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Information Communication Technology Adoption and Supply Chain Performance of Parastatals in Kenya's Energy Sector

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Abstract:*Adoption of information and communication technology (ICT) has a significant effect on organizational processes, operational efficiency and service delivery. This study was undertaken to establish the effect of ICT adoption on supply chain performance of parastatalsin Kenya's energy sector. A descriptive study was undertaken in which the population of the study was nine parastatals in Kenya's energy sector.The study used primary data which was collected through administration of a semi-structured questionnaire to ICT managers, supply chain managers, ICT support staff and procurement officers.The studyfound a positive effect of ICT adoption on procurement, production scheduling, business to business collaboration and risk management. However, the use of ICT in parastatals is hindered by inadequate data migration, poor ICT infrastructure, user resistance, lack of top management support, inadequate training and high initial capital outlay. To realise the envisioned benefits, parastatals need to enhance data migration, user involvement, training and integration of various systems.*

Key Words: *ICT, Interorganizational Information Systems,Supply Chain*

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I. Introduction

Information and communication technology (ICT) has transformed all types of businesses. With the support of ICT, organizations reengineer their processes in order to enhance information sharing, knowledge management, service delivery and operational efficiency. Within supply chain management (SCM), ICT is considered as an enabler due to its ability to support data capturing, processing, storage and information sharing.Thus, adoption of ICT within the supply chain management facilitates not only information sharing but also shortening of information processing time and consequently eliminating the bullwhip effect (Lee et al., 1997). Since a firm's supply chain cut acrossfunctions and has major implications on production, service delivery and customer satisfaction, supply chain management is recognized as a strategic issue in most organizations. Therefore, a key concern in most organizations is on how to implement an efficient, effective, flexible and reliable supply chain.

Since the operating environment is quite competitive, there is need for organizationsto invest in information systems that integrate internal business processes. Equally important is the integration of systems between an organization and its key stakeholders such as suppliers and customers through the use of interorganizational information systems (IOIS). Adoption of ICT in supply chain management has resulted in information systems that facilitateseffective and efficient procurement of goods and services, production scheduling, business to business collaboration, risk management and inventory management.

In Kenya, energy is recognized as one of the major ingredients in the achievement of the country's development agenda as documented in the Vision 2030. Development and operations of the energy sector is governed by Session Paper No.4 of 2004 and the Energy Act No.12 of 2006.Currently, there are nine parastatals each with a specific mandate. Although the country generates electricity from numerous sources such as hydro, geothermal, thermal and wind, over 70% of the electricity supply in the country is from hydro generation plants. In additionto government owned parastatals, there are alsoIndependent Power Producers (IPPs) who generate and sell power to the national grid.

II. Literature review

As noted by Marinagi et al. (2014), new technologies, global competition and increased customer demands are compelling organizations to adopt ICT in their supply chain. In general, the term ICT refers to technologies that are used to capture, store, process and disseminate information. These technologies comprise of people, hardware, software, data resources and communication networks that collects, transform and distribute information within and outside the organization(O'Brien, 2002). On the other hand, a supply chain

refers to a network of suppliers, manufacturers, warehouses, distributors and retailers who coordinate their plans and activities in order to convert raw materials to finished goods (Chandra &Grabis, 2007).According to Olson (2012), supply chain processes include product development, procurement, manufacturing, physical distribution, customer relationship management and performance measurement. The key objective in any supply chain is to ensure that supplies are provided to customers as per the quality specifications, on time, right quantities, at the lowest cost and at the specified location(Simchi-Levi et al., 2004).

Adoption of ICT in supply chain facilities integration, coordination and collaboration across organizations supply chain (Stank, Keller & Daugherty, 2001). Consequently, with increased use of information technology-based systems, organizations are able to create seamless supply chains that link partner organizations hence allowing them to access critical data and information on customer demands, inventory level, supply details, lead time, price and quality specifications. In addition, ICT also enable organizations to coordinate their processes by sharing critical information among themselves. This facilitate planning, service delivery and minimizetransaction cost.Further, through the use of ICT in supply chains, organizations are enhancing operational efficiency by implementing automatic replenishment programs, vendor managed inventory and collaborative planning, forecasting and replenishment programs (Daugherty et al., 1999).

ICT facilitates integration of various value chains and as noted by Norris et al. (2000), only organizations that are able to integrate their value chain with those of partners will prosper. Therefore, organizations need to adopt interorganizational information systems (IOIS) in order to facilitate external integration (Premkumar, 2000; Grover & Saeed, 2007; Shaik & Abdul-Kader, 2013).Further, there is need for design and implementation of compatible systems within and without the organization as this will enhance seamless flow of supply chain information. To achieve this, organizations must adoption certain basic standards in the design of supply chain systems (Gunasekaran& Ngai, 2004).

