



Information Technology: A Sustainable Competitive Advantage Trend in Nigerian Oil and Gas Industry

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ABSTRACT

The purpose of the study was to examine the relationship between information technology and sustainable competitive advantage in the Nigerian Oil and Gas Industry. The design adopted is the cross-sectional survey and data collection was carried out using the structured questionnaire from a total of 120 workers within the firms. The Cronbach alpha reliability was used in assessing the reliability of instruments adapted for the study. The tests on the hypotheses showed that information technology contributes significantly to sustainable competitive advantage. It was therefore concluded that information technology is critical to the functionality of the organization and its systems and to a substantial level impacts on the organization's capacity for organization responsiveness and cost leadership. It was therefore recommended that; focus should be placed on innovations, developing technologies and constantly updating the information technology needs of the organization in a manner that coincides with the growing changes and dynamics of the organizations market and the expectations of its customers.

Keywords: Oil and Gas Industry, information technology, Sustainable Competitive Advantage

INTRODUCTION

The recent downturn in the price of crude oil has been a turning point experience in the Nigerian oil and gas industry. This unprecedented turn of event has plunged many organizations in the sector into rigorous competition in order to strengthen operations, survive, and increase efficiency that would shape the future of the oil and gas industry. However, it is evident that in order to foster production of hydrocarbons and increase organizational efficiency in an environment of cost cutting, capital discipline, postponed or cancelled projects, management would have to reengineer processes, build capacities, realign assets and implement strategies capable of engendering Sustainable Competitive Advantage (SCA). Many scholars have sought to examine different strategies and variables to achieving SCA due to the implications in business efficiency.

Drobis (1991) maintained that organizational progression into hyper competitive markets solidify the continuous need to innovate and communicate, therefore, specialized strategies should be adopted to reach out to different customers and gain Sustainable Competitive Advantage (SCA). Hilda (2016) affirmed that this growing uncertainty is the result of higher customer expectations. As the level of dynamics in business environment increases, the development of strategies that will differentiate the organization from competitors becomes the key factor (Gathungu & Mwangi, 2012). Coyne (1986) opined that customers must perceive the difference between a firm's product and that of the competitors. These differences must be due to some resource capability within the organization outside the knowledge of the competitors. Rouse and Zietsma (2008) maintained that learning to respond to early signals of environmental changes constitutes the development of dynamic capabilities for environmental adaptation. Gowrie (2012) advocated that no advantage is sustainable on a prolong basis as the organizational environment is open to competitors to compete and cut short sustainability by products/strategy imitation or rapid technological change could shorten the lifespan of the technological resources or capacity of the

organization. Thus to build a Sustainable Competitive Advantage (SCA), a firm should be sustenance in holdings in the incumbent organizations.

Due to the importance of SCA, many scholars have attempted to advanced research on Sustainable Competitive Advantage strategy. They linked several variables in the measurement of sustainable competitive advantage. For instance, Porter (1984) presented the type of SCA strategies that could help organization – Low cost, Differentiation and focus. Zoubi (2012) examined the impact of market-share on sustainable competitive advantage in Jordan telecommunication industry. His findings revealed that market-share has a significant impact on sustainable competitive advantage. Fahy (2002) conducted a study on profitability and sustainable competitive advantage. His findings indicated that profitability has a positive effect on sustainable competitive advantage. While it is true that the variables studied have greater potential to achieving sustainable competitive advantage, Barney (1991) added that a firm is said to have a sustained competitive advantage when it is implementing a value-creating strategy not concurrently being implemented by any competitors and when these other companies are not able to duplicate the benefits of such strategy. Bhardwaj, et al (1993) also supported Barney’s view that when other companies are unable to duplicate the benefits of such strategy then the competition is sustained. Hence, there must be consistency in creating values. Barney’s assertion of value-creating strategy proposed a framework using four primary attributes – Value, rareness, inimitability and non-substitutability. Therefore, the basic way to creating SCA is the ability to forecast the actions of other players in the industry and matching the organization’s capabilities or resources to the existing gaps and voids in the industry. Sustainability of the advantage is measured on the ability of the competitor to take necessary actions to close these gaps (Coyne, 1986). Thus management must be focused and competent enough to x-ray the environment and continually look to innovate, build capacities, and develop technologies to increase efficiency.

