

**EFFECTS OF SUPPLY CHAIN INTEGRATION ON SUPPLY CHAIN MANAGEMENT
PERFORMANCE OF PUBLIC UNIVERSITIES: A CASE STUDY OF THE
UNIVERSITY OF NAIROBI**

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ABSTRACT

Supply Chain Management (SCM) system facilitates inter-enterprise cooperation and collaboration with suppliers, customers and business partners. The understanding and practicing of supply chain management has become an essential prerequisite for staying competitive in the global market and for enhancing profitably. This necessitates the need to employ supply chain integration. A descriptive research design has been used in this study. The target population will be all staff of Nairobi University working in operation, finance, procurement and human resource department. The study indicates that there existed a positive relationship between supply chain integration practices information sharing, coordination of supply chain operations, and user customer integration and supply chain performance in the University. This implied information sharing, coordination of supply chain operations, and user customer integration led to improvement in revenue, customer base, quality of service delivery, improvement in provision of services and real time response. The finding further revealed that Business processes should structure to allow full use of information. From the findings, respondents indicated that the

coordination in the organization payment of raw material suppliers, manufacturing, distribution, distribution, third party logistic providers and retailers increase organization revenue, organization's customer segmentation improves organization's' customer base, organization customization of the products and services improve the organization performance and that organization's customer relationship management enhance real time response in operations.

Key words: Supply Chain Management performance, Information sharing, Integration of Supply Chain Operations, User Customer Integration and Logistics Management Integration

Introduction

Supply Chain Management (SCM) system facilitates inter-enterprise cooperation and collaboration with suppliers, customers and business partners. Although this system can bring benefits and competitive advantage to organizations, the management and implementation of this system pose significant challenges to organizations (Yu, Jacobs, Salisbury and Enns, 2013). The understanding and practicing of supply chain management has become an essential prerequisite for staying competitive in the global market and for enhancing profitably. This necessitates the need to employ supply chain integration. This is a process of redefining and connecting parts of a whole in order to form a new one (Matusik and Hill, 2008).

In the US firms, the emphasis is on operational integration of physical process flows between a organization and its suppliers and customers. They place greater emphasis on supply chain operational planning for problem recovery using organizational culture as the leverage means (Lysons and Farrington, 2006). Analyzing data from almost 2,000 firms in the USA, Australia, Japan, and Korea, they found that efficient supply chains exhibit operational excellence and responsive supply chains exhibit collaborative closeness. Japanese and Korean firms were more likely to integrate supply chains based on operational excellence, while US and Australian firms

were more likely to integrate supply chains on the basis of collaborative closeness (Green Jr, Whitten & Inman, 2008).

The supply chain in most Chinese companies easily spans across multiple continents. Consequently, the performance of these firms is highly affected by the availability of timely information about the market (Li, 2007). However, as a country transforming from a planned economy to a market economy, China does not have sufficient formal institutions that support free markets. The findings of these studies may not be valid when applied to the context of emerging economies. Habib and Jungthirapanich (2008) proposed Integrated Educational Supply Chain Management (IESCM) for the universities in Thailand. They argued that educational management represents the process component, which may be accomplished in three levels, including strategic, planning and operating levels. The proposed conceptual IESCM model for the universities provides a novel approach for decision makers of each supply chain components to review and appraise their performance toward fulfillment of ultimate goals, i.e. producing high-caliber graduates and high-impact research outcomes for the betterment of the society.

Kim (2009) investigated the impact of the level of integration on organization's competitive capability in South Africa companies in different industries. Kim (2009) found that, supply chain integration leads to competitive capabilities in South African companies and these capabilities affect the organization's performance in relation with supply chain operational capability.

Cheruiyot (2013) observed the impact of integrated supply chain on performance at Kenya Tea Development Agency. Cheruiyot (2013) found that the supply chain integration was positively associated with supply chain performance. Cheruiyot (2013) emphasized the roles of internal, supplier and customer integration in enhancing supply chain performance. Elias, Kimani and

Githii (2012) observed that the adoption of supply chain management practices in small holder tea sector in Kenya will bring about competitiveness within the tea sector both locally and internationally. Further, Elias *et al.*, (2012) noted that KTDA should identify and partner with appropriate organizations which can add value to small holder tea and thus, provide an efficient supply chain network for delivering value. They recognized the special role of supplier and customer relationships, value addition, information technology, information sharing, flexibility in internal operations/processes, upgrading of tea seedlings, proper coordination, institutionalization, policy reforms, training, monitoring marketing environment, strategic decisions, irrigation, venturing in new markets through partnership, and civil society involvement as competitive supply chain strategies (Elias *et al.*, 2012).

