The Influence of Information Technology Capability on Supply Chain Integration and Marketing Performance of Downstream Petroleum Sector in Nigeria

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Abstract

This study ascertained the relationship between information technology capability on supply chain integration and marketing performance of down streams petroleum sector in Nigeria. Data were elicited from supply chain managers of seven (7) major petroleum oil marketing firms with the used of questionnaire and partial least square – structured equation modeling for test of hypotheses. This study revealed that information technology capability positively and significantly relates to supply chain integration and marketing performance of downstream petroleum sector in Nigeria. It concluded that information technology capability is a key driver to enhance effective and efficient supply chain integration and marketing performance. Therefore, the study recommended that management of oil and gas companies should adopt effective software and logistics information mechanism that will facilitate order placement, inventory control, planned shipment /logistics as well as reducing lead time in their operations

Keywords: Information Technology Capability, Supply chain, Marketing Performance.

Introduction

Petroleum industry in Nigeria is described as the largest among all industries in the country. This is probably because it accounts for 80% of the gross domestic product (GDP) of the nation (Lukeman, 2003). Petroleum is viewed as the mainstay of the nation's economy as well as the livewire or oxygen upon which everything in the economy revolves (Augusto, 2002; Atakpu, 2007; Odulan; 2008).

The petroleum industry comprises the upstream, midstream and the downstream sectors. The upstream is concern with mining, exploration, production and exportation and it is dominated by multinational firms such as chevron, Shell, AGIP, Elf, Esso-Mobile and Texaco (Now MRS), with few indigenous upstream oil and gas firms in compliance with the provision of local content policy of the Nigerian Government (Ogbeifun, 2009; Aderoumi & Adenugba, 2010). The midstream sector involves processing, storage, marketing and transportation of crude oil and gas. While the downstream sector engaged in refining distribution and market of petroleum products to the consuming publics which is the point of focus

in this paper (Aigberlian & Iyayi, 2007). Nigeria is one of the world largest producers of crude oil as well as the 6th largest exporter of crude among Organization of Petroleum Exporting Countries (OPEC) members, also rated among deep water oil producers in the world (Nwanze, 2007).

There are four refineries in Nigeria, two in Port Harcourt (PHRC) with installed capacity of 210, 000 barrel per day (bpd), one in Warri, Delta State (WRPC) with 125,000 bpd and Kaduna (KRPC) with 110,000 bpd, given a total capacity of 445,000 bpd (frynas, 1999). The peculiarity and integrated activities of the 3-streams of the petroleum sector gave rise to supply chain integration which has to do with how an organization and its trading partners work in synergy to achieve business objectives in a way of integrating business process and information sharing (Flynn, Huo & Zhao, 2010). No doubt these technologies are capable of enhancing effective marketing of downstream petroleum products such as Petroleum Motor Spirit (PMS), auto motive Gas oil (AGO), and Domestic Pure Kerosene (DPK). However, in spite the intervention of information technology capability in supply chain in downstream petroleum sector to facilitate effective performance in the marketing activities, there seems to be a lacuna between demand and supply of petroleum products which leads to an increase in the importation of petroleum products to meet domestic consumption in the recent past. This uncertainty gave rise to unethical practice, such as hoarding, smuggling, product diversion and product shortages in major petroleum oil marketing firms. Many researches have been conducted in supply chain. For instance, Won, Kwon and Severance (2007) examined the relationship between supply chain linkages involving customer, supplier, and internal processes of manufacturing firms in the United State of America. Amue and Ozuru (2014) carried out an empirical research on supply chain collaboration and Organizational performance in oil and gas industry in Nigeria. These studies do not captured supply chain integration and marketing performance together. Furthermore, information technology capability was not used as moderating variable as well. The study anchored on resource based view theory, which believes that firm's competitive advantage is predicted on its resources and capabilities (Peteraf & Bergen, 2003).

It is obvious that effective application of supply chain integration mechanism in the downstream sector of petroleum will surely promote marketing activities with the aid of information technology capability. The current study is limited to downstream sector of petroleum since its findings could not be generalized to other

sectors of the economy. Hence, the objective of the study is to determine the influence of information technology capability on supply chain integration and marketing performance of downstream petroleum sector in Nigeria.