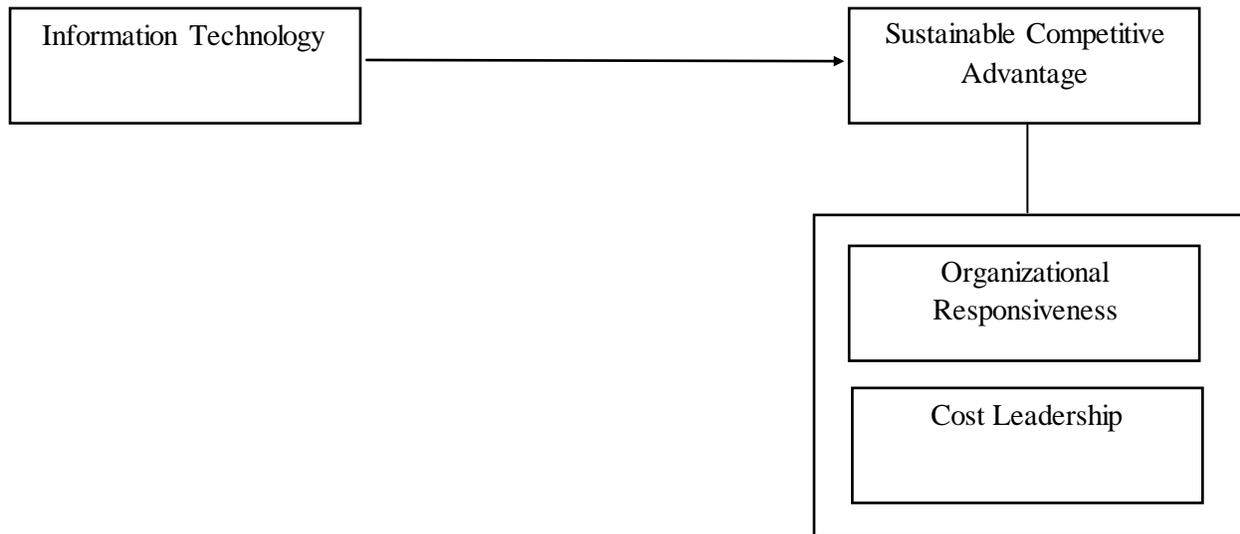
In spite of all these studies and importance placed on sustainable competitive advantage, studies have shown the poor rate at which businesses in Nigeria achieve sustainable competitive advantage (Adeneyi, 2014).

Research have focused on financial metrics such as market share, profitability and turn-over to measure superior performance that leads to the construct - sustainable competitive advantage. While it is true that these variables may possibly lead to an organization achieving sustainable advantage, the internal resources which is not made available to competitors, that has greater potential to generate superior sustainable competitive advantage is neglected. To bridge this gap, this study tends to bring to afore the rise of sustainable competitive advantage using a strategic tool which is Information Technology (IT) in Nigerian oil and gas industry.

Information Technology (IT) is the use of computers, telecommunication and system applications for storing, retrieving, sending, transmitting and manipulating data of economic importance as drivers and enablers of business process. Information technology (IT) has historically played an important role in the business efficiency. It makes it possible to obtain improvements in business process reengineering. It is regarded by some scholars as a major enabler for new forms of working and collaborating within an organization and across organizational borders. Hammer (1990) considers information technology (IT) as the key factor in Business Process Reengineering for organization that wants to witness a ‘‘radical change’’ in its operation. He prescribes the use of IT to challenge the assumption inherent in the work processes that have existed since long before the advent of modern computer and communication technology. He argues that at the heart of transformation is the notion of discontinuous thinking or recognizing and breaking away from the outdated rules and fundamental assumptions underlying operations. These rules of work design are based on assumptions about technology, people and organizational goals that no longer hold.

Business efficiency literature has identified several disruptive technologies that could help in changing the traditional ways about how work should be carried out in an organization. One of such technologies is digital information technology. Information technology is concerned with the use of computer systems and other forms of communication/digital technology in the business to improve work performance. Some of them include the use of a shared database to making information available at many places.

