

The Macrotheme Review

A multidisciplinary journal of global macro trends

Improving the Value Chains of Manufacturing Firms in Nigeria through the Application of Information and Communication Technology (ICT)

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Abstract

Information and Communication Technology (ICT) has grown exponentially in the last few years and has been found to aid value chain activities of manufacturing firms in production, marketing/sales and infrastructures to achieve competitive advantage. However, not all the firms are taking advantage of this window of opportunity. It is for this reason that the study sought to examine the role of ICT on value chain activities in accordance with the Michael Porter's generic framework and to identify the causes of the indifference. The firm-level survey collected data using a 5-point rating scale questionnaire from 335 manufacturing firms under the auspices of the Manufacturers Association of Nigeria (MAN) by means of the stratified random sampling technique. Multiple regression was used to test the hypotheses at 5% level of significance and it was discovered that manufacturing firms invest less on ICTs preferring to use those found off-the-shelf, mainly in marketing/sales and other firm's infrastructure, but rarely in production, which is probably why Nigerian firms are unable to join the global value chain and not surprisingly unable to benefit from the advantages therein. It is therefore recommended that captains of the industry should as a matter of priority invest in ICTs and adopt it all along the value chain thereby improving their margin.

Keywords: Competitive advantage, Value chain, Manufacturing firms, ICT.

1. Introduction

Information and Communication Technology (ICT) consists of the hardware, software, networks, and media for the collection, storage, processing, transmission and presentation of information (voice, data, text, images), as well as related services (World Bank, 2013) and it covers vast areas of technologies such as mobile and wireless technology, telecommunications, security, and intelligence systems. It is playing an increasingly important role in businesses, which allows users to become more efficient and effective (Ssewanyana, 2009). Furthermore, ICT is also credited with the ability to confer competitive advantage when applied to value chain activities (Mintzberg, Lampel, Quinn, & Goshal 2003; Porter, 1987). ICT affects competition in a number of ways and its application allows a firm to achieve its aim (Hinton & Tao, 2006; Porter & Millar, 1985). The technologies support the communication and cooperation of human beings and their organization (Herselman & Hay, 2003). It is clear therefore that ICTs are decisive for

the way that enterprises run their business, organize internal communication, share information with partners and communicate with customers (Giannakouris & Smihily, 2013).

The ultimate goal of the value chain analysis is to provide margin through the competitive advantages of cost leadership, differentiation, innovation, growth, and focus strategy (O'Brien & Marakas, 2011; Porter, 1985) and this can be measured using any of several performance measurement systems such as the balanced scorecard, the performance prism or the Cambridge Performance Measurement process. However the key measuring metrics that matter has been grouped into cost reduction, timeliness, quality, efficiency, reducing inventory, reducing maintenance, and increasing flexibility (Davidson, 2013).

Statement of the Problem

When in 1985 Porter & Millar assessed how information technology permeates the value chain, it triggered the interests of other scholars who have contributed in no small way in the discourse (Bakos & Treacy, 1986; Buchanan & Gibb, 2007; Lederer & Salmela, 1996; Sethi & King, 1994). Unfortunately, the pace of technological changes appears to be faster than the theories could cope with, which is probably why the ICT adoption rate in the manufacturing sector is low in Nigeria (OECD, 2011). With a capacity utilization of less than 50%, the sector is adjudged to be underperforming. The reason (s) for such a dismal performance is yet to be fully explored.

Objectives of the Study

The main objective of the study was to examine the role of information and communication technology in improving the performance of the value chain activities of manufacturing firms in Nigeria. The specific objectives are as follows:

1. to examine the role of ICT in the performance of primary activities of manufacturing firms in Nigeria, and
2. to examine the role of ICT in the performance of support activities of manufacturing firms in Nigeria.

Research Questions

The following questions guided the study:

- i. what is the role of ICT in the performance of primary activities of manufacturing firms in Nigeria?
- ii. what is the role of ICT in the performance of support activities of manufacturing firms in Nigeria?

Hypotheses of the Study

The following null hypotheses were formulated for the study:

- Ho1: "There is no significant relationship between the application of ICT in operation activities and the performance of manufacturing firms in Nigeria."
- Ho2: "There is no significant relationship between the application of ICT in marketing/sales activities and the performance of manufacturing firms in Nigeria."
- Ho3: "There is no significant relationship between the application of ICT in firm's infrastructures and the performance of manufacturing firms in Nigeria."

