

**INFORMATION TECHNOLOGY INTEGRATION AND
PERFORMANCE OF MOTOR VEHICLE SUPPLY CHAINS IN
KENYA**

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DECLARATION

I declare that this research project is my original work and has not been presented for examination in any other university or institution of higher learning.

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D61/ 81479/ 2015

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I thank the almighty God for enabling me have time to undertake this project. I also thank my supervisor, Dr. Iraki for his continued support during the time of project development. I also thank my family for their support throughout this period.

DEDICATION

This research project is dedicated to my family for their unending support.

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ABSTRACT

The purpose of this study was to examine the link amid information technology integration in supply chains and performance of automotive companies in Kenya. The specific research objectives entailed: To investigate the dimensions of information technology integration in the Kenyan motor vehicle supply chains; to investigate the different IT technologies used in the functional areas of Kenyan motor vehicle supply chains and to determine the extent to which supply chain performance of motor vehicle companies in Kenya is affected by information technology integration. The study was guided by the diffusion of innovation theory, technology acceptance model and unified theory of acceptance and use of technology. The study applied a cross-sectional research design and targeted 340 motor vehicle dealers or companies registered with the Kenyan Motor Industry Association. 100 motor vehicle firms were randomly selected from the Kenya Association of Manufacturers list. The study used primary data that was collected using structured questionnaires. In analysing the data, the study used both descriptive and inferential analysis. Descriptive statistics used included frequencies, percentages, means and standard deviations. Inferential statistics included correlation analysis which was used to show relationships between the independent variable and the dependent variable. The study findings revealed that most respondents agreed that various dimensions of information technology had been put in place in the firms. The study further found that there were different functional areas in the Kenyan motor vehicle supply chains and the different IT technologies used in the areas of supply, product and demand. The study concluded that information technology integration positively and significantly affected supply chain performance of the motor vehicle firms in Kenya. Improving information technology integration across these firms will therefore improve performance of supply chains, which improve the overall performance of the firm. The study recommends need for organizations to have enhanced supply chain integration so as to improve supply chain performance even further and therefore have a competitive advantage over other firms. The study suggests that further research can be conducted to assess information technology integration in supply chains and performance of automotive companies outside Nairobi in Kenya.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Business processes are continually being automated to improve efficiency and enhance quality of services or products offered to end-users. In order for automotive industries to be successful they need to be flexible and conform to their customer specifications. Supply chain management (SCM) refers to systems used to manage the flow of materials, information and services in the industry up to the end customer. Role of this system is to improve collaboration among suppliers and increase efficiency in operations (Ambe & Badenhorst-Weiss, 2011).

Automotive industry supply chains have evolved over the past decades; initially the push system supply chain was used among motor vehicle industries. It entailed using information on marketing and sales to predict customers demand and change production processes of the firm. Advancement in technology then led to adoption of lean Just in Time (JIT) production procedures (Ambe & Badenhorst-Wess 2013). Both of these strategies shaped automotive firms' production strategy.

Through using IT, automobile companies can deliver data that can enable them comprehend their operations. Through understanding internal processes, the firms can use the new data-driven solutions for their business units and customers to augment their business processes (Coia, 2017). The concept of information technology integration falls under the expanding notion of lean strategies that can be traced to top manufacturing companies such as Toyota, Allen Bradley and Boeing. González-Benito, Lannelongue and Alfaro-Tanco (2013) argue that integration of technology in supply chains is an aspect that contributes to creation of lean and green supply chain systems that result in efficient operations in organizations. This paper will explore ways through which information technology integration correlates with performance of automotive companies in Kenya.

1.1.1 Supply Chain Performance

Supply chain performance is pegged on financial performance; which refers to strategies of ensuring the results of an organization's policies and operations are achieved in terms of monetary value. Some of the most critical financial metrics

investors and market analysts use for organizational wealth assessment in the auto industry include the debt-to-equity ratio (D/E), the inventory turnover ratio and the return on equity (ROE) ratio (Yazdanfar, 2013). It is worth noting that these are subjective measures of how well a company is using its resources from its main mode of business to maximize the wealth of the stakeholders.

Financial performance could also mean the overall financial health of an organization over a given time and could be used a comparative metric for similar firms in an industry or to compare industries or sectors in an economy (Asimakopoulos et al., 2009). Financial performance is vital for organizations as it forms a basis for effective decision-making; aids in identifying the strengths and weaknesses and how well they can be maximized or countered effectively (Nazir, 2010).

1.1.2 Information Technology Integration in Supply Chains and Supply Chain Performance

Youssef and Nakib (2015) posit that managing supply chains is one of the biggest tasks for companies that intend to sustain the competitive advantages reflected in their bottom-line financial figures. Companies can no longer place emphasis on only optimizing their own operations to the exclusion of their suppliers' and customers' operations. Financial performance of organizations portrays the effectiveness of supply chain systems. Measuring the financial performance, in the same way, aids in gaining greater understanding of the supply chain and improve its overall effectiveness.

Although it is intuitive that integration of technology in supply chains is likely to positively influence firm performance, there is insufficient large-scale empirical evidence. Majority of the published papers provide information on the efficiency improvement and cost reduction in supply chain operations though with less focus on the strategic consistencies amid the features of information technology integration and overall financial performance of organizations. The effects of attaining competitive advantage ripple outward to all aspects of the organization and lead to the financial success of the company. Wu and Shen (2013) state that to facilitate financial success, companies need to optimize supply chain performance through increased customer service and responsiveness which are in turn, linked to financial performance.