Adoption of ICT within organizations is dependent on a number of factors which are detailed in various technology adoption models. According to Technology Acceptance Model (TAM), there are two key factors namelyperceived usefulness (PU) and perceived ease of use (PEOU) that determines when and how users adopts new technology. In addition, the Unified Theory of Acceptance and Use of Technology (UTAUT) explains user intentions to use new technology based on four constructs namely performance expectancy, effort expectancy, social influence and facilitating conditions. With increased implementation of new ICT systems in supply chain, organizations in Kenya needs to undertake capacity building for employees and users as this will have an impact on their supply chain performance.

III. Research Problem

In their endeavor to reduce operational costs and enhance service delivery, organizations have continued to adopt information technology-based systems. Based on extant literature on the positive relationship between ICT and organizations performance, there seem to be consensuses that ICT is a key enabler in supply chain management as it facilitates informationsharing and shortening of information processing time. Consequently, various organizations have and continue to invest in ICT with the hope of enhancing efficiency and service delivery through streamlined supply chains. According to Hult (2008), effective supply chains are critical in risk management and this is only possible with the adoption of appropriate ICT based systems.

Parastatal in Kenya's energy sector have implemented various ICT systems with a view of delivering quality services to the public. Some of the adopted systems are specific to their respective mandate while others are general and cover areas such as human resource, finance and reporting. Although these parastatals have adopted ICT based systems,there has been disruption of services due to non-availability of components in the right location, supply of sub-standard products, late deliveries of critical components, poor forecasting among others. Consequently, there have been concerns on the benefits of the installed ICT systems since the expected level of service delivery has not been commensurate with the investment in the requisite systems. This study was therefore designed to answer the research question; what is the effect of ICT on supply chain performance in parastatals in Kenya's energy sector? The objectives of the study were to:

i. Establish the extent to which ICT has been adopted in supply chain by parastatals in the Kenya's energy sector;
ii. Determine the effect of ICT adoption on supply chain performance of parastatals in the Kenya's energy sector;
iii. Determine factors hindering ICT adoption in supply chain by parastatals in the Kenya's energy sector.

IV. Research Methodology

A descriptive research design was used in the study as it allows for collection and analysis of data in order to describe a specific phenomenon (Mugenda & Mugenda, 2003). The study population was the nine parastatals in Kenya's energy sector. Since the population size was small, all parastatals in the energy sector were included in the study. Primary data was used in the study and was collected through administration of a

questionnaire. In each parastatal, the respondents were ICT manager, supply chain manager, one ICT support staff and procurement officer.

Completed questionnaires were inspected for completeness, coded and data entered into SPSS. Since this was an exploratory study, descriptive statistics were used in the analysis.

V. Results and Discussions

On the use of ICT in supply chain, frequencies were computed and the results show that 100% of the parastatals had adopted use of ICT in one way or the other. This may be due to the fact that in Kenya, national government institutions such as ministries, departments, agencies and parastatals as well as county governments are required to use the Integrated Financial Management Information System (IFMIS) in their procurement processes. IFMIS is an automated system that was developed and implemented to enhance planning, budgeting, procurement, expenditure management and reporting by both national and county governments. However, majority of these institutions also have their own supply chain systems to facilitate procurement, planning/scheduling, business collaboration and inventory management. Consequently, variationsexist in adoption of IFMIS as well in the use of different types of supply chain systems with some of the parastatals integrating their operations through Enterprise Resource Planning (ERP) systems.

To achieve objective two, respondents' opinion on the effect of ICT on supply chain was analysed based on a five-point Likert Scale where 1= Strongly disagree, 2= Disagree, 3=Neutral, 4=Agree and 5=Strongly agree. The mean and standard deviation were computed for the effectof ICT on procurement, production scheduling/planning, business to business collaboration and risk management. The results on each aspect are presented in Table 1 to Table 4.