Review of Relevant Literature

Supply Chain Integration

In a completive business environment an increase in the area of corporation, co-ordination and collaboration among businesses or firms are on the high side. This is as a result of the quest to compete favourably in the global market that brought about the idea of integration in supply chain. Bagchi and Skjoett-Larsen (2002) posit that integration is the quality or the state of collaboration that exist between departments which are required to achieve success through collaborating efforts of various unit in order to satisfy market demand. For effective distribution of petroleum products to the consuming public the need for internal integration, supplier integration, and information integration are of necessity for effective service delivering.

The concept of supply chain integration in the recent time has gained widespread attention in supply chain literature (Gimenez, Van Der Vaart & Van Donk, 2012; Schoenherr & Sioink, 2012; Zhang & Huo, 2013). Scholars further buttress the essence of supply chain integration in a complex business world by pointing out that it is relevant for the smooth and effective flow of information and resources between supply chain partners (Lee, 2000; Mishra, Modi & Animesh, 2013; Caridi, Moretto, Perego & Tumino, 2014). Supply chain integration is also defined as the degree to which a manufacturer strategically collaborates with its supply chain partners to manage intra-and inter-organization process (Flynn, Huo & Zhao, 2010). The scholars equally stated that the essence of supply chain integration by firm is to achieve effective and efficient flow of products and services, information, money and decisions that are capable of providing the desire customer value with cost reduction and at high speed. Putting it differently, integrating the functional units in the supply of petroleum products, as stated earlier in this study, will enhance availability of product to consumers as well as customer satisfaction. It is on this premise that Kwon and Suh (2005) note that supply chain integration is a strategic tool which attempts to minimize the operating costs and thereby enhancing values for the stakeholders by linking all functional units in the system from suppliers to the customers. It is on this premise that Jekey, Ezirim and Amue (2020)

emphasize that supply chain integration bordered on interactive intensity within and outside a firm for the purpose of delivering effective services to the target audience.

Marketing Performance

Different indicators are used to measure the performance of marketing in difference organizations. In downstream petroleum sector the availability of products and satisfaction derived by customers from pump attendants of major oil marketing firms demonstrate what marketing performance meant (Lages & Lages, 2005). It is on this note that is often expressed that marketing activities in an organization enable it to create values and sustain competitive advantage in a complex business environment. Therefore, performance is behaviour evaluated in terms of its contribution to organization's goals and objectives (Johnston & Marshal; 2003). The distribution of petroleum products (PMS, Ago and DKP) among others, from the point of production, which in this case refineries or tank farms owned by major oil marketers to dispensing stations equally defines what marketing performance represent.

It is inarguably that marketing activities are all about outcome. It is based on this that scholars in marketing field posit that marketing performance is a measure of contribution of organization's marketing function to its corporate goals and objectives Churchill & Peter, 1995; Jackson, Schlate, Schular & Wolfe, 1995). This is in line with the standpoint of other scholars that the widest degree of integration with suppliers and customers have the strongest association with performance improvement (Frohlich & Westbrook, 2001). Morgan, Clark and Gooner (2002) pointed out that the purchase behaviour of customers and prospects in the target market can earn a firm with advantage which in turn results to effective marketing performance in this paper, marketing performance is defined as the measurement indicators used by respondents to rates how an organization is performing in relation to competitors.

Information Technology Capability (ITC)

In modern day business operation, information technology is key. No wonder this age is often refers to as jet age. Prior to this time, Brick and Mortar system was invoke. But modernization has changed the narrative in cause of business transaction, where click and mortar system is embraced for effective business transactions. For instance, the use of Electronic Data Interchange (EDI) and inter-

organizational Information System (IS) among others to mediate buyer- supplier transaction are used (Chatfield & Jetton, 2000; Vijay a Sarathy & Rob, 1997). The advantages of information technology application cannot be overstretched. This is occasioned on the fact that it enhances economic value of business transaction, reduces cost of carrying inventory, obsolescence and transportation through more accurate and timely information exchange with the application of Electronic Data Interchange (Chatfield & Jettson, 2000; Mukhopadhyay & Kekre, 2002).

It is unequivocal that the advent of internet has led to speedy transaction of business–to–business (B.B) world especially in the area of supply chain activities. Scholars in the field of information technology also opined that electronic integration into supply chain activities enhance a wide range of inter-firm channel activities by means of enterprise resource planning (ERP) which facilitate Collaborative demand planning and fulfillment, as well as demonstrating varying results on business process and structures in international supply chain relationship (Kim, 2006).