1.1.3 Motor Vehicle Companies in Kenya

There are diverse motor vehicle dealers operating in Kenya, with the most established being Toyota East African Cooper Motor Corporation (CMC), General Motors (GM), Simba Colt, DT Dobie and Honda (Munywoki & Noor (2015)). There are also vehicle assembly units in Kenya whose focus is mostly on the assembly of pick-ups and heavy commercial vehicles. There is huge demand for small vehicles and major franchises have been set up to meet the demand but are facing intense rivalry from imported vehicles from Europe and far East countries by second hand car dealers.

The intense rivalry faced by dealers results from second hand car imports from Japan and United Arab Emirates, which account for over 70% of the market. The Kenya Motor Industry Association (KMI), which is a representative body of the corporate players in the automotive sector, has been working hard to ensure new cars are bought and that there's less dependence on second hand imports (KMI Briefs, 2017). Improvements in agricultural production and construction sectors positively influence expansion of sales in the automobile sector, especially for the pick-ups and heavy commercial vehicles.

1.2 Research Problem

Intense rivalry, irregular marketplace demand and expanding consumer needs have led to increasingly sophisticated preferences among customers (Hines, 2014). Variations in the market including reduced product life cycles, new product developments, and demand volatility make it difficult to forecast customers' needs in Kenya. Globalization has a great impact on the automotive sector because of increased differentiated consumer preferences for motor vehicles. Ambe and Badenhorst-Wess (2013) suggest that for motor firms to augment their performance, responsiveness to customers' needs is paramount. According to the Christopher (2016), the main challenges that automotive supply chains face include supply chain visibility, cost reduction, risk mitigation, increasing customer needs, and globalization. Integration of technology to incorporate the entire supply chain and share information helps manage operations in real-time and make decisions collaboratively.

Integration of technology in supply chains of different organizations has been considered a powerful approach to achieve competitive edge in the marketplace.

Businesses are continually becoming inter-connected hence the need to create networks to facilitate easy flow of information and resources right from raw materials through production and finally to the consumers. Amir et al. (2015) notes that performance of the automotive sector in Kenya is attributable to firm's resources, technical support, product offering and distribution processes. Integration of supply chain and adoption of technology are two vital requirements for supply chain performance.

The optimized interconnection of operations using IT results in low warehousing, transportation, and overall operational costs while maintaining firms' performance. Chizzo (2008); Cheruiyot (2013) and Gulles (2012) have emphasized the need for supply chain management in automotive sector. However, there is scantiness in literature on integration of information technology integration in motor vehicle companies in Kenya. The research aimed at filling that gap.

1.3 Research Objective(s)

The focus of the proposed study was to examine the link between information technology integration in supply chains and performance of automotive companies in Kenya. The specific research objectives entailed;

- i. To investigate the dimensions of information technology integration in the Kenyan motor vehicle supply chains
- ii. To investigate the IT technologies used in the functional areas of Kenyan motor vehicle supply chains.
- iii. To determine the extent to which supply chain performance of motor vehicle companies in Kenya is affected by information technology integration.

1.4 Value of the Study

The results of the proposed research will widen knowledge on the empirical association of information technology integration in supply chains and firm performance, with a focus on the automotive companies in Kenya. The proposed study will provide critical information on how technology adoption in supply chains influences the financial performance of automotive firms as well as other similar organizations.

The results of the research would act as a spring board for subsequent researches especially for scholars in finance as well as financial managers in different organizations that entail logistical issues such as supply chain operations. The

professionals in finance would find this research useful as it would facilitate better decision-making with regards to investment decisions that would enhance attainment of the overarching stakeholders' decisions.

An understanding of the concept of information technology integration and how it relates to automotive firms' performance could enable policy makers to implement programs that enhance augmented firm performance, globalization, and greener firm operations leading to environmental conservation.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter is composed of a review of literature on the different concepts that will be used in the current study. The subsequent sections of this chapter are organized as follows; theoretical review, determinants of financial performance of automotive firms, empirical review, conceptual framework and finally a summary of this chapter.

2.2 Theoretical Framework

This section provides a review of theories under which this study is anchored. Three theories are reviewed in this section namely; diffusion of innovation theory, technology acceptance model and unified theory of acceptance and use of technology.

2.2.1 Diffusion of Innovation Theory

Diffusion refers to the mode by which a technology or innovation is adopted by a certain group of people (Hashim, 2015). Seminal works on this theory point out that diffusion is not dependent on itself but encompasses other theoretical perspectives that define diffusion of innovations (Dingfelder & Mandell, 2011). According to this theory, four determinants are shown to influence how members of an organization adopt an innovation. These factors include; communication mode use to channel information about the innovation, type of innovation, composition and nature of the group and time (Dingfelder & Mandell, 2011). Diffusion theory gives a framework that facilitates interrogation of why innovations may be adopted by other people and rejected by others. This theory can help to account for factors that might help to integrate technology in supply chains or those factors that hinder combining supply chains with technology in companies (Hashim, 2015).

In the current study this will help track flow of technology innovations and the rate the adoption of these technologies along the supply chain. The rate at which technology is adopted is illustrated by diffusion theory.

2.2.2 Technology Acceptance Model

This model was first proposed by Davis in 1986. Technology Acceptance Model (TAM) has been vital in determining and explaining technological behaviour (Chen, Shing-Han & Chien-Yi, 2011). This approach can be used to explain the reasons

surrounding acceptance and rejection of a technology. Further, it offers a basis in which external factors are included in evaluation of technology performance. TAM specifically observes that; technology use is both directly or indirectly influenced by users' attitudes, expected usefulness gained from technology and convenience or expected ease. This framework is relevant to the current study in that a firm will only integrate technology in its supply chain if it is perceived to be beneficial.

TAM helped will help document the factors surrounding adoption and rejection of different technologies along the supply chain. These factors are size of the company, organizational structure and customers and supplier's pressures.