Table 1: Effect of ICT on Procurement

Statements on the effect of ICT	Mean	Std. Dev
E-tendering application promotes information access by potential bidders.	4.17	1.07
E-award application enhances transparency and access of market information by bidders.	4.06	1.09
E-payment application enables suppliers to receive payments in real time.	4.03	1.13
E-ordering application enhances accuracy of information during ordering.	3.91	1.08
E-evaluation ensures bids are evaluated uniformly since the same criteria is used.	3.89	0.93
Mean	**4.01**	**1.06**

As shown in Table 1, access of information by bidders was rated highly with a mean score of 4.17 and standard deviation of 1.07 while e-evaluation had the lowest mean score of 3.89 and standard deviation of 0.93. With the use of ICT, procuring entities normally post tender details in their web portal or send the details to prequalified suppliers thus facilitating ease access to procurement opportunities. However, the low rating on e-evaluationmay be attributed to the fact that majority of the parastatals in the energy sector have not fully adopted electronic systems during tenderevaluation.

Table 2: Effect of ICT on Production Scheduling/planning

Statements on the effect of ICT	Mean	Std. Dev
ICT facilitate reduction of production errors.	4.12	1.00
ICT facilitate matching of production to demand.	4.12	1.00
ICT promotes smooth flow of information in the supply chains.	4.11	0.76
ICT facilitate monitoring of products quality.	3.83	0.94
ICT facilitate accurate material planning.	3.77	0.88
Mean	**3.99**	**0.92**

Table 2 shows the effect of ICT on production scheduling/planning in which the overall mean score was 3.99. These results show that ICT facilitates scheduling/planning through reduction of production errors, matching of production with demand, provision of supply chain information, monitoring of product quality and accurate material planning. The results are in line with those of Graves (2011) who found a positive relationship between ICT adoption and production scheduling.

Table 3: Effect of ICT on Business to Business Collaboration

Statements on the effect of ICT	Mean	Std. Dev
ICT facilitate tracking of goods movement from the supplier to the store.	4.17	0.93
ICT promotes business to business relationships through resource pooling	4.14	0.69
ICT facilitate analysis of demand pattern.	3.97	0.91
ICT promotes transparent supply chains.	3.86	1.13
ICT promotes information sharing	3.86	1.12
Mean	**4.00**	**0.96**

Table 3 presents the effect of ICT on business collaboration. The respondents rated tracking of goods through the use of ICT highly with a mean score of 4.17 while sharing of information was rated last with a mean score of 3.86. The result supports Bryson (2011) assertion that collaboration is critical in supply chain management.

As shown in Table 4, the overall rating on the impact of ICT on risk management was 3.90. The results also show the impact of ICT on risk management is achieved through reduction of loss of goods on transit due to tracking, tracking of expiry date, monitoring of operations and reduction of stockouts/overstocking.

Table 4: Effect of ICT on Risk Management

Statements on the effect of ICT	Mean	Std. Dev
ICT reduces loss of goods in transit through tracking.	4.17	0.89
ICT minimizes loss of goods through tracking of expiry date	3.86	1.06
ICT facilitates monitoring of operations.	3.79	0.82
ICT deployment minimizes the risk of stock outs/overstocking.	3.76	0.95
Mean	**3.90**	**0.93**

For objective three, frequencies were computed to determine key factors hindering use of ICT in supply chain. As shown in Table 5, majority of the respondents (86%), indicated inadequate data migration and poor ICT infrastructure as factors hindering adoption of ICT in supply chains. Thus, as organizations implement automated supply systems, there is need to ensure completeness and accuracy of data migration. In addition, systems must meet certain design standards in order to allow portability of data across interorganizational systems.

Table 5: Challenges in the Adoption of ICT in Supply Chain

Challenges	Percentage
Inadequate data migration	86%
Poor ICT infrastructure	86%
User resistance	85%
Lack of top management support	80%
Inadequate training	77%
High cost of initial investment	75%

The study also identified user resistance as a hinderance to the implementation of supply chain systems. Users may resist system implementation due to various reasons such as fear of unknown, lack of skill required to use the system, inadequate information on the purpose of the system and not being involved in the change process. Thus, user training and participation in the design and implementation of supply chainsystem should be enhanced in order to reduce user resistance. Equally important is provision of information on the system'sobjectivesand the role of different user categories. Another challenge identified was high cost of initial investment. However, this challenge may be addressed through adoption of an appropriate clouding computing model.

VI. Conclusion and Recommendations

The study findings have established the use of ICT by all parastatals in the energy sector in Kenya. Some of the benefits of adoption ICT in supply chain include facilitating informationsharing, matching of supply and production, tracking of supply of goods and services, enhancing transparency during procurement and resource pooling. However, to realise the envisioned benefits, there is need for parastatals to enhance migration of data from manual or legacy systems to integrated supply chain systems. Availability of reliable network is also critical as this would facilitate collaboration and sharing of critical data among the supply chain partners. Further, there is need for each parastatal to integrate their supply system with IFMIS.