2. Literature Review

The Porter's value chain model views an organization as a chain, or series of processes and it classified an organization's activities into two categories: primary activities and support activities (O'Brien & Marakas, 2012). The goal of these activities is to create value that exceeds the cost of providing the product or service, thus generating a profit margin.

In 1985, Porter and Millar extended the Porter's value chain model by assessing how information technology permeates the value chain. The aim of the value chain framework is to maximize value creation while minimizing costs (Porter, 2001). The work of Porter & Millar (1985) analysis guided this study and an adaptation is presented as Figure 1.

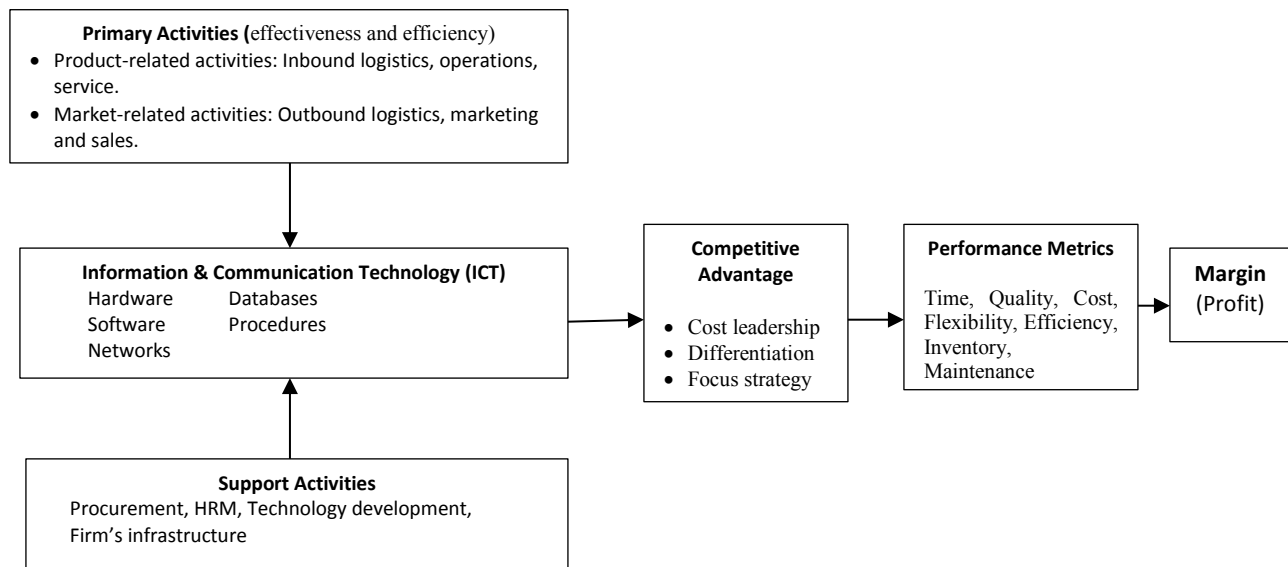


Figure 1: Conceptual Framework

Source: Adapted from Porter & Millar (1985)

ICT and Operations

Product-related activities are the activities that the organization performs to add value to the products and services itself. The activities are classified as: Inbound logistics; operations; and service (Saha, 2011). Inbound logistics activities include purchasing, inventory management, receipt of raw materials from suppliers and the use of ICT in logistics also has an important impact on firms' competitive advantages (Bourlakis & Bourlakis, 2006; Closs & Xu, 2000). Manufacturing makes use of automation, which invariably reduces costs; enhances higher and consistent quality; very fast and reliable; can run 24 hours a day; and with it, huge volume can be produced in a short time ((Kalpakjian, & Schmid, 2006).

Information technology is used in inventory management, and a groups of software systems such as enterprise resource planning (ERP); supply chain management (SCM); new product development (NPD); and customer relationship management (CRM) has been found to facilitate operations (Davis, Aquilano & Chase, 2003; Fasanghari, Roudsari & Chaharsooghi, 2008). Computer-aided manufacturing (CAM), Computer-Aided Design (CAD) and Computer-Integrated Manufacturing (CIM) are playing significant role in manufacturing (Ames, 2000; Daintith, 2004; Davis, et al, 2003). Computer-controlled manufacturing has revolutionized the

way products are made. Industrial robots are very expensive but can work 24 hours a day and are extremely accurate and so product quality is high.