Regardless of the significant contributions of information technology in reshaping the organizations, little attempt has been made to measure its impact on SCA in Nigeria, particularly in oil and gas sector. Moreover, studies have shown that most of the literature on this subject have focused on theoretical as well as speculative cases with little empirical support. Also most of these studies developed a set of measurable variable that represent SCA in terms of financial metrics – turnover, profitability, market share, etc. Their findings indicate that they are important, positive and reliable indicators for the measurement of sustainable competitive advantage, however, neglecting the core capacity and internal resources of a firm - information technology which could help a firm achieve superior Sustainable Competitive Advantage. Therefore, our point of departure is to investigate the relationship between Information Technology and Sustainable Competitive Advantage in the Nigerian Oil and Gas Industry using organizational responsiveness and cost leadership as measures of sustainable competitive advantage.



Conceptual Framework of Information Technology and Sustainable Competitive Advantage

Source: Desk Research (2020).

Purpose and Objective of Study

The purpose of this study is to examine the relationship between Information Technology and Sustainable Competitive Advantage in the Nigerian oil and gas industry.

The specific objective includes to:

1. Assert the extent to which information technology enhances organizational responsiveness in the Nigerian oil and gas industry
2. Assert the extent to which information technology affects cost leadership in the Nigerian oil and gas industry.

Research Questions

1. To what extent does information technology enhance organizational responsiveness in the Nigerian oil and gas industry?
2. To what extent does information technology affect cost leadership in the Nigerian oil and gas industry?

LITERATURE REVIEW

Theoretical Framework

Theoretical foundation of this study was drawn from Resource-Based View (theory). The resource-based theory refers to how organizations could achieve competitive advantage through the possession of valuable and rare resources that other competitor cannot imitate (Takeuchi, Lapak, & Wang, 2007). Barney (1991) asserted that a firm is said to have a sustained competitive advantage when it implementing a value-creating strategy not concurrently being implemented by any competitors and when these other companies are not able to duplicate the benefits of such strategy. Therefore, it establishes the need for an organization to consistently create valuable set of resources and bundling them in an exceptional manner in order to achieve organizational success and competitive advantage.

Information Technology

Information Technology (IT) is the use of computers, telecommunication, digital, and system applications for storing, retrieving, sending, transmitting and manipulating data of economic importance as drivers and enablers of business process. Information technology (IT) has historically played an important role in the business efficiency. Companies are focused on innovations with low cost strategies for a longer environment and consistently strive to develop technologies to increase efficiency. Hence, Information technology makes it possible to obtain improvements in business process transformation (Baker 2019). It is regarded as a major enabler for new forms of working and collaborating within an organization and across organizational boundaries. Thus the development of information technology is beginning to change the way we work and these technologies are likely to impact the future of the industry overtime. Hammer (1990) considers information technology (IT) as the key factor in Business Process Reengineering for organization that wants to witness a ‘‘radical change’’ in its operation. He prescribes the use of IT to challenge the assumption inherent in the work processes that have existed since long before the advent of modern computer and communication technology. He argues that at the heart of transformation is the notion of discontinuous thinking or recognizing and breaking away from the outdated rules and fundamental assumptions underlying operations. These rules of work design are based on assumptions about technology, people and organizational goals that no longer hold. Baker’s work presented some key disruptive digital information technologies that could shape the future as well as increase business efficiency if rightfully deployed in the oil and gas industry. They include; Artificial Intelligence/Automation, Data Analytics and Internet of Things/Electronic Monitoring.

Artificial Intelligence (AI) This involves the use of technology and development of system applications to perform task normally requiring human intelligence and solving problems, such as human speech recognition, visual perception, decision making and multiple language translations. The deployment of these technologies may have consequential impacts on the operational efficiency in the oil and gas industry. Artificial Intelligence applications may cover wide range of operational areas such as survey, monitoring, inspection, safety etc. Details from operation can be coded in real-time into digital technologies or hand-held devices with specific information such as photos, measurement, analysis and locations. This information can be synchronized automatically with linked database to the control system, SMART room, maintenance scope and schedules as well as accessed through three-dimensional (3D) virtual modelling or graphical representation that is visible to all users and champion aspect in a timely manner. The system can evaluate risk, flag potential concerns and recommend mitigation measures. Therefore, saving operational time and costs.