Since this was an exploratory study, there is need for a robust study to evaluate the relationship between use of ICT in supply chain, parastatal characteristics, service delivery and organizational performance.

References

[1]. Apiyo, M., & Peck, H. (2012). Building the resilient supply chain. The international journal of logistics management, 15(2), 1-14.
[2]. Bryson, J. M., Crosby, B. C., & Stone, M. M. (2011). The design and implementation of Cross- Sector collaborations: Propositions from the literature. Public administration review, 66(1), 44-55.
[3]. Chandra, C., Grabis, J. (2007). Supply chain configuration – concepts, solutions and applications, Springer, New York: Springer Science &Business Media.
[4]. Chang, H. C. (2010). A new perspective on Twitter hashtag use: Diffusion of innovation theory. Proceedings of the American Society for Information Science and Technology, 47(1), 1-4.
[5]. Daugherty, P. J., Myers, M. B.,&Autry, C. W. (1999). "Automatic replenishment programs: An empirical examination," Journal of Business Logistics, Vol. 20, No. 2, pp. 63-82

[6]. Graves, S. C. (2011). A review of production scheduling. Operations research, 29(4), 646-675.
[7]. Grover, V., &Saeed, K.A. (2007). The impact of product, market, and relationship characteristics on interorganizational system integration in manufacturer supplier dyads. Journal of Management Information Systems, 23(4), 85- 216.
[8]. Gunasekaran, A., Ngai, E.W.T. (2004). Information systems in supply chain integration and management. European Journal of Operational Research, 159, 269–295.
[9]. Hult, G. T. M., Ketchen, D. J., & Slater, S. F. (2008). Information processing, knowledge development, and strategic supply chain performance. Academy of management journal, 47(2), 241-253.
[10]. Jeyaraj, A.,& Seth, B. (2010). Implementation of information systems infrastructures for supply chain visibility. Proceedings of the Southern Association for Information Systems Conference, Atlanta, GA, USA, March 26-27.
[11]. Lee, Hau L., &V. Padmanabhan (1997). The bullwhip effect in supply chains. Sloan Management Review, Vol. 38, No. 3.
[12]. Legris, P., Ingham, J., &Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. Information & management, 40(3), 191-204.
[13]. Maria K., & Dreyer, H (2006).Exploring the impact of ict on integration in supply chain control: A research model. Department of Production and Quality Engineering, Norwegian University of Science and Technology, NTNU S.P. Andersens v. 5, 7491 Trondheim, Norway.
[14]. Marinagi, C., Trivellas, P ., &Sakas, D (2014).The impact of information technology on the development of supply chain competitive advantage. Procedia - Social and Behavioral Sciences,147,586 – 591.
[15]. Melville, N., Kraemer, K., &Gurbaxani, V. (2011). Review: Information technology and organizational performance: An integrative model of IT business value. MIS quarterly, 28(2), 283-322.
[16]. Moharana, H, S., Murty, J.S., Senapati, S. K., &Khuntia, K. Importance of information technology for effective supply chain management.International Journal of Modern Engineering Research (IJMER), 1, (2), 747-751.
[17]. Mugenda O.M. & Mugenda. A. M. (2003). Research methods: Quantitative and qualitative Approaches. Nairobi: African Centre for Technology Studies.
[18]. O'Brien, J. A. (2002). Management Information Systems: Managing Information Technology in the E-Business Enterprise. New delhi: Mc Graw-Hill Higher Education.
[19]. Olson, L.D. (2012). Supply Chain Information Technology. In: S. Nahmias (Ed.) The Supply and Operations Management Collection. New York: Business Expert Press.
[20]. Premkumar, G.P. (2000). Interorganizational systems and supply chain management: An information processing perspective. Information Systems Management, 17(3), 56-69.
[21]. Shaik, M.N., and Abdul-Kader W. (2013). Interorganizational Information Systems Adoption in Supply Chains: A Context Specific Framework. International Journal of Information Systems and Supply Chain Management, 6(1), 24-40
[22]. Sillanpää, I (2012). Empirical study of measuring supply chain performance. Proceedings of the 13th Management International conference Budapest, Hungary, 22-24 November 2012.
[23]. Simchi-levi, D., Kaminsky, P. and Simchi-levi, E. 2004, "'Managing the supply chain - The definitive guide for the business professional'", New York, pp. 116-118.
[24]. Stank, T.P., Keller, S.B. and Daugherty, P.J. 2001, "Supply chain collaboration and logistical service performance", Journal of Business Logistics, Vol. 22, No. 1, pp. 29-48.

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