ICT and Marketing

Marketing essentially analyses the needs and wants of customers and is responsible for creating awareness among the target audience of the company about the firm's products and services. These activities include the advertising, channel selection, product promotion, selling, product pricing, retail management, etc and are performed to make sure that the products are transferred to the targeted customer group (Saha, 2011). Market-related activities are activities the organization performs to transfer the finished products and services to the customer. These activities are classified into outbound logistics and marketing and sales.

Outbound logistics include handling of goods, distribution and dispatch of products and services and the management of the flow of resources between the point of origin and the point of consumption in order to meet some requirements, for example, of customers or corporations (Owusu, Manso, & Osei-Mensah, 2014). The use of good ICT improves customer services and customer demand. Internet marketing and online advertising efforts are typically used in conjunction with traditional types of advertising like radio, television, newspapers and magazines (Mohammed, Fisher, Jaworski & Paddison, 2004). From database development, website design to market research, translation software, direct mail marketing and training, the application of ICT is critical for economic success (Ryan, 2011). ICT is making marketing efforts more flexible by introducing novel products, accommodating shifts in production, vary production with no detrimental effect on efficiency, and to switch between different products in the product mix (Awwad, 2007).

ICT and Firm's Infrastructure

The firm's infrastructure is a support mechanism in the value chain analysis (Porter, 2001) and one of the support activities that assist the primary activities in helping the organization achieve its competitive advantage and includes: planning and control systems, such as finance, accounting and corporate strategy (Lynch, 2003). Although support activities are often viewed as overhead, some firms have successfully used them to develop a competitive advantage, for example, to develop a cost advantage through innovative management of information systems.

Technological change is one of the most important forces affecting a firm's competitive position and the support activities in the form of its infrastructure has been affected by ICT. Financial and accounting software are leading the in simplifying planning and organizational control. By using complex software which can analyze the tastes and preferences of customers, companies can offer personalized products to customers. The most complex and expensive business accounting software is frequently part of an expensive suite of software often known as enterprise resource planning (ERP) software (Montgomery, 2010). However, in the long run the overall cost of operation diminishes.

3. Materials and Methods

The research was a survey, which was geared towards the collection of data for hypotheses testing. The research instrument will be developed on the basis of the formulated hypotheses. A 5-point rating scale questionnaire was developed based on the research hypotheses, with options varying from strongly agree through uncertain to strongly disagree. The

multi-staged sampling method was used with the first stage drawing respondents based on the geographical spread of respondents from 13 branches that made up the study area and then the next stage was to stratify respondents along the 10 sectoral groups (MAN, 2013).

Population

The population of the respondents was obtained from the database of MAN in Nigeria, which as at 2014 has 1, 526 registered members in 13 branches and members operate in 10 sectoral groups

Sampling and Sampling Techniques

Cluster sampling was used to select members on the basis of geographical spread while the stratified random sampling technique, which is appropriate for a study drawing data from a population with diverse characteristics (Hinton, Brownlow, McMurry & Cozens, 2004; Oppenheim, 1992; Sambo, 2005), was used to draw the sample for the study on the basis of sectoral groupings. From a population of 1, 526, a representative sample of 335 was selected using the Israel (1992) formula for determining sample size.

Data collection method

For the purpose of this study, the primary data was obtained through the administration of a structured 5-point rating scale, closed-ended questionnaires to the respondents.

4. Data Analysis and Results

Table 1 presents the three research hypotheses that were tested using multiple regression analysis.

Table1: Results of Multiple Regression Analysis

	Hypotheses	<i>p</i> value	Decision
Ho1	“There is no significant relationship between the application of ICT in operation activities and the performance of manufacturing firms in Nigeria.”	.072	Accept
Ho2	"There is no significant relationship between the application of ICT in marketing/sales activities and the performance of manufacturing firms in Nigeria."	.001	Reject
Ho3	"There is no significant relationship between the application of ICT in firm's infrastructures and the performance of manufacturing firms in Nigeria."	.002	Reject

As shown in table 1, with a *p*-value of .072, there is no significant relationship between the application of ICT in operation activities and the performance of manufacturing firms in Nigeria. The hypothesis is therefore accepted. On the other hand, hypothesis 2 is rejected because of the *p*-value of .001, which signifies that there is a significant relationship between the application of ICT in marketing/sales activities and the performance of manufacturing firms in Nigeria. Similarly, hypothesis 3 is rejected because of the *p*-value of .002, which implies that

there is a significant relationship between the application of ICT in firm's infrastructures and the performance of manufacturing firms in Nigeria.