Statement of the Problem

The higher the degree of Supply Chain Integration (SCI) the higher the cost reductions, improvements in inventory, customer service, new product development, information and material flows, and financial performance for an organization (Madhavaram & Hunt, 2008). Supply chain management in public universities has had numerous challenges over the years (Osoro, 2013). This has been evidenced by high levels of inefficiency and ineffectiveness in the procurement functions. Due to this there are stalled projects in almost every public university (Osoro, 2013). Unclear procurement policies in public universities in Kenya hinder efficient and effective lean supply chain management practices and results into poor performance of public universities due to increased costs associated with supply chain activities. This could be addressed by supply chain integration which according to Kanjejo (2012) has not been adequately implemented in public universities, University of Nairobi being one of them.

According to Osoro (2013), much has been put in place to streamline the procurement function for example the Public Procurement and Disposal Act, 2005 and the Regulations, 2006. However, the problem of poor performance in public universities supply chain management has persisted. With the expansion of public universities owing to high demand for higher education, supply chain integration is critical. Different colleges and campuses have different needs that need supply chain management attention. The performance of these colleges or campuses and indeed the entire university will be determined by how well supply chain management will be handled (Kanjejo, 2012). There is a gap of supply chain integration in the University of Nairobi as different campuses have their own almost fully independent supply chain departments. The supply chain management performance at the University of Nairobi has also not been optimal. This study therefore attempted to fill this gap by determining the influence of supply chain integration on supply chain management performance of the University of Nairobi in Kenya.

LITERATURE REVIEW

Information sharing refers to the extent to which critical and proprietary information is communicated to one's supply chain partner and seeks to achieve a common goal of ultimately improving organizational performance (Lysons, and Farrington, 2006). Information sharing is a central process through which team members collectively utilize their available informational resources.

Integration of supply chain operations refers to supply chain activities that enable in time movement of inventories across the supply chain, which shortens lead time and reduces the bullwhip effect, thereby increasing cash flow to improve business performance (Sanders, 2008).

Supply chain business process integration involves collaborative work between buyers and suppliers, joint product development, common systems, and shared information. According to Lambert and Cooper (2000), operating an integrated supply chain requires a continuous information flow. However, in many companies, management has concluded that optimizing product flows cannot be accomplished without implementing a process approach. The key supply chain processes stated by Lambert (2004) are: Customer relationship management, customer service management, demand management style, order fulfillment, manufacturing flow management, supplier relationship management, product development and commercialization, and returns management.

Logistics management integration refers to functional aspects such as timeliness and ordering procedures and technical aspects such as order accuracy and order condition informed by an accurate assessment of what the customer truly values (Davis and Mentzer, 2006).

Logistics is an organizational function which shares responsibilities with marketing and production (Casanovas and Cuatrecasas, 2001). The combination of the integration levels achieved in these two interfaces can be presented in a continuum. At one extreme scenario is a strategy of little or no integration. At the other end of the continuum is a strategy with high levels of integration in both internal interfaces: logistics-marketing and logistics-production. And, in between these polar extremes are companies whose strategies involve integration in the logistics-marketing interface or the logistics-production interface.

User customer integration comprises the entire array of practices that are employed for the purpose of managing customer complaints, building long-term relationships with customers that are aimed at improving customer satisfaction and enhance performance (Siekman, 2000).

Power relationships are also a major issue in SCM, as a dominant firm within the chain can use its market power to coerce as well as collaborate with partners. Maloni and Benton (2000) defined power as the ability of one firm to influence the intentions and actions of another firm. Their finding matches much of the inter-organizational networks literature, specifically: that coercive power holds a negative association with cooperation; trust and commitment increase with expanded interdependence; and, inter-firm asymmetry will defeat both trust and commitment. They conclude that most firms are not completely aware of the broad scope of power dimensions and need to better understand how power influences performance.

Supply Chain Management Performance

Supply chain management is the management of all processes or functions to satisfy a customer's order (Moberg, Whipple, Cutler and Speh, 2004). Supply chain management performance is based upon the idea that an organization is the voluntary association of productive assets, including human, physical, and capital resources, for the purpose of achieving a shared purpose (Barney, 2001). There are three supply chain management performance measures according to Chan and Qi (2003). They include inputs, outputs, and composite ones. Input measures are such popular dimensions as time and costs. Time is a strategic dimension in assessing the management performance in pursuit of faster responsiveness and lower inventory level. It is of critical concern to both internal and external customers. Cost dimension relates to consumption of a variety of resources, such as labor, capital, knowledge, facility etcetera (Beamon and Chen, 2001).