Relationship between ITC, Supply Chain Integration and marketing performance

Information technology capability in the modern day business operation is described as an enabler for supply chain integration. Rajab (2010) states that information technology is the ability of a firm to effectively and efficiently dispense information to all functional units in the organization for efficient service delivery. Furthermore, information technology in an organization is the creator of value (Rajab, 2010). Amid (2007) emphasize that in today competitive market complex economy environment, information technology capability is critical factor in organizational performance. The scholar believe that the possibility of organizational performance is dependent on effective information distribution between all functional units of the channel of distribution. Jiang (2007) posits that the creation and deployment of information system works hand in hand with information technology. In other words, information technology is efficient to aid cooperation between organizations and functional units in the channel of distribution, which in turn enhance effective marketing performance.

Droodchi and Nikmehr (2007) submit that proper management of information flows will enhance effective costs reduction, quality in the distribution of goods and services, flexibility and timeliness in service delivery, and ultimately

organizational profits. Drawing from scholarly dispositions, it is our opinion that information technology capability has good relationship with supply chain and marketing performance. In other words, for effective performance of marketing activities in the downstream petroleum sector, information technology capability will be in place to enforce effective supply chain mechanism by integrating various functional units for efficient service delivery premise upon the above literature review, the research model in the figure below was formulated. Thus:

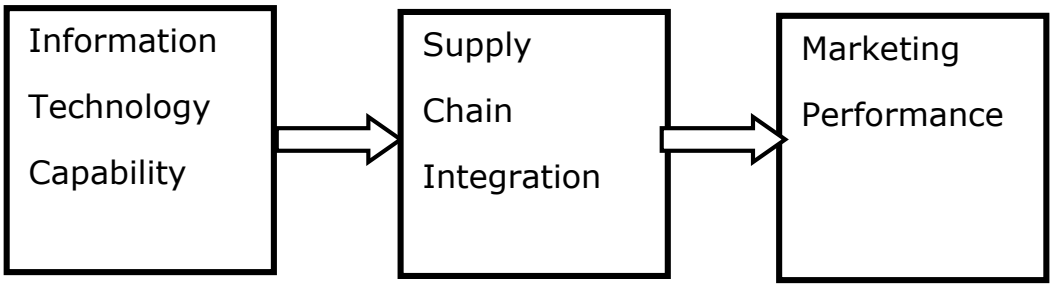

Figure 1:1: Conceptual model

Therefore, the hypothesis below was formulated:
H_{01}: There is a significant and positive relationship between supply chain integration and marketing performance.

H_{02}: Information technology capability positively and significantly relates with supply chain integration and marketing performance

Research Methodology

Cross sectional survey design was adopted in the study since data was obtained once from respondent. The study was carried out in seven (7) major oil petroleum downstream marketing companies which comprises; Conoil Nig. Plc., Forte Nig. Plc., MRS Nig. Plc., Mobil Nig. Plc., Total Nig. Plc., and NNPC Mega Stations of Six South-South states in Nigeria, with accessible population of 930 top level management as revealed by the Human Resources departments of the companies. Since the population was known, Taro Yamane formula was adopted to arrive at a sample size of 280, with an error margin of 5% (0.05). The study used purposive sampling technique Primary data was used in the study to obtain information from the respondents through the deployment of a structured questionnaire. The

impression of each respondents was rated on a 5- point Likert – Scale in which 1, denotes "disagree, 2 denotes "strongly disagree" 3 denotes " Neutral", 4 denotes "agree", and 5 denotes "strongly agree" as well as an "uncertain alternative to prevent bias in response. Content validation was used since it is a subjective measure of the relevance, adequacy, and representative of the items in the constructs. While Cronbach's Alpha value of 0.7 was used to ascertain the reliability cut-off point of the study. Partial least square- structural Equation modeling was employed to analyze the inferential statistics of the study. This technique is mostly used to explain the relationships and prediction of target constructs. Descriptive statistics was conducted with the aid of Statistical Package for Social Science (SPSS) Version 22.0.

Analysis and Discussion

Construct	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
	Statistic	Statistic	Statistic	Statistic	Statistic
Supply Chain Integration	218	2.12	3.99	2.58	.646
Marketing Performance	218	2.04	3.14	2.50	.521
Information Technology Capability	218	2.50	3.41	2.91	.574
Valid N (listwise)	218				

Source: SPSS Computation from Data, 2021

The first results in the table above shows the statistics on the aggregate items of supply chain integration. It indicate that supply chain integration had moderate score (M=2.58, SD= .65). This means that supply chain integration in the petroleum marketing companies in South-South Nigeria was moderately carried out.

The second results indicated that marketing performance is just at the cut off mean score (M=2.50; SD=52).