2.2.3 Unified Theory of Acceptance and Use of Technology (UTAUT)

It is believed to be the most rigour method in evaluating and predicting how the end user will perceive a technology (Venkatesh, Thong & Xu, 2012). This model is based on four major factors of usage and intention (expected performance, social influence, underlying conditions and expected effort). In the current study this theory will be used to evaluate user acceptance of information systems based on whether integration of information technology in supply chain will improve or decrease the supply chain performance of the organization.

2.3 Information Technology Integration in Supply Chains

Most of the recent research on information technology integration in the supply chain place emphasis on adoption of the web to conduct business-to-business commerce across the supply chain, thus augmenting operational efficiency, reduced operational costs, and increased customer satisfaction among other benefits (Alexandru, 2014). IT integration refers to an information system that is meant to transmit information within and between forms electronically (impact of information technology integration).

IT enables firms to coordinate processes along their supply chains including upstream procurement, internal processes, and downstream sales and customer services besides information sharing along the supply chain (Gulles, Çağliyan & Bedük, 2012). Integration of technology in supply chains results in connectivity which is a necessity for cross-organizational data exchange. Through information technology integration, information systems facilitate sharing of standardized as well as customized information. Downing (2010) states that the expected ultimate result would be

globalization, collaboration, and augmented organizational performance though utilization of these IT systems in most companies is still at infancy stages (Samaranayake, Laosirihongthong & Chan, 2011).

2.4 Motor Vehicle Supply Chain

Supply chain is a combination of activities and distribution alternatives that are meant to purchase materials, change these materials into finished or unfinished products and finally ensures the end product is delivered to the customer (Lengnick, Lengnick, Rigsbee, 2013). Cheng, Farooq and Johansen (2015) further adds that SCM is all about relationships that are meant to ensure consistency in the inflow and outflow of goods. Automotive supply chains have evolved over the last decade; initially these supply chains used the push system where they relied on market and sales data to forecast demand and supply customers with new products. However, with introduction of technology and change in consumer preferences; there has been a shift to mass customisation. Production levels and designs of automotive manufacturing firms are driven by customer's preferences (Ambe & Badenhorst-Weiss, 2011).

The Kenyan motor vehicle industry is composed of assemblers and dealers in second hand cars. Vehicle assemblers can be categorised depending on the size of vehicles they assemble. For instance; Kenya vehicle manufacturing limited, general motors and association of vehicle assemblers are majorly known for dealing in lorries and pickups. It is important to note that other companies such as Toyota, Tata, Fonton and Hyundai are also getting into the assembling business (Munywoki and Noor, (2015)). The most established auto motive industry in Kenya is Toyota. The others include; Cooper Motor Cooperation, Honda motors, General Motors, Simba Colt, DT Dobie, Tata motors and Aschock Limited. However, these firms have stiff competition from second hand vehicles being imported in Kenya.

According to Lepercq, West and Denver (2017) functional areas in which Information Technology could be adopted along the supply chain include; supply, product and demand. In terms of supply; activities along the supply chain include resource sourcing and planning, management of supplier relationships and optimization of networks. In terms of product; designing and manufacturing of products are the main activities along the supply chain in terms of products. In relation to demand; fulfilling customers'

demand in terms of preferences and quantities is on the fore front. Additionally, management of relationships among clients and the organization is also a core objective along the supply chain. Finally, management of finances within the organizations is also done through supply chains so as to improve operations. Information technology is identified as one of the support functions that can help these functional areas along the supply chain.

In order to have efficient operations among motor vehicle firms, firms have adopted the use of supply chains to increase efficiency. However, with the ever-changing preferences and growing demand of auto motives there has to be integration of supply chain technologies so as to improve operations (Marobela & Moeti-Lysson, 2015). Technologies meant to improve operations along the supply chain can be categorised into functional and integrative technologies (Hazen, Cegielski & Hanna, 2011). Functional technologies are used for attaining a particular objective. They include; warehouse and transport management systems. Integrative technologies on the other hand are meant to increase coordination flow of information examples include feedback mechanisms (Magutu, 2012). Other technologies include; internet services (E-procurement and E-markets), electronic data interchange, use of bar codes and demand forecasts.

2.5 Technology Adoption

Technology adoption is a major internal factor that may have an impact on the firm's financial performance. Technology levels in a firm are manifested in efficiency levels while undertaking operations. Technology can help increase efficiency at different stages of the firm, from production, sales and finally reporting. The ability of a firm to use its resources in an efficient manner that minimizes costs and/or maximizes profits can be measured using financial ratios. One of these ratios can be used to account for technological level in a firm. According to Nazir (2010) the operating profit to the income ratio can be used to ascertain effect of technology on profits. The bigger ratio demonstrates a higher level of efficiency used for income generation and hence better financial performance, the inverse of this is true. Efficiency ratio will be used as a measure of technology; this ratio is computed by comparing the current profits to income.

Automotive firms are currently using a lot of technology to handle supply chain management activities. Some of these activities include procurement, communication and data management (Kamariah & Udin, 2009). Complexity in terms of access and use of information has spearheaded the adoption and use of supply chain technologies in management of supply chains.

2.6 Supply Chain Performance of Motor Vehicle Companies

Supply chain management processes that trigger increased financial performance are at the heart of every business. Economically finance is a major foundation in all forms of economic activities (Burange & Yamini, 2008). It refers to the extent with which financial goals set by an organization have been accomplished. It is a way used to measure operations and policies of the firm in monetary terms. This measure derived from financial performance can be used to ascertain a firm's financial health over a time period as well as to compare different firms in the same industry to evaluate their performance.