Data Analytics (DA): The concept of data analytics is the process or science of collecting, examining, cleaning, transforming, modeling and integrating raw data to discover useful information for operational decision-making. It is concerned with the increase volume, variety and velocity of data in the oil and gas industry. The sector generates a huge quantity of data resulting from wide range of operational activities such as, drilling data, maintenance data, 3D seismic surveys, safety data, production control and monitoring data. The management and analysis of these data have presented many organizations in the sector with its peculiar challenges. Analyzing these vast quantities of information has been major innovative drive of players in the oil and gas industry with specific focus on improving exploration,

production and safety efficiencies. The application of data analysis is critical to operational areas such as maintenance, exploration, drilling, reservoir and production engineering. The accuracy of these data is useful for operational deliveries and enhance efficiencies across business in real time. Where discrepancies occur, the applications trigger maintenance error messages to alert or create maintenance request to users for component replacement or preventive maintenance. They also speed up data-driven innovations, enhance productivity and process automation in the industry.

Internet of Things and Electronic Monitoring (IOT): This is concerned with the connection of sensors and monitoring devices to send and receive data over the internet. It is a system of interconnected computer devices, mechanical, electronics, digital machines, and objects that provided with Unique Identifiers (UIDs) and have the ability to communicate and exchange data over a network without requiring human interface or interaction. These applications can also be remotely controlled and monitored from base office in terms of offshore assets within the oil and gas industry. The devices can provide real time information on equipment and machineries. It can also be used to track equipment for maintenance requirements, monitor other factors that can affect productions, such as temperature, corrosion, humidity, swell height, wind speed, etc. IoT technologies are designed with a view to improving efficiency and safety. Real time data linked to process automated communication system enhances timely informed operational decision by management, save cost and increase productivity.

The Concept of Sustainable Competitive Advantage

Sustainable competitive advantage is related to the firm's efforts in establishing and maintaining advantages for a long-term period. Sustainable competitive advantage is affected by three factors: the size of the target market, greater access to resources and customers, and restrictions on the powers of the competitors. Usually a firm can create the sustainable competitive advantage whose managers apply its strategy based on characteristics that cannot be easily copied (Coyne Kevin, 1986)

Coyne Kevin (1986) argues that to create sustainable competitive advantage, customers need to recognize the differences between a firm's products and those of the competitors. These differences must have been created due to the firm's resources that are not accessible by its competitors (Coyne Kevin, 1986). Other researchers have more accurately explained special resources and skills that contribute to the creation of sustainable competitive advantage. For example, Barney (1991) argues that all of the firm's resources are not able to create sustainable competitive advantage (SCA) and SCA-resources must have four characteristics: rarity, value, impossibility of being imitated, and impossibility of being replaced. According to Hunt Shelby and Robert Morgan (1995), potential SCA resources are divided into financial, physical, legal, human, organizational, informational, and rational resources. They believe that competitive advantage in resources can become a competitive advantage in the marketplace (Hoffman Nicol, 2000). Prahalad and Hamel (1990) argue that firms combine resources and skills with core competencies/technology so that they can successfully create sustainable competitive advantage in a consistent and unique way.

Measures of Sustainable Competitive Advantage

Organizational Responsiveness

The market place has evolved to be a global competition arena. A new paradigm shift based on the deeper exploration of investigation of the value chain is emerging (Buzacott, 1995). Organizational responsiveness is the ability of an organization to respond in an appropriate manner to mitigate negative threats or capitalize on positive opportunities generated by an organization's environment. Responsiveness therefore, should be considered as a concept that is solely focusing on changing customer's needs and its measurability depends on where the system boundaries are drawn and thereby on the definition of the system's customers (Reichart and Howler, 2007). Organizational responsiveness refers to the ability of an organization to respond to its external environment in an appropriate manner (Clippinger, 1999). A more radical definition would be that responsiveness is the aggressiveness of an organization's marketplace strategy (Gresov, Haveman and Oliva, 1993). Konsynski et al, (2007) added

that organizational responsiveness also refers to the inter-individual knowledge exchanges which in turn influence the ability of the organization to respond to a changing environment in a particular style.

Cost Leadership

Cost leadership is a business strategy in which organization creates a competitive advantage by having the lowest cost of operations in the industry. It is the ability of the organization to compete against major competitors based on low price (Li et al., 2006). According to Porter (1980) cost leadership is the achievement of overall cost leadership in an industry through a set of functional policies aimed at some basic objectives. It requires an aggressive setting up of internal efficient scale facilities, vigorous cost trap and reduction policy, overhead control, cost minimization, etc. Green et al (1993) maintained that cost leadership can be achieved through focusing on organization efficiency which could be obtained via various production and processes (economies of scale). Therefore, cost leadership could be seen as top low-cost driving strategy within the organization.