Output measures refer to the process from suppliers through manufacturers to distributors and sales (Chan and Qi, 2003). It adds value to the materials and products or provides services. These outputs can be measured by assessing their functional performance with their missions. For

example, the purchasing process is responsible for materials replenishment in ensuring smooth operations. Its functions are supply base management, material procurement, and inbound material management (Gunasekaran *et al.*, 2001). Accordingly, the output performances of the purchasing process can be measured through measuring material replenishment reliability and others that are concerned with its functions. Popular performance dimensions in SCM include delivery reliability, timeliness and error-free, flexibility in manufacturing, customer responsiveness to demand and new product introduction (Chan and Qi, 2003).

Composite measures include productivity, efficiency, and utilization. They are widely employed to assess the outputs in comparison with inputs or expectation. These composite measures involve both inputs and outputs, and make more sense. However, all these composite measures should be well-defined and normalized in order to address mutual understanding and channel-spanning benchmarking (Moberg *et al.*, 2004).

Empirical Studies

Mesmer-Magnus and DeChurch (2009) used meta-analysis to synthesize extent research on team information sharing. Meta-analytic results from 72 independent studies demonstrated the importance of information sharing to team performance, cohesion, decision satisfaction, and knowledge integration. Although moderators were identified, information sharing positively predicted team performance across all levels of moderators. The information sharing–team performance relationship was moderated by the representation of information sharing (as uniqueness or openness), performance criteria, task type, and discussion structure by uniqueness (a three-way interaction). Three factors affecting team information processing were found to enhance team information sharing: task demonstrability, discussion structure, and cooperation. Three factors representing decreasing degrees of member redundancy were found to detract from

team information sharing: information distribution, informational interdependence, and member heterogeneity. Mesmer-Magnus and DeChurch (2009) concluded that although sharing information is important to team outcomes, teams fail to share information when they most need to do so.

Fullwood, Rowley and Delbridge (2013) examined knowledge sharing in universities, by profiling the attitudes of and intentions towards knowledge sharing of UK academics, and by profiling their views of some of the factors that might be expected to impact on knowledge sharing activities. Fullwood *et al.* (2013) observed that respondents had positive attitudes towards knowledge sharing and their intentions in this area were also good. This may be related to their belief that knowledge sharing will improve and extend their relationships with colleagues, and offer opportunities for internal promotion and external appointments. Respondents were relatively neutral regarding the way in which they are led, and the role of organizational structure and information technology in knowledge sharing. They had a relatively low level of affiliation to their university, perceptions of a high level of autonomy, coupled with a high level of affiliation to their discipline.

Green Jr, Whitten and Inman (2008) did a study on the impact of logistics performance on organizational performance in a supply chain context. They theorized and assessed a logistics performance model incorporating logistics performance as the focal construct with supply chain management strategy as antecedent and organizational performance, both marketing and financial, as consequences. Data from a national sample of 142 plant and operations managers was analyzed using a structural equation modeling methodology. The results indicated that logistics performance is positively impacted by supply chain management strategy and that both logistics performance and supply chain management strategy positively impact marketing

performance, which in turn positively impacts financial performance. Neither supply chain management strategy nor logistics performance was found to directly impact financial performance. This implies that to compete at the supply chain level, organizations must adopt a supply chain management strategy. Such a strategy requires integration and coordination of key external processes such as purchasing, selling, and logistics with supply chain partners.

Shang and Marlow (2002) examined logistics capability and performance in Taiwan's major manufacturing firms. They did a survey of 1200 manufacturing firms in Taiwan, using structural equation modeling to examine the relationships among logistics capabilities, logistics performance, and financial performance. Results showed that the information-based capability is the most critical since it can impact upon benchmarking capability, flexibility capability, and logistics performance. Moreover, information-based capability also indirectly impacts on financial performance through logistics performance.

RESEARCH METHODOLOGY

Descriptive research design will be adopted due to qualitative and quantitative approach of the study. The target population of this study was 180 employees working in four departments at the University of Nairobi. This is because they have information on supply chain integration and performance in the university, information that is of interest to this study. This study used the Cochran formula to come up with a study sample from the 180 target population. Questionnaires were used to obtain information about the population. The questionnaire contained both closed-ended and also a few open ended questions. The study collected both primary and secondary data. Primary data was collected using semi-structured questionnaires. The questionnaires were distributed using drop and pick method to the respondents. Quantitative data from the questionnaire was analyzed by employing descriptive statistics and inferential analysis using

statistical package for social science (SPSS). A multiple regression analysis was done to establish the effects of information sharing, integration of supply chain operations, user customer integration and logistics management integration on organizational performance.