2.7 Determinants of Information Technology Integration

2.7.1 Company Size

Omondi and Muturi (2013) highlight that firm size is likely to determine the financial performance of the business in question. Size is important when looking at economies of scale, it basically describes that as the size of the firm increases there is a higher probability that there is a decrease in unit costs used in production of this output. Firms with higher output levels are likely to have better financial performance in comparison to firms with lower output levels. This reduction in costs is because of the firm's ability to produce a higher level of output using the same level of fixed costs. Similarly, firms can obtain discounts when they procure inputs at larger quantities (Duffy, 2009). Size was measured by the average level of production per month in terms of units

2.7.2 Organization Structure

Variables determining the organization structure have had both positive and negative effects in integration of technology in firms. For instance, centralization of decisions is expected to have an effect on the level of technology adoption among automotive firms (Vanichchinchai, 2012). Centralization refers to the extent which the power of making decisions is only limited to a few individuals in the company. This variable was

measured as a dummy variable depending on the nature of decision making in organizations.

2.7.3 Customer and Suppliers Pressure

It is important to consider the number of customers and suppliers with which an automotive company or industry is working with so as to determine the need for technology adoption among firms. This variable was measured as a continuous variable where managers were asked to indicate the average number of suppliers and customers they have had over the past twelve months (Talib, Rahman & Qureshi, 2011).

2.8 Empirical Studies

Chin et al. (2014) studied the effect of supply chain on the level of operations of Malaysian industries. A total of 201 small and medium manufacturers were interviewed through questionnaires. The authors use principal component analysis method for creating a supply chain integration index. So as to ascertain if the factors included in the analysis were valid, they employed a Kaiser-Meyer-Olkin (KMO) test which is found to be greater than five meaning all the factors used in calculating the index were valid. From these results we can conclude that integration of supply chain in firms has a significant and positive effect on its financial performance. These findings are relevant for manufacturers who are engulfed with paucity of resources so as to ensure optimal performance in the industry.

Hao et al. (2014) while studying the effect of integrating supply chain on firm's performance uses a hierarchical regression to analyse data collected from 604 firms in China. The main purpose of the study was to showcase the effectiveness of different supply chain integration strategies that are used under competitive strategies. The author finds that strategies meant to improve the competitive edge of the firm had an effect on supply chain integration mechanisms, namely; process, internal and product integration. Further, results highlight that process integration as a supply chain integration practice significantly influence financial performance of firms that product differentiation as a competitive strategy. On the other hand, internal integration was more relevant to firms that used the cost leadership competitive strategy.

Othman et al (2016) studies the relationship between Just-in-Time, supply chain integration and logistics performance among automotive companies in Malaysia. The

aim of this study was to determine if there was any significant impact on supply chain management integration and Just-in-Time strategies on logistical performance of automobile firms. Data was collected using questionnaires where a total of 94 automobile suppliers in Malaysia were interviewed. A regression model was further used to test the theoretical model. Findings from this study reveal that; Just- in- Time purchasing, Just-in – Time manufacturing and integration of supply chain had a linear and statistically significant impact on logistical performance among automotive industries in Malaysia.

Singhry (2015) conducted a study on the effect of innovation along the supply chain on the operations of manufacturing industries. This study was based on cross sectional data from 286 industries in Nigeria that were randomly sampled. The purpose of this study was to find out if innovations along the supply chain had any effect on the functionality/performance of supply chains. The study uses structural equation models so as to be able to make inferences from the data. Findings demonstrate that; functionality of the supply chain is significantly affected by the nature of innovations incorporated along this chain. Examples of the innovations considered under this study were: technology, support from top management, and collaboration and innovation capability of a firm.

Gules et al. (2012) studied the impact supply chains and information technologies might have on business performance in Turkey. Case study approach is used to analyse this objective. More specifically the study was conducted on industries producing Fast Moving Consumer Goods. The authors modelled supply, production and distribution activities to be short, medium and long-term operations. Results showed that including information technologies in supply chains has a linear / direct effect on business performance at different criterions.

Jela (2013) conducted a study on adoption of technology in supply chains for large manufacturing firms in Nairobi. The study sought to find out; the determinants of technology adoption in a company's supply chain, determine the level of adoption of supply chain and determine the extent to which technology adoption in the firm supply chain affects its performance. A total of 64 firms were randomly selected for interviews using questionnaires. Descriptive statistics and linear regression were the methods used

for data analysis. Results demonstrated that; use of technology in the supply chain improves both efficiency and effectiveness of operations. Similarly having supply chains that have embrace technology serves a competitive advantage over other organizations.

Cheruiyot (2013) studied the performance of Kenya Tea Development Agency and the effect of using integrated supply chain management. A total of 132 respondents were interviewed but only 97 of them answered the questionnaire fully. A regression model was used for data analysis. Results highlight that; supply chain integration activities such as; internal activities, suppliers and customers had a positive effect on the cost of raw materials, transportation costs and other supply chain performance indicators. The study further recommends need for organizations to have enhanced supply chain integration so as to have a competitive advantage over other firms.

Magutu (2012) studies strategies used in supply chains, technology and performance of manufacturing companies in Kenya. Main objectives were to; show the relationship between performance of supply chain and supply chain strategies and determine the extent to which technology used in supply chains affects performance of large manufacturing firms. Cross sectional data was collected from a total of 63 large scale manufacturing firms in Kenya. Qualitative approaches such as, Descriptive statistics and other statistical tests namely, correlation analysis and cause and effect methods like regression analysis provided basis for whether or not to reject the null hypothesis. Findings show that; approximately half of the supply chain performance were explained by supply chain strategies. Similarly, if supply chain strategies and supply chain technology are combined they explain up to 90 percent of a firm performance.