Information Technology and Sustainable Competitive Advantage

Aremu and Saka (2006) argued that Information technology (IT) is a strategic resource that facilitates major changes in competitive behavior, marketing and customer service. In essence, IT enables a firm achieve sustainable competitive advantages. Davenport (1990) conducted a research and found out that information technology (IT) has a strong role in sustainable competitive advantage. Similarly, studies (Labarre, 2019, Minerich, 2008, Simon, 1994, Hammer, 1990.) have shown that through IT, businesses can make their tasks easier, redesign their organization, change the traditional way they work and achieve sustainable competitive advantage. They could make use of disruptive technologies such as shared database, expert system, telecommunication network, decision support tools, computers etc. in the reengineering process to achieve sustainable competitive advantage. However, studies conducted by Frone (2003) found out that information technology may not necessarily lead to achieving sustainable competitive advantage in an organization. This may be due to the fact that most times it is difficult for employees to make use of the disruptive technologies or they may be resistant to change. They are conversant with the old ways of doing things rather than the new methods this could hinder the reengineering process in the organization making it difficult for the organization to achieve sustainable competitive advantage. Based on these, it is hypothesized as follows:

HO₁: There is no significant relationship between information technology and organizational responsiveness?

HO₂: There is no significant relationship between information technology and cost leadership?

METHODOLOGY

This study adopted a cross-sectional survey of quasi-experimental design with oil and gas companies. The findings are based on 116 completed survey responses. A total of 120 survey questionnaires were emailed to five (5) selected multinational oil and gas companies in Niger Delta Region of Nigeria. The questionnaires emailed yielded 116 returns which represent an overall response rate of 97%. Participants for the study are selected in line with the unit of analysis which is the organization. Key positions within these companies were identified as imperative to understanding of information technology and sustainable competitive advantage, these include - Office of the General Manager (GM), Manager, Supervisors and Team Leaders in charge of critical operational lines such as Maintenance (MTC), Engineering, Procurement and Project (ECP), Material and Logistics, Contract and Procurement (C&P), Production and Human Resource (HR). The reliability test for the instrument was done using Cronbach Alpha Coefficient and all the items were assessed to be greater than 0.7 as shown in table below. The Spearman rank correlation coefficient was used by the Researcher to determine the strength and direction of relationship between the study variables.

Table 1: Reliability Co-efficient of variable measures

Variables	Measures	Indicators	Alpha
Information technology		3	0.882
Sustainable Competitive Advantage	Cost Leadership	3	0.842
	Organizational responsiveness	3	0.764

Source: Research data output, 2020.

DATA ANALYSIS AND RESULTS

The hypotheses were tested using Spearman rank order of correlation tool at a 95% confidence interval and significance were fixed at 0.05 level of significance; where $PV < 0.005$ would imply that significant association between the study variables and a falsification of the null hypothesis and $P > 0.005$ would imply that an insignificant level of association between the study variables an acceptance of the null hypothesis; where $P > 0.005$ accept the null hypothesis.

Information Technology and Sustainable Competitive Advantage

		Technology	Cost	Responsive
Spearman's rho	Technology	1.000	.625**	.457**
	Correlation Coefficient			
	Sig. (2-tailed)	.	.000	.000
	N	116	116	116
	Cost Leadership	.625**	1.000	.286**
	Correlation Coefficient			
Responsive	Sig. (2-tailed)	.000	.	.002
	N	116	116	116
	Correlation Coefficient	.457**	.286**	1.000
Technology	Sig. (2-tailed)	.000	.002	.
	N	116	116	116

Source: Research data, 2020.

HO₁: There is no significant relationship between information technology and organizational responsiveness?

The above result demonstrates the significant relationship between information technology and organizational responsiveness with correlation coefficient of 0.457 and PV of 0.000 which is less than 0.05. We therefore, reject the null hypothesis.

HO₂: There is no significant relationship between information technology and cost leadership?

Our second hypothesis has a correlation of coefficient of 0.625 and PV of 0.000 which is also less than alpha of 0.05. Hence, we would reject the null hypothesis.

