

Information Communication Technology on Supply Chain Management Performance - A Critical Literature Review

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Abstract: Supply Chain Management (SCM) is a very important function in any company and it should aim at cutting or reduction cost and customer satisfaction which translates to performance. This management function within an organization plays a key role in the performance of any company and no single firm can run away from this. Organizations have realized that competitive edge within and without the industry are achieved through performing supply chains. In Kenya, over 70% of public sector organizations have reduced costs and meet customers' expectations through a vibrant Information Communication Technology in SCM. E-procurement reduces paper work and increase productivity especially when firms adopt Information Communication Technology (ICT) in the physical flow of material products. SCM performance may be influenced by a hybrid of factors however Information Communication Technology is playing a key role in its performance and competitiveness. We therefore carry out document review to gain in-depth analysis and understanding on how information communication technology impacts supply chain management performance.

Key words: Information Communication Technology, Supply Chain Management, Customer service

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I. Introduction

Different persons have different needs and wants for goods, works and services as others have or produce them in different places and times. This will call for a strong chain that will link the suppliers (who have) and the consumers (who needs). Sayed (2013) says that supply chain is a network of manufactures and services providers that work together to convert and move goods from the raw materials stage through to the end user. The manufacturers and service providers are linked together through physical flows, information flows, and monetary flow. SCM is the management of supply chain activities and relationships in order to maximize customer value and achieve a sustainable competitive advantage (Chopra & Meindl, 2010). According to Pettersson (2008) Supply Chain Management is the integrated control and planning of materials and product flow from supplier to customer. All these activities should and are always aimed at meeting customer service levels. Once the customer is satisfied and receives value for money then we will have achieved SCM performance.

SCM involves movement and storage of raw materials, work-in-process and finished goods through from point of origin to point of consumption with value addition at every stage then with reverse logistics. Simchi-Levi, Kaminsky and Simchi-Levi (2010) posit that SCM puts up approaches that efficiently integrate suppliers, manufactures, warehouses, and stores, so that merchandise is produced and distributed accordingly. All this activities in the SCM function can be efficiently and effectively be managed using a sound information communication technology (ICT) system.

SCM performance is realized when it leads to a firm meeting its customer's expectations on service like delivery precision through lead-time (Chopra & Meindl, 2010). To achieve high customer service and low cost is a challenge for companies. Pettersson (2008) says from his experience, the company has to be good in measuring saving time and cost to be able to know if it is working with the right strategies in its SCM functions. This means that efficiency improvement is achieved through Just-In-Time production and logistics, while effectiveness is achieved through customer orientation (Quesada, Gazo, & Sanchez, 2012). Efficiency and effectiveness in some companies are used to describe and evaluate a performing SCM system.

According to Pettersson (2008) SCM performance may be said to be the extent to which a firms top managements supply chain goals are accomplished. According to Beamon (1999) SCM performance is the measure of how well the resources allocated are utilized within the chain. At the same time Chopra and Meindl (2010) states that if the customer is excluded, any theory generated about SCM will not reflect the real world since the customer is the crucial reference or yard stick to measure success.

ICT can be applied in SCM activities to help in meeting customer service levels. ICT help to achieve Quesada, Gazo and Sanchez (2012) reduced delivery time, improved financial performance, greater customer satisfaction and supplier trust. According to Chen, Jun-Der and Chyou-Huey (2014) organizations must pursue the goal of matching supply with demand in a timely fashion through the most efficient use of cross-chain resources. This can be achieved when there is ICT system integration together with high levels of partnering to maximize resource utilization, develop standardized processes, eliminate duplicate efforts, and minimize inventory levels. The goal is to have Supply Chain Management integration which leads to both information and material flows seamlessly across the supply chain as an effective competitive weapon (Ochieng, 2014). It should be noted that designing the supply chain management system has an effect to its performance through influencing information sharing and management enabled by ICT