Onyango (2011) conducted a study on the effect that management practices along the supply chain might have on performance of cement industries in Kenya. The study uses primary data collected by aid of semi-structured questionnaires across cement factories in Kenya. Descriptive statistics and multivariate regression are used for analysis so as to determine the effect that management practices along the supply chain may have on performance of the companies. Findings indicate that; company performance is significantly influenced by the type of management practices used along the supply chain. Further, about 80 percent of variation in firm performance can be attributed to

supply chain management practices. The study recommended the need for manufacturing companies in Kenya to establish functional supply chain frameworks.

Munywoki and Noor (2015) research on the effect of management of supplier relationship might have on the operations of motor vehicle supply chains in Kenya. The study collected data from a random sample size of 400 employees. Descriptive statistics is used to obtain results from the data. The study found out that; trust relationships, supplier development, collaboration amongst suppliers and information communication and technology affected the performance of supply chain of a firm. The study further recommends that; there is need to evaluate practices for relationship management so has to have a system of improved feedback.

From the reviewed studies, it is evident that there is scantiness in terms of literature focussing on the effect of integrating technology in supply chain of motor vehicle companies. Studies that focus on automobile firms are very few and they do not focus on information technology integration and more so in the supply chain like the current study. Hence the current study seeks to make a relevant contribution to literature by determining financial performance of automotive industries through integrating technology in the supply chain.

2.9 Conceptual Framework

Conceptual framework highlights the relationship between the dependent variable and explanatory variables. The dependent variable was supply chain performance which was measured using communication and data management along the supply chain, efficiency of the supply chain, resource allocation and utilization in the supply chain, costs, profits and operating profit to income ratio. Similarly, size of the company, organizational structure and customer and suppliers' pressure moderated the effect of information technology integration on supply chain performance of automotive companies in Kenya. The conceptual framework is shown in Figure 4.2.

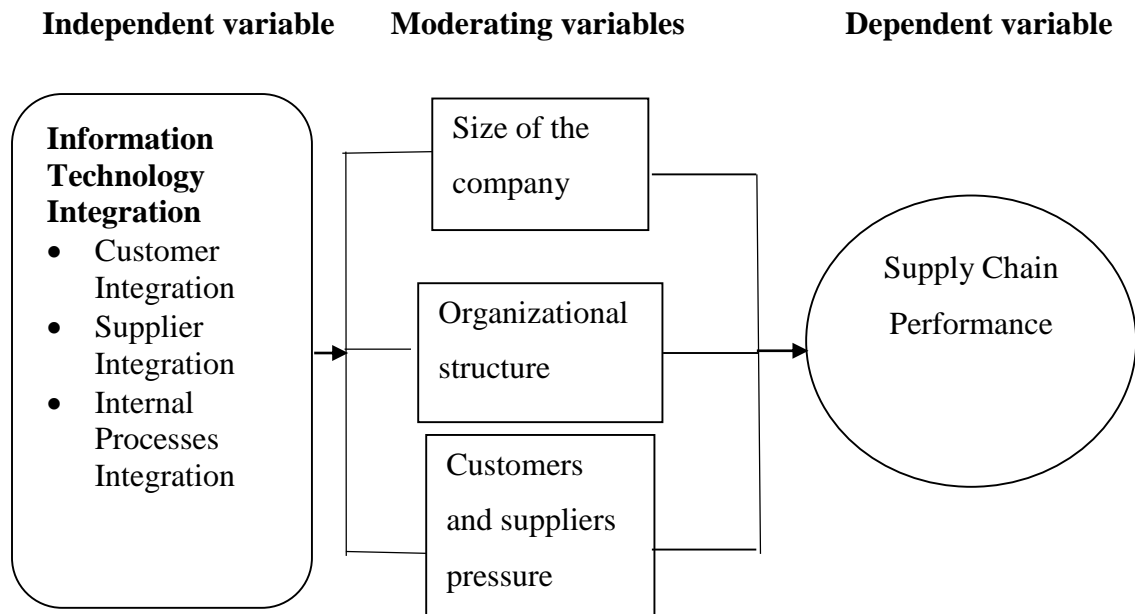


Figure 2.1 Conceptual Framework

Source: Author's own conceptualization

The objectives of the study were to investigate the dimensions of IT integration in the Kenyan motor vehicle supply chains, to investigate the IT technologies in the different functional areas and to investigate the extent to which this integration affects supply chain performance of motor vehicle companies in Kenya. The conceptual model therefore relates to the objectives by showing how the dimensions of IT integration aided by company size, organizational structure and customers and suppliers pressures drive supply chain performance.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the approaches and steps that were used to implement the proposed study. Specifically, it gives an outline of the research design that was used, target population, methods that were used for data collection, data analysis techniques to reach objective conclusions and a clear presentation of the analytical framework.

3.2 Research Design

The study adopted a descriptive design. Cross sectional data research design is applied because it is convenient in terms of time and cost. Further this approach has no loss of follow-up interviews since data is collected once (Kothari 2011).

3.3 Population of the Study

All motor vehicle companies that are operational in Kenya were the study population for this study. According to the Kenyan Motor Industry association website (<http://www.kmi.co.ke/>), there are 340 motor vehicle dealers or companies registered with them.

3.4 Sampling design

The final sample was a mix of small, medium and large automobile industries in Kenya so as to increase data variation. Basis of grouping this firms according to the highlighted categories was based on the Kenya Association of Manufacturers grouping of 2010/11 where; a firm that has more than 100 employees is considered large; 51-100 workers is categorised as medium and small firms are those that employ at maximum 50 workers.