Research Findings

The finding indicated that information sharing in supply chain improves organizations financial performance in great extent with the mean of 4.86. Again Stakeholders have transparent information about each other's inventory status. This is with agreement with Kaipia *et al.*, (2002) who stated that by sharing inventory-level information, communication frequency can be increased without increasing ordering frequency. Again Li *et al.*, (2001) stated that If the supplier is able to use the customer's demand information, as opposed to the customer's order information, one stage of information distortion is eliminated and the demand is less variable than in the "no information-sharing" case.

The finding further revealed that Business processes should structure to allow full use of information. This is on agreement with Gavirneni *et al.*, (1999) who indicated that demand information-sharing is not that beneficial if demand variance is high while the available information relative to the uncertainty in the demand supply network is small and thus the cost reduction is not that effective.

From the findings, respondents indicated that the coordination in the organization payment of raw material suppliers, manufacturing, distribution, third party logistic providers and retailers increase organization revenue to a great extent as indicated by a mean of 4.81. The study further found through coordination, the organization reduces risk prone operations increasing the organization income and that the coordination has focused on adoption of superior technology,

security, accessibility, networking, flexibility and good information processing thus improving service provision in the organization to a very great extent as indicated by a mean of 4.65. This is with agreement with Gimenez *et al.* (2012) who established that supply chain integration increases performance if supply complexity is high, while a very limited or no influence of supply chain integration can be detected in case of low supply complexity, again high supply complexity environments the use of structured communication means to achieve supply chain integration has a negative effect on cost performance.

From the findings From the findings, organization's customer segmentation improves organization's customer base, organization customization of the products and services improve the organization performance and that organization's customer relationship management enhance real time response in operations to a very great extent as indicated by a mean of 4.82. Again the study further found that through user customer integration in the organization, improved innovation lead to improved service provision and Improved service delivery and that the organization's competition in the market was reduced by offering quality services to a great extent as indicated by a mean of 4.17. This is in line with Siekman, (2000) who stated that user customer integration comprises the entire array of practices that are employed for the purpose of managing customer complaints, building long-term relationships with customers that are aimed at improving customer satisfaction and enhance performance.

The result shows that there is timeliness in delivery of materials to the various work stations with the mean of 4.32 and SD 0.36, again the study finds that the ordering procedures are simple and efficient, again orders are accuracy such that what is ordered is exactly what is delivered and the orders are in the right condition. The studies agrees with the study by Stank *et al.* (2001) and Gimenez and Ventura (2003, 2005) who share a common aim in analysing the impact of internal

and external integration on performance. The integration-performance models of these authors included also a relationship between the levels of internal and external integration. Again Stevens (2003) suggests that external integration is an extension of the internal integration achieved in a previous stage. Accordingly, companies with a low internal integration strategy should present a low level of external integration and companies implementing the full internal integration strategy should have the highest levels of external integration.

Supply chain management leads to organizations, responsiveness to customers, and with the mean of 4.54 and standard deviation 0.254 the respondent agreed that, inventory level in the organization is lowered, purchasing process addresses replenishment in ensuring smooth operations, supply chain management ensures delivery reliability is adequate and it ensures there is timeliness and error-free deliveries. This is in agreement with the studies by Chan and Qi, (2003) who stated that the output performances of the purchasing process can be measured through measuring material replenishment reliability and others that are concerned with its functions. Popular performance dimensions in SCM include delivery reliability, timeliness and error-free, flexibility in manufacturing, customer responsiveness to demand and new product introduction

According to Moberg *et al.*, (2004) states that Composite measures include productivity, efficiency, and utilization. They are widely employed to assess the outputs in comparison with inputs or expectation. These composite measures involve both inputs and outputs, and make more sense. However, all these composite measures should be well-defined and normalized in order to address mutual understanding and channel-spanning benchmarking

Regression Analysis

In addition, the researcher conducted a linear multiple regression analysis so as to test the

relationship between the independent variables on total quality management. The researcher applied the statistical package for social sciences (SPSS) to code, enter and compute the measurements of the multiple regressions for the study

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.087(a)	.728	.788	0.34

A Predictors: (Constant) Information sharing, Coordination of Supply Chain Operations, User Customer Integration

R is the square root of R-Squared and is the correlation between the observed and predicted values of dependent variable implying that the association of 0.087 between factors affecting supply chain performance that include information sharing, integration of supply chain operations, and user customer integration was strong.