DICUSSION OF FINDINGS

The result from this research has identified information technology as significant predictor of Sustainable Competitive Advantage (SCA). As such information technology can be considered as contributing essentially towards outcomes such as organizational responsiveness and cost leadership. In this way, the technology of the organization can be considered as key to effectively harmonizing its systems, and integrating its functions to be able to drive, compete and to pull through with current trends in the environment. This corroborates the position and assertions of previous scholar (Aremu and Saka, 2006.) who affirmed that information technology is a major facet of any healthy organization as it provides the mechanism through which the organization is able to communicate and interact on a more

substantial level. As such it drives the adaptability and responsiveness of the organization in a manner that is sustainably competitive.

CONCLUSION AND RECOMMENDATION

This study addressed information technology and sustainable competitive advantage in the Nigerian oil and gas industry. The study through its results presented that information technology contributes significantly towards achieving sustainable competitive advantage (organizational responsiveness and cost leadership). IT is also critical to the functionality of the organization and its systems and to substantial level impacts on the organization's capacity. It was therefore recommended that; focus should be placed on innovations, developing technologies and constantly updating the information technology needs of the organization in a manner that coincides with the growing changes and resulting dynamics of the organizations market and the expectations of its customers. As oil and gas companies in Nigeria navigate towards a future of innovative smart technologies, the benefits resulting from such investment are manifest in increased efficiency, operational cost reduction, improved productivity and safety. However, care must be taken in terms of over-reliance on technologies without considerable percentage of human inputs as technology is likely prone to failure.

REFERENCES

- Adeyemi, S., & Aremu, M.A. (2008). Impact assessment of business process reengineering on organizational performance. *European Journal of Social Sciences*, 3(4) 115-125.
- Barney, J.B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*. 5(1) 99-120.
- Barney, J.B. (2001). Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view. *Journal of Management Science*. 27(2), 643-650.
- Bhardwaj, S.G., Varadarajan, P.R. & Fahy, J. (1993). Sustainable competitive advantage in service industries: A conceptual model and research proposition. *Journal of Marketing*, 57, 83-99.
- Buzacott, J.A. (1995). A perspective on new paradigms in manufacturing. *Journal of Manufacturing Systems*, 14(2)118.
- Ceglinski, P. F., & Wisniewska, A.S. (2016). CSR as a source of competitive advantage: The case study of Polpharma group. *Journal of Corporate Responsibility and Leadership*, 3(4), 4-10.
- Clippinger, J. (1999). Order from the bottom up: complex adaptive systems and their management. In Clippinger J. (Ed.), *The Biology of Business: Decoding the Natural Laws of Enterprise*, 4(3)1-30. Jossey- Bass, San Francisco, CA.
- Coyne, K.P. (1986). Sustainable competitive advantage: What it is, what it isn't? *Business Horizons*, 29(1):54-61.
- Crowe, T.J., Fong, P.M. & Zayas-Castro, J.L. (2002). Quantitative risk level estimation of business process reengineering efforts. *Business Process Management Journal*, 8(5), 490-511.
- Drobis, R. (1991). Taking corporate strategy seriously. *Public Relations Journal*, 47(8) 50-53.
- Fahy, J. (2002). The resource-based analysis of sustainable competitive advantage in a global environment. *International Business Review* .11(1) 57-77
- Gowrie, V., Jayashree, S., & Marthandan, G. (2012). Critical success factors of sustainable competitive advantage: A study of Malaysian manufacturing industries. *International Journal of Business and Management*, 7(22) 29- 45.
- Hammer, M. & Champy, J. (1990). *Reengineering the corporation: A manifesto revolution for business*. New York: Harper Business.
- Lin, Y & Wu, L. (2006). Dynamic capabilities, environmental dynamism and competitive advantage: Evidence from China. *Journal of Business Research*, 67(1), 2793-2799.
- Porter, M.E. (1984). Towards a dynamic theory of strategy. *Strategic Management Journal*, 12(1), 95-117
- Prahalad, C.K. and Gary H. 1990. "The core competence of the corporation." *Harvard Business Review* 68 (May-June): 79-91.

- Reichhart, A., & Holweg, M. (2007). Creating the customer-responsive supply chain: a reconciliation of concepts. *International Journal of Operations & Production Management*, 27(11), 1144-1172.
- Rouse, M., & Zietsma, C. (2008). The emergence of adaptive dynamic capabilities for strategic renewal. The International Conference Paper on Organizational Learning, Knowledge and Capabilities.
- Zoubi, R.M. (2012). Leadership competencies and competitive advantage: empirical study on Jordan Telecommunication. *European Journal of Business and Management*, 4(7), 14-18.