The result that showed an acceptance of hypothesis 1 was shocking and is not supported by literature. However, the null hypothesis is supported by several scholars (Bayo-Moriones, Billon & Lera-Lopez, 2013; Machikita, Tsuji, & Ueki, 2010). The result that indicated the rejection of hypothesis 2 and 3 supports other findings by scholars (Apulu, 2012; Irefin, Abdulazeez & Tijani, 2012; Polo-Pena, Frias-Jamilena & Rodriquez-Molina, 2011).

5. Conclusion and Recommendations

The manufacturing sector of the Nigerian economy has great potentials, but managers are not gaining the desired advantages that ICT confers of manufacturing activities. ICT tools can positively affect production, marketing as well as other supporting activities. It is therefore recommended that captains of the manufacturing sector should as a matter of priority invest in ICTs and adopt it all along the value chain thereby improving their margin.

References

- Ames, B. B. (June 19, 2000). How CAD keeps it simple. *Design News*.
- Apulu, I. (2012). *Developing a framework for successful adoption and effective utilization of ICT by SMEs in developing countries: A case study of Nigeria*. (Doctorate dissertation, University of Wolverhampton, 2012). Retrieved from wlv.openrepository.com/wlv/bitstream/2436/249899/1/Apulu_PhD on 15/03/2014.
- Awwad, A. S. (2007). The role of flexibility in linking operations strategy to marketing strategy. Paper presented at the POMS 18th Annual Conference, Dallas Texas, USA. 4 -7 May 2007.
- Bakos, J. Y. & Treacy, M. E. (1986). Information technology and corporate strategy. *MIS Quarterly*, 10(2), 107 – 119.
- Bayo-Moriones, A., Billon, M., & Lera-Lopez, F. (2013). Perceived performance effects of ICT in manufacturing SMEs. *Industrial Management & Data Systems*, 113(1), 117 – 135.
- Bourlakis, M., & Bourlakis, C. (2006). Integrating logistics and information technology strategies for sustainable competitive advantage." *Journal of Enterprise Information Management*, 19 (4), 389-402.
- Buchanan, S. & Gibb, F. (2007). The information audit: Role and scope. *International Journal of Information Management*, 27(3), 159 – 172.
- Closs, D., & Xu, K. (2000). Logistics information technology practice in manufacturing and merchandising firms – An international benchmarking study versus world class logistics firms. *International Journal of Physical Distribution & Logistics Management*, 30(10), 869-886.
- Daintith, J. (2004). *A dictionary of computing* (5th ed.). Oxford University Press.
- Davidson, M. (2013). 28 manufacturing metrics that actually matter: How to monitor high-level goals and the processes that achieve them. *QualityDigest*. Retrieved from www.qualitydigest.com/inside/quality-insider-article/28-manufacturing... On 04/12/2014.
- Davis, M. M., Aquilano, N. J. & Chase, R. B. (2003). *Fundamentals of operations management*. (4th ed.). Boston: McGraw-Hill Irwin.
- Fasanghari, M., Roudsari, F. H., & Chaharsooghi, S. K. (2008). Assessing the impact of information technology on supply chain management. *World Applied Science Journal*, 4(1), 87 - 93.
- Giannakouris, K., & Smihily, M. (2013). Enterprises making slow progress in adopting ICT for e-business integration: ICT usage in enterprises 2012. *Eurostat Statistics in Focus*. Retrieved from http://ec.europa.eu/eurostat on 03/09/2013.