Furthermore, the respondents were of the view that average marketing performance of petroleum products in the downstream sector was occasioned by the distribution methods.

The third results show that all indicators are within acceptable limits of normality, whereby ITC_3 is the most skewed (-0.501) and ITC_4 scoring 3. 103, as the largest value of kurtosis. From the output, all items on ITC had moderate mean scores. Statistical output on the first statement item (ITC_1) suggests that there is a moderate level at which booking of petroleum products are facilitated by information technology (M=2.52; SD=.52). Secondly, result on item ITC_2 indicates that there is a moderate level of IT compliance in the downstream petroleum sector (M=2.50; SD=.62). ITC_3 showed a moderate level of strategic positioning of the firms due to IT adoption (M=3.41; SD=.73). ITC_5, results implies that downstream sector of petroleum marketing firms save costs, time and human efforts in securing products through IT applications (M=2.61;SD=.69).

Information Technology Capability on the Relationship between Supply Chain Integration and Marketing Performance

Table 4: Summary of Results on the Test of H_{01}

Null Hypothesis - H_O:17	**Path (Relationship)**	**Path Coefficient (β), (t – value)**	**Predictive Accuracy R^2**	**Decision**
Hypothesis Testing without moderating variable	SCI -> MP	0.391(1.974) Significant	0.368 Moderate	Not supported
Hypothesis Testing with moderating variable	SCI -> MP	0.453(3.171) Significant	0.508 Weak	
	ITC -> MP	0.271(1.985) Significant	0.508 Weak	
	Moderating Effect 1 –> MP	0.128(1.969) Significant	NIL	

Source: SmartPLS 3.2.6 output on research data, 2021

Results in table 4 show that when information technology capability (ITC) does not interject, the standardized path coefficient from Supply Chain Integration (SCI) to marketing performance (MP) was positive, moderate and significant. However, with the introduction of ITC as the moderator, there was an increase in the path relationship between SCI and MP.

Moreover, after controlling for the covariates, SCI and ITC, the Interaction between SCI and ITC significantly accounted for the remaining variance of MP. Therefore, positive and significant relationship exits between supply chain integration and marketing performance. In the same vein, information technology capability positively and significantly relate with SCI and MP. Furthermore, the application of ITC by the downstream petroleum marketers enhances SCI, which in turn increases the level of marketing performance. This result is supported by the assertion of Amid (2007) that information Technology Capability is a panacea for effective marketing performance through the application of the mechanism of supply chain integration in downstream petroleum sector. This result is equally in consonant with the position of Rathman and Afsar (2008) that information technology capability impact positively on supply chain integration and business performance in an organization.

Discussion of findings

The aim of the study was to ascertain the relationship between ITC, SCI and MP of the downstream petroleum sector. Two hypotheses were tested in the study.
First, finding between supply chain integration and marketing performance revealed a positive and significant relationship between SCI and MP. This shows that the more cordial relationship that exist between the functional units of the supply chain partners the more petroleum products will be made available for customer consumption which implies effective marketing performance which is the aim of the entire chain. This is in consonance with the views of Yeung, Selen, Zhang & Huo (2009) which posit that the rationale behind supply chain integration is to combine partner resources and perspectives into a firms value propositions which allowed all partners in the chain to excel in performance which in turn enhance effective distribution of petroleum products through marketing activities. Finding on hypothesis2, on how information technology capability relates with supply chain integration and marketing performance, the results revealed that there is a positive and significant relationship between ITC, SCI and MP in the downstream sector of petroleum industry. This result agrees with the findings of

Amid (2007) which state that the possibility of marketing performance is dependent on effective application of information technology capability and all operations and processes in the supply chain.

Conclusion and Recommendations

The essence of adopting information technology capability is to ensure effective delivery performance that enhances products availability and customer satisfaction to the consuming publics. It is evident from the findings that ITC enhances supply chain integration and marketing performance. Most of the shortages and scarcities bedeviling distribution of petroleum products are occasioned by lack of collaboration among chain partners. Hence, to ensure effective marketing performance, every unit and supplier must be customer drivers. The veritable tool to settling this in oil and gas industry is the application of information technology capability to enhance efficient supply chain.

Based on our findings, the study therefore recommend that Management of oil and gas companies should adopt effective and efficient supply chain software and logistics information mechanism that will facilitate order placement, inventory control planned shipment/logistics and reduce lead time in their operations. Oil company management should create a department of supply chain that will be responsible with coordination of both internal and external cross-functional units as well as relating supplier issue.

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