R-Squared is the proportion of the variance in the dependent variable organization performance that was explained by variations in the independent variables information sharing, coordination of supply chain operations, and user customer integration. This implied that there was 72.8% of variance or correlation between variables in general.

Adjusted R² is called the coefficient of determination which indicates how the organization performance varies with variation in supply chain integration practices, information sharing, coordination of supply chain operations, and user customer Integration. From table above, the value of adjusted R² is 0.788. This implies that, there was a variation of 78.8% of companies performance varied with variation in factors affecting financial performance which includes

information sharing, coordination of supply chain operations, and user customer Integration and was statistically significance with P-Value of 0.01 which was less than 0.05 at a confidence level of 95

Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	7.000	.535		4.601	0.01
Information sharing	0.732	.455	.787	3.191	0.02
Integration of Supply Chain Operations	0.644	.626	.972	3.383	0.04
User Customer Integration	0.678	.248	.619	2.606	0.03
Logistics Management Integration	0.432	.255	0.487	1.181	0.21

Dependent variable: Supply chain management performance

The strength of variation of the predictor values influence the supply chain performance dependence variable at 0.01 significant levels.

$$Y = 7.000 + 0.732 X_1 + 0.644X_2 + 0.678X_3 + 0.432 X_4 + e$$

Where X₁= Information sharing, X₂= Integration of Supply Chain Operations, X₃= User Customer Integration, X₄ = Logistics Management Integration

From the above regression model, it was found that companies performance in would be at 7.000 constant, information sharing, coordination of supply chain operations, and user customer Integration constant at Zero. Increase in information sharing, would lead to an increase in

companies performance in by factor of 0.732 with P value of 0.002 while enhancing coordination of supply chain operations would lead to an increase in companies performance in by a factor of 0.944 with P value of 0.004.

The study also found that effective user customer integration led to increase performance in water companies by a factor of 0.678 with P value of 0.003. This clearly indicates that there existed a positive relationship between supply chain integration practices information sharing, coordination of supply chain operations, and user customer integration and supply chain performance in the University. This implied information sharing, coordination of supply chain operations, and user customer integration led to improvement in revenue, customer base, quality of service delivery, improvement in provision of services and real time response.

The findings concurred with Mele (2009) who found that most companies searched for new business paradigms that would led to competitive advantage. The findings also concurred with Dillman (2007), who indicated that the objective of supply chain management is to maximize the overall value generated rather than profit generated in a particular supply chain.

Conclusions of the study

Operating an integrated supply chain requires continuous information flows, which in turn assist to achieve the best product flows. Therefore University of Nairobi need to establish an appropriate supply chain in order to optimize the product flows.

University of Nairobi need to embark on information sharing through information technology so as to respond to customer requirement, enhance the product availability, increase sales volume and reduce material and manufacturing overheads and efficiently coordinate processes in order to

lower the cost of inventory investment, offer better customer service, and have properly guided capacity plans.

University of Nairobi should adopt strategic utilization of the information in order to achieve coordination, join forces, share design information and technology trends as this would lead to effective communications with organization suppliers and stakeholders on research activities and new product development, minimized information distortion. University of Nairobi enhances customer relationship management through supply chain integration so as to improve market value of the organization and achieve high customer satisfaction. Coordination in the organization payment of raw material suppliers, distribution, third party logistic providers and retailers increase organization revenue. The coordination in organization supply chain integration reduces risk prone operations increasing the organization income.

Recommendation

The study recommended that management in University of Nairobi should embark on information sharing so as to respond to customer requirement, enhance the product availability, and efficiently coordinate processes in order to lower the cost of inventory investment, offer better customer service, improve revenues, and have properly guided capacity plans.

The study recommended that management in University of Nairobi should adopt strategic utilization of the information in order to achieve coordination, join forces, share design information and technology trends as this would lead to effective communications with organization suppliers and stakeholders on research activities.

The study recommended that management in University of Nairobi improve customer relationship management so as to improve customer value maximization and achieve high customer satisfaction. The study recommended that management in University of Nairobi need to improve the logistics processes, so as to improve the inventory visibility and velocity of inventory movement and have a positive performance.

Recommendation for Further Study

The study recommends that a further study should be carried out to establish ways through which other public organizations could enhance supply chain integration so as to improve supply chain productivity and enhance positive performance. A further study should be carried out to establish the factors affecting supply chain integration on performance of firms in other sectors such as manufacturing.

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