100 motor vehicle firms were randomly selected from the Kenya Association of Manufacturers list. Further the sample was equally divided across the different types of automotive firms so that each category had 33 companies to be interviewed.

3.5 Data Collection

Primary sources were used for data collection. The tool used in obtaining data from primary sources was a semi-structured questionnaire which was administered to the sampled firms. Questionnaires were administered by self-delivery and later picked upon completion by the informants. Use of semi-structured questionnaire is highly encouraged since it advocates for clear responses.

3.6 Data analysis

So as to obtain the relationship between the dependent and independent variables, correlation analysis was used. Data was entered into Statistical Package for Social Sciences (SPSS) which was used for analysis. Results of the correlation were clearly presented in tables and interpretations made in reference to the effect of the independent variable on the supply chain performance of automotive industry. Reliability of the research instruments was checked using Cronbach Alpha coefficient. A coefficient of 0.81 was obtained which is more than the recommended 0.7 and therefore the questionnaires used to collect data were reliable. Validity of the research instruments was ascertained by consulting the supervisor which ensured content validity.

3.6.1 Analytical Model

To investigate the dimensions of information technology integration in the Kenyan motor vehicle supply chains

This objective was achieved by use of descriptive statistics whereby frequencies, percentages, means and standard deviations were used to show the distribution of different supply chain technologies in firms.

To determine the extent to which supply chain performance of motor vehicle companies in Kenya is affected by information technology integration.

The study used regression analysis to determine the effect of information technology integration on supply chain performance. A regression model was adopted as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Where;

Y = Supply Chain Performance

α = Intercept

$\beta_1 - \beta_3$ = Slope coefficients representing the influence of independent variables over the dependent one.

X_1 = Customer Integration

X_2 = Supplier Integration

X_3 = Internal Processes Integration

ε = Error term

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter gives an analysis of collected data and interpretations. Data was analyzed using both descriptive and inferential statistics. The results are presented according to the research objectives. The objectives of the study were to investigate the dimensions of information technology integration in the Kenyan motor vehicle supply chains, to investigate the IT technologies used in the different functional areas of the Kenyan motor vehicle supply chains and to determine the extent to which supply chain performance of motor vehicle companies in Kenya is affected by information technology integration. The background of the analysis comprises the response rate and the general characteristics of the firms in the study.

The study aimed to collect data from a sample of 100 motor vehicle firms selected from the Kenya Association of Manufacturers. These firms included both importers and local assemblers. The study achieved a response rate of 83% as shown in Table 4.1. This response was considered excellent as recommended by Kothari (2011) who suggested a response rate of more than 70% as good for deducting study findings. The response was therefore sufficient for analysis. Most of the firms had established supply chain departments while a few did not have supply chain departments.

Table 4.1 Response Rate

	Frequency	Percentage
Returned Questionnaires	83	83
Unreturned Questionnaires	17	17
Total	100	100

4.2 General Information

This section presents results on general characteristics of the firms studied. The basic features presented in the study included the period of operation of firms, number of employees of the companies, average level of production per month, organizational structure of the firms, customers served per year, suppliers per year and usage of IT in the firms' supply chains.

4.2.1 Period of Operation of the Firms

The study sought to establish the period in which the motor vehicles firms have been operating in Kenya. The findings obtained are presented in Table 4.2 and imply that most motor vehicle firms have been in operation for at least 5 years. The findings suggest intense competition from already established firms and therefore few entrants.

Table 4.2 Period of Firms' Operation

	Frequency	Percent	Cumulative Percent
Less than 5yrs	6	7.2	7.2
5-10 years	34	41.0	48.2
10-20 years	28	33.7	81.9
More than 20 years	15	18.1	100.0
Total	83	100.0	

4.2.2 Number of Employees

The findings indicate that most firms had staff of between 25 and 100 as shown in Tables 4.3. The findings imply that most firms have more than 25 employees and lie in the small and medium category of firms. The findings suggest that with more than 25 employees, the firms can effectively reach and serve their target customers.

Table 4.3 Staff Size of Firms

	Frequency	Percent	Cumulative Percent
Less than 25	7	8.4	8.4
25-300	35	42.2	50.6
300-1000	29	34.9	85.5
More than 1000	12	14.5	100.0
Total	83	100.0	

4.2.3 Average Level of Sales

The study determined that most firms are productive as more than 500 units were sold per month in most firms as shown in Table 4.4. the firms studied included importers of second-hand cars. This suggests high incomes or easy access to financing by the target customers.

Table 4.4 Average level of sales of firms

	Frequency	Percent	Cumulative Percent
Less than 500 units	11	13.3	13.3
500-2500 units	45	54.2	67.5
2500 - 5000 units	15	18.1	85.5
More than 5000 units	12	14.5	100.0
Total	83	100.0	

4.2.4 Firms' Organizational Structure

The findings indicated that most motor vehicle firms prefer a centralized organizational structure in Kenya as shown in Table 4.5. This implies that most motor vehicle firms are owned by franchises and therefore need for a centralized structure as the franchises determine the firm's strategic direction.

Table 4.5 Organizational Structure of the Firms

	Frequency	Percent	Cumulative Percent
Centralized	49	59.0	59.0
De-centralized	34	41.0	100.0
Total	83	100.0	

4.2.5 Number of Customers Served by the Firms

The findings showed that most firms serve a good number of customers, as most firms have more than 500 customers per year as shown in Table 4.6. The findings suggest an increasing demand for motor vehicles.

Table 4.6 Customer Served by the Firms Per Year

	Frequency	Percent	Cumulative Percent
Less than 500	20	24.1	24.1
500- 1000	39	47.0	71.1
1000- 2500	11	13.3	84.3
More than 2500	13	15.7	100.0
Total	83	100.0	

4.2.6 Number of Suppliers for the Firms

The findings of the study indicate that most firms have less than 100 suppliers per year as shown in Table 4.7. The findings suggest less after sale support activities which require more suppliers.