II. Critical Literature Review

Information Communication Technology (ICT) is changing the way we work, socialize, create and share information. Companies can monitor costs and incorporate customers' feedback into product innovation and streamline product research using ICT in its SCM activities. To keep costs low and meet customer satisfaction in SCM activities, a research by Mongare and Nasidai (2014) found out that organizations develop and implement effective ICT systems both individually and collectively within the SCM activities. The study carried out a descriptive and correlation research using stratified random sampling. The results concur with another descriptive survey by Angulo (2007) where it was found that ICT will result to SC performance due to improved technology if the initiative is embraced by the partners. This studies as stated above ignored the fact that some parties within the supply chain may not be willing to work with others in this initiative. At the same time there may be cases of incompatibility in the systems due to dynamics. According to Fox (2016) the dynamics of the firms and the markets makes it difficult to collaborate and partner especially using technology. For instance, materials do not arrive on time, production facilities fail, and customers change or cancel orders, and interfere with logistics activities in the supply chain. This makes it not possible to achieve customer service levels. This may be especially if partnering initiatives for encouraging collaboration and information sharing among SCM partners are interfered with.

A study done by Cheng-Min and Chien-Yun (2006) showed that applying ICTs on logistics management has already had an impact and provided significant benefits to SCM functions. It is supported in triangulated research study by Evangelista, McKinnon and Sweeny (2013) who found that ICTs have been widely applied in the operations of customer services, transportation management, order processing, and warehousing management. This study used quantitative design and questionnaires as a tool to collect data. The study elaborated areas ICT was applied in SCM, but it does not stated how exactly it was used. Customer service management within the chain undertaking may be the most worthwhile area to apply ICT. Though, this may have serious consequences if the bullwhip effect is encountered in the supply chain. It is true according to an empirical investigation by McAfee (2012) that found out that ICT failure disrupts the entire operations in companies supply chain management especially when they fully rely on the fully automated system that may experience some kind of a breakdown. This breakdown may interrupt with customer service level especially when lead times are not met.

In the research by Evangelista, McKinnon and Sweeny (2013) it was revealed that ICT enhances firm's operation efficiency, and innovation processes are accelerated and generates value addition to businesses. However the study does not reveal clearly how ICT accelerates the value addition which customers look for as a benefit from the supply chain management function. Cheng-Min and Chien-Yun (2006) found out that ICT transforms companies' internal logistics operations as well as their external relationships with suppliers, intermediaries, third party logistic providers and customers. This means ICT is used as the enabler of SCM links and it is stemmed from the availability of information for both upstream and downstream customers. This enables automatic alerts to go to the supplier, indicating when the distribution center or certain stores have reached critical levels on inventory. However this may not be achieved where the parties in the chain use incompatible ICT systems or have not integrated their systems. According to qualitative study that used random sampling by Scupola (2010) it is stated that ICT equipment may not always be user friendly and they don't find a simple way to categorize and standardize the different companies and components, for different SCM partners. Therefore, there is a need to study companies using ICT systems that are incompatible and complex to find out if the results shall be the same. This view is supported by Kioko and Were (2014) who found a negative relationship between ICT and SCM performance in a descriptive research with stratified sampling. They found out that ICT adaptability can only help SCM if the company has not adopted more complicated e-business applications. From their study it is also clear that the adoption of ICT applications is not exclusively a matter of resources. Operational compatibility and the level of supply chain collaboration are two of the factors that play a determinant role more especially to companies with different abilities.

The complexity of SCM has forced companies to go for online communication systems which increase the richness of communications through greater interactivity between SC partners. In a qualitative correlation research by Fasanghari, Habibipour and Chaharsooghi (2010) it was revealed that the most impact of ICT on SCM is on procurement, logistics, firm, vendor relationship management and customer relationship management. Mongare and Nasidai (2014) found out that ICT enables stock monitoring, production scheduling and transport management by monitoring of pickups at regional distribution centers by carriers. It is true if we say that ICT increases information sharing in the supply chain and this reduces uncertainty, transaction costs thus leading to closer buyer supplier-relationships. These sentiments are negated by Kiveu and Ofafa (2013) when they say limited access to finances and ICT facilities combined with unfavorable policy and regulatory environment hinder full benefits ICT application in companies.

ICT influences automatic replenishment programs in SCM activities. In an empirical study carried out by Kollberg and Dreyer (2010) with model developed from literature and incorporates areas of control, ICT, integration dimensions, ICT effects, influencing factors and supply chain integration. It was found out that at vendor managed inventory (VMI) and collaborative planning, forecasting and replenishment (CPFR) are based on an increased level of automation. This comes especially in the flow of physical materials and goods, and the flow of information amongst SC players and companies to improve the efficiency in the entire chain. This sentiment is supported by a survey research that used random sampling where Castorena, Enríquez and Adame (2004) found out that SCM is influenced directly by the integration of ICT where the SCM aims to improve the capacity deliveries together with the control and data management. The findings from the study by Kiveu and Ofafa (2013) identified limited access to information, poor quality ICT facilities, and stiff competition in the markets from giant companies, limited research, and weak capacity for e-commerce and high costs of installing ICT as constraints to Kenyan companies SCM. It is stated by Beare (2017) that it is not easy to successfully combine two or more different management teams, with seemingly different business models, into one entity. The differences may lead to poor or lack of coordination within the supply chain hence collapse the flow of the goods and related information which is very harmful to the chain. In the long run the supply chain may experience a bullwhip effect that affects customer service.

To reduce costs in SCM activities and offer real-time customer service levels, companies use computers and other several ICT equipment and machinery. According to Apiyo and Mburu (1999) it is revealed that ICT equipment provide supportive role to human resources activities in an organization. An analysis of a study done by Castorena *et al.* (2014) implied that employers establish strategies to enable all workers to improve their skills in the subject of ICT and in this sense; the results are to be useful for decision making and for the better management of supply chain. The study findings do not point out the exact workers skills that influence the SCM. This study only brings out the aspect of improving employees skills for decision making. However employees can still make important SCM decision without relying on ICT. In the same breadth, Wanjiru and Abdala (2015) studied about effects of information communication technology adoption on procurement process in Kenya's oil industries. They used a survey in total Kenya Limited Mombasa County. The study revealed that the impact of ICT adoption on procurement mainly refers to time reductions and quality improvements. There is need to use a different design other than survey to several firms in the same (oil) industry to find out if the result will be same. Such study will find out if ICT can help in cost reduction or control and meeting customer satisfaction in the industry that studied.

ICT equipment enables execute activities faster, automate decision making processes and enable distributive operations for logistic efficiency (Cheng-Min & Chien-Yun, 2006). This brings about transparency to the stakeholders which lead to better business practices to meet customer's service levels. This may be in the production processes, marketing, supply chain integration and customer feedback. Negating this, survey research done by McAfee (2012) revealed that, work reports prepared using machines that are not integrated or compatible with others cannot be retrieved, stored or worked upon on another machine or software. For example an architect's prepared drawings for instance may not be retrievable into the client's Word Processing package. This simply means that reports will be reentered manually as raw data into other systems which is an extra cost and customers may not be satisfied in the end. In support of this negative view Zhang (2012) states that money is actually spent in buying, implementing, running and updating ICT in all its diversity. These may be extra costs in SCM. This is supported by Awad and Nassar (2010) who states that the more complex the supply chain, the more difficult it becomes for companies to answer basic questions, make conclusive decisions, communication among entities is not always clear or consistent, and each may optimize their own objectives without regard for others. The results can drastically affect customer demands with the related costs. There is need to have to carefully look into such areas as use of ICT equipment in supporting supplies chain management processes.

III. Conclusion

From the review of literature it is clear that SCM is an important function within an organization. If SCM is well managed then any organization is bound to meet customer service levels. The Customer satisfaction is all about identifying and satisfying customers' needs for any given works, goods and or service. Firms need to be committed to delivering consistently high standards of services at reduced or controlled cost to gain and retain customers. This can be through creating customer service culture within the supply chain management function. Information Communication Technology is changing a lot in today's world. The literature reviewed indicates that ICT has a key role to play in managing the day to activities in SCM. It has been noted that it helps to reduce paper work and smoothens the work. ICT enhances operation efficiency and innovation processes. It has been widely applied in SCM operations. The ICT hardware and software help in fastening work reducing the costs and enhance quality and quantity monitoring within SCM.

IV. Recommendations

Following the reviewed literature, it is true that much has been written about ICT use in the SCM and performance. However it is worth noting that organizations differ from each other. Based on his more studies need to be done to establish if same ICT system used in one will still help another firm achieve SCM performance considering the differences. At the same time studies should establish if one ICT system that helps a firm achieve SCM performance and competitive edge within a given industry can used in outside of that industry. This will also help establish if ICT will still help that firm meet customers' satisfaction from outside the industry it operates in. Some more studies should establish if it is achievable for firms to integrate their SCM activities using incompatible ICT systems.

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