- Herselman, M. E. & Hay, H. R. (2003). Challenges posed by information and communication technologies (ICT) for South African higher education institutions. *Informing Science*, 931-943.
- Hinton, C. M. & Tao, Y. (2006). Exploring sources of competitive advantage: E-business applications within the Chinese real estate industry. *Journal of Technology Management in China*, 1 (1), 92-106.
- Hinton, P. R., Brownlow, C., McMurray, I., & Cozens, B. (2004). *SPSS explained*. London: Routledge.
- Irefin, I. A., Abdulazeez, I. A. & Tijani, A. A. (2012). An investigative study of the factors affecting the adoption of information and communications technology in small and medium-scale enterprises in Nigeria. *Australian Journal of Business and Management Research*, 2 (2), 1-9.
- Israel, G. D. (1992). *Determining sample size*. Program Evaluation and Organizational Development, IFAS, University of Florida. PEOD-6. November 1992. Retrieved from www.soc.uoc.gr/socmedia/papageo/metaptyxiakoi/sample_size/samplesize1.pdf on 19/01/2014.
- Kalpakjian, S., & Schmid, S. (2006), *Manufacturing engineering and technology* (5th ed.), Prentice Hall,
- Lederer, A. L. & Salmela, H. (1996). Toward a theory of strategic information system planning. *Journal of Strategic Information Systems*, 5(3), 237 – 253.
- Lynch, R. (2003). *Corporate strategy*. (3rd ed.). Prentice Hall Financial Times.
- Machikita, T., Tsuji, M., & Ueki, Y. (2010). How ICTs raise manufacturing performance: Firm-level evidence in Southeast Asia. Economic Research Institute for ASEAN and East Asia (ERIA) Discussion Paper 2010-07.
- Manufacturers Association of Nigeria (2013). Economic review (January - June). *MAN Economic Review*. R. No. 30.
- Mintzberg, H., Lampel, J., Quinn, J. B. & Goshal, S. (2003). *The strategy process*. (4th ed.). Pearson Education International.
- Mohammed, R., Fisher, R. J., Jaworski, B. J., & Paddison, G. (2004). *Internet marketing: Building advantage in a networked economy*. New York: McGraw-Hill Inc.
- Montgomery, N. (2010). Two-tier ERP suite strategy: Considering your options. Gartner Group. Retrieved from www.gartner.com/doc/1412121 on 02/02/2014.
- O'Brien, J. A., & Marakas, G. M. (2011). *Management information system*. (10th ed.). New York: McGraw-Hill.
- Oppenheim, A. N. (1992). *Questionnaire design, interviewing and attitude measurement*. London: Pinter Publishers.
- Organization for Economic Co-operation and Development [OECD] (2011). *The impact of ICT on productivity and growth*. ICTNET Assessment Paper 1
- Owusu, K. K., Manso, J. F., & Osei-Mensah, R. (2014). Outbound logistics management in manufacturing companies in Ghana. *Review of Business & Finance Studies*, 5 (1) 83-92.
- Polo-Pena, M. A., Frias-Jamilena, D. M., & Rodriquez-Molina, A. I. (2011). Impact of market orientation and ICT on the performance of rural smaller service enterprises. *Journal of Small Business Management*. 49(3), 331 – 360.
- Porter, M. E. (1987). *From competitive advantage to corporate strategy*. *Harvard Business Review* 3, 43 - 59 (May-June).
- Porter, M. E. (2001). Strategy and the Internet. *Harvard Business Review*, 79 (3), 63-78.
- Porter, M. E., & Millar, V. E. (1985). How information gives you competitive advantage. *Harvard Business Review*, July / August, 149-160.
- Ryan, V. (2011). Why information communication technology is a vital marketing tool with reference to the dvd / cd industry. Retrieved from <http://www.technologystudent.com/prddes1/ict1.html> on 13/11/2014.
- Saha, A. (2011). Mapping the Porter's value chain activities into business functional units. *Management Innovation Exchange*. Retrieved from www.managementexchange.com/hack/mapping-porter's-value-chain on 12/11/2013.
- Sambo, A. A. (2005). *Research methods in education*. Lagos: Stirling-Horden Publishers (Nig.) Limited.

- Sethi, V. & King, W. R. (1994). Development of measures to assess the extent to which an information technology application provides competitive advantage. *Management Science*, 40 (12), 1601 – 1627.
- Ssewanyana, J. K. (2009). ICT usage in microfinance institutions in Uganda. *The African Journal of Information Systems (AJIS)*, 1 (3), 5-28.
- World Bank (2013). *ICT glossary guide*. Retrieved from <http://go.worldbank.org/UPJ4PKMG60> on 09/09/2014