Table 4.7 Number of Suppliers in the Firms

	Frequency	Percent	Cumulative Percent
Less than 50	25	30.1	30.1
50 -100	34	41.0	71.1
100- 150	12	14.5	85.5
More than 150	12	14.5	100.0
Total	83	100.0	

4.2.7 Use of IT in Supply Chain Management

The findings of the study found that almost all motor vehicle firms use IT in supply chain management as shown in Table 4.8. The findings need for visibility, timely delivery of cars as well eliminating unnecessary manual processes.

Table 4.8 IT usage in Supply Chain Management

	Frequency	Percent	Cumulative Percent
Yes	82	98.8	98.8
No	1	1.2	100.0
Total	83	100.0	

Descriptive Analysis

The specific research objectives entailed; to investigate the dimensions of information technology integration in the Kenyan motor vehicle supply chains; to investigate to investigate the IT technologies used in the different functional areas of the Kenyan motor vehicle supply chains and to determine the extent to which supply chain performance of motor vehicle companies in Kenya is affected by information technology integration. The findings are given based on frequencies, percentages, means and standard deviations.

4.3.1 Dimensions of Information Technology Integration

The study sought to investigate the dimensions of information technology integration in the Kenyan motor vehicle supply chains. A Likert scale data was collected rating the views in a scale of 1 to 5 where 1 represents strongly disagree, 2 represents disagree, 3 represents neither agree nor disagree, 4 represents agree whereas 5 represents strongly agree. The results from the collected responses were analyzed based on means and their standard deviations to show the variability of the individual responses from the overall mean of the responses per each aspect of the dimensions of information technology integration in the Kenyan motor vehicle supply chains.

The study found that most respondents agreed that their company used IT to establish the needs of customers. The respondents also agreed that IT had been integrated in the management of suppliers; IT was used to manage upstream procurement; their companies had integrated IT in the management of internal processes; their companies used IT to manage sales; their companies used IT to provide customer services; their companies used IT to predict the needs of their suppliers; and their companies used IT to predict the needs of their customers. Table 4.9 gives the results on the first objective of the study.

The study findings agree with those posited by Hazen, Cegielski and Hanna (2011) and Cheruiyot (2013) who found that supply chain integration activities such as internal activities, suppliers and customers had an influence on the cost of raw materials, transportation costs and other supply chain performance indicators. Similarly, Marobela and Moeti-Lysson (2015) support these findings that supply chain and supply chain technology are combined to improve firm performance. Additionally, Munywoki and Noor (2015) found that trust relationships, supplier development, collaboration amongst suppliers and information communication and technology affected the performance of supply chain of a firm, in line with this study.

Table 4.9 Descriptive Statistics on IT Integration Dimensions

	Mean	Standard Deviation
My company uses IT to establish the needs of customers	3.90	.532
IT has been integrated in the management of suppliers	4.33	.683
IT is used to manage upstream procurement	4.04	.551
My company has integrated IT in the management of internal processes	4.24	.673
My company uses IT to manage sales	4.14	.566
My company uses IT to provide customer services	4.23	.770
My company uses IT to predict the needs of its suppliers	4.20	.600
My company uses IT to predict the needs of its customers	4.28	.686
Overall mean	4.17	

The study also used a t test to test the hypothesis that there is no difference between the means of information technology integration. The findings obtained, shown in Table 4.10, show that null hypothesis is rejected as t value of 92.093 and p value of 0.000 were obtained which is less than 0.05 at 95% confidence level. Therefore, the means were not the same across the values of information technology integration.

Table 4.10 T test Statistics on Information Technology Integration

$H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6 = \mu_7 = \mu_8$	T	Sig.
Information technology integration	92.093	.000

4.3.2 Functional Areas of Supply Chain Management and Technologies Used

The second objective of the study was to investigate the different functional areas in the Kenyan motor vehicle supply chains. The functional areas studied were supply, product and demand areas. On supply functional area, the findings determined that most

respondents agreed that their companies used IT in the sourcing of its resources. The respondents also agreed that IT had been integrated in the planning of resource use; their companies used IT to manage their relationship with suppliers and that their companies used IT to optimize their supplier networks.

On product dimension, the study found that most respondents agreed that IT had been integrated in the product design process at their companies and that their companies had integrated IT in the product manufacturing process. On demand dimension, most respondents agreed that IT had been integrated in the fulfilment of customers' demands; their companies used IT to manage customer relationships and that their companies used IT to manage their finances. The findings are shown in Table 4.11.

In line with the findings of the study, Singhry (2015) argue that the functionality of the supply chain is significantly affected by the nature of innovations incorporated along this chain. Examples of the innovations considered were technology, support from top management, and collaboration and innovation capability of a firm. The current study considered the dimensions of supply, demand and product and how they are integrated into information technology. In addition, Jela (2013) demonstrated that use of technology in the supply chain improves both efficiency and effectiveness of operations. Similarly having supply chains that have embrace technology serves a competitive advantage over other organizations.

