in the supply of products. Adendorf *et al.* (2012) noted that the success of any logistic system is mostly dependent on the location of a production facility (refineries in this case) and warehousing facilities (storage depots in this case).

To tackles and reverse these challenges, the respondent voiced several strategies that could help advance the development and growth of the downstream sector of the oil and gas industry so that it evinces positive linkage with the rest of the economy. Figure 1 depicts these responses in the proportion they respondents gauge their importance. It is apparent that more than half of the respondents (56.8%) favour full deregulation of the downstream oil and gas sector. This corroborates the earlier finding of Anyadike (2013) who reported that the majority of the stakeholders in the industry wanted full deregulation of the sector. The establishment of new refineries received the second highest rating of 15.9% of the complete response, while turn around maintenance of the refineries to increase capacity utilisation received 13.6% rating. However, this betrays another problem where some of the oil servicing companies benefit hugely from import subsidies on refined petroleum products because of the non-performance of the four local refineries at Port-Harcourt, Kaduna and Warri. This attitude is strengthened by the negligible number of respondents (just 6.8%) who attach any importance to adequate maintenance of the downstream facilities.
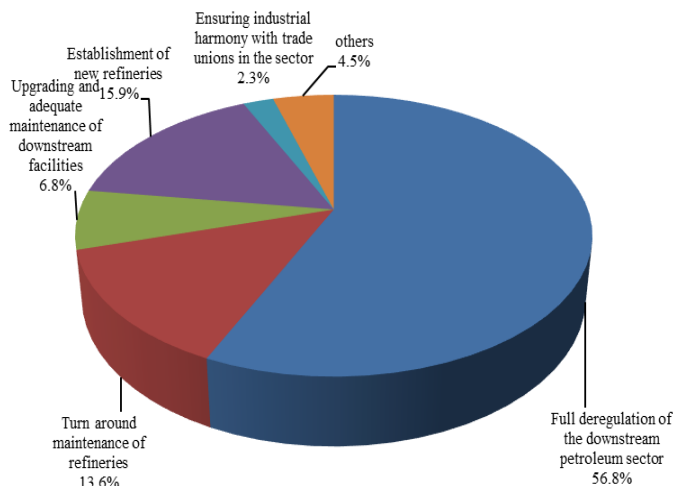

Figure 1: Means of improvement for the petroleum products supply chain

CONCLUSION

This study reveals several causes of the challenges bedevilling the supply chain sustainability in the downstream sector of the Nigerian oil and gas industry. The challenges include low capacity utilisation of domestic refineries, inappropriate pricing of petroleum products and subsidy schemes, and frequent pipeline vandalisation. Other factors include environmental uncertainty, variability in demand and supply of petroleum products also affect the effectiveness of the supply chain. Is

was against these challenges and more that the study recommends the deregulation of the downstream sector of the Nigerian oil and gas industry, among others.

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