Table 4.11 Descriptive Statistics on Functional Areas of SCM

	Mean	Standard Deviation
Supply		
My company uses IT in the sourcing of its resources	3.92	.447
IT has been integrated in the planning of resource use	4.35	.740
My company uses IT to manage its relationship with suppliers	4.00	.494
My company uses IT to optimize its supplier networks	4.36	.554
Overall mean	4.16	
Product		
IT has been integrated in the product design process at my company	4.20	.558
My company has integrated IT in the product manufacturing process	4.29	.615
Overall mean	4.25	
Demand		
IT has been integrated in the fulfilment of customers' demand	4.10	.576
My company uses IT to manage customer relationships	4.17	.621
My company uses IT to manage its finances	4.14	.521
Overall mean	4.13	

The study also used a t test to test the hypothesis that there is no difference between the means of functional areas of supply chain management. The findings obtained, shown in Table 4.12, show that null hypothesis is rejected as t value of 89.779 and p value of 0.000 were obtained which is less than 0.05 at 95% confidence level. Therefore, the means were not the same across the values of functional areas of supply chain management.

Table 4.12 T test Statistics on Information Technology Integration

H ₀ : $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6 = \mu_7 = \mu_8 = \mu_9$	T	Sig.
Functional areas of supply chain management and technologies used	89.779	.000

4.3.3 Supply Chain Performance

Descriptive statistics on supply chain performance of the motor vehicle industries studied was sought. A Likert scale data was collected rating the views in a scale of 1 to 5 where 1 represents worse supply chain performance whereas 5 represents improved supply chain performance. The results obtained indicated that means of more than 4 were obtained for all items showing an improved supply chain performance in communication along the supply chain, data management along the supply chain, efficiency of the supply chain, resource allocation and utilization in the supply chain, costs, profits and operating profit to income ratio due to IT integration. The findings are shown in Table 4.13.

Table 4.13 Descriptive Statistics on Supply Chain Performance

	Mean	Standard Deviation
Communication along the supply chain	4.36	.575
Data management along the supply chain	4.65	.633
Efficiency of the supply chain	4.67	.497
Resource allocation and utilization in the supply chain	4.65	.614
Costs	4.69	.467
Profits	4.71	.456
Operating profit to income ratio	4.73	.520
Overall mean	4.64	

4.3 Regression Analysis

The study used regression analysis to find the relationship between supply chain integration (measured using customer integration, supplier integration and internal processes integration) and supply chain performance at a significance level of 0.05 (95% confidence level). The model summary, ANOVA table and coefficients of regression were obtained to explain the relationships that existed between the variables of the study. The results are as shown in Table 4.14.

Table 4.14 Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.822 ^a	.676	.664	.19332

a. Predictors: (Constant), Internal Process Integration, Customer Integration, Supplier Integration

As illustrated in the Table 4.15, the predictor variables (internal process integration, customer integration and supplier integration) explain 67.6% of the variation in supply chain performance in the motor vehicles in Kenya. This is as given by the R square coefficient with a value of 0.676. Thus, based on this coefficient, other factors that were not considered in study amount to 32.4% of the variability in chain performance in the motor vehicles in Kenya.

Table 4.15 Relationship ANOVA Table

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	6.163	3	2.054	54.974	.000 ^b
1	Residual	2.952	79	.037		
	Total	9.116	82			

a. Dependent Variable: supply chain performance

b. Predictors: (Constant), Internal Process Integration, Customer Integration, Supplier Integration

As illustrated in the Table 4.15, the significance value in testing the reliability of the model for the relationship between the independent variables (internal process integration, customer integration and supplier integration) and supply chain performance was obtained as 0.000 which is less than 0.05 the critical value at 95% significance level. Therefore, the model is statistically significant in predicting the relationship between the dependent and independent variables of the study.

Table 4.16 Regression Coefficients

Model	Unstandardized		Standardized	t	Sig.	
	Coefficients		Coefficients			
	B	Std. Error	Beta			
1	(Constant)	1.216	.268		4.538	.000
	Customer Integration	.245	.073	.315	3.339	.001
	Supplier Integration	.357	.102	.404	3.502	.001
	Internal Process Integration	.149	.068	.203	2.203	.030

a. Dependent Variable: Supply Chain Performance

The findings shown in Table 4.16 indicate that all the variables had positive and significant influence on supply chain performance.

4.4 Discussion of Results

This section presents the discussion of the findings of the study. The study determined that information technology integration improved supply chain performance in the motor vehicle firms in Kenya.

The findings obtained in this study agree with those of Chin et al. (2014) who also found that integration of supply chain in firms has a significant and positive effect on performance. Similarly, Hao et al. (2014) while studying the effect of integrating supply chain on firm's performance agree that IT integration as a supply chain integration practice significantly influence performance of firms. Similar findings were also posited by Othman et al (2016) who found that integration of supply chain had a linear and statistically significant impact on logistical performance among automotive industries in Malaysia.

In line with the findings of the study, Singhry (2015) argue that the functionality of the supply chain is significantly affected by the nature of innovations incorporated along this chain. The current study considered the dimensions of supply, demand and product and how they are integrated into information technology. In addition, Jela (2013) demonstrated that use of technology in the supply chain improves both efficiency and effectiveness of operations. Similarly having supply chains that have embrace technology serves a competitive advantage over other organizations.

The findings of the study agree with those of Ambe and Badenhorst-Wess (2013) who determined that automotive industry supply chains use technology then has led to adoption of lean Just in Time (JIT) production procedures which have shaped automotive firms' production strategy. Coia (2017) also agrees that through using IT, automobile companies can deliver data that can enable them to comprehend their operations. Through understanding internal processes, the firms can use the new data-driven solutions for their business units and customers to augment their business. González-Benito, Lannelongue and Alfaro-Tanco, (2013) also agree that integration of technology in supply chains is an aspect that contributes to creation of lean and green supply chain systems that result in efficient operations in organizations.

Locally, Cheruiyot (2013) posited that supply chain integration activities such as internal activities, suppliers and customers had a positive effect on the cost of raw materials, transportation costs and other supply chain performance indicators. Similarly, Magutu (2012) support these findings that supply chain and supply chain technology are combined to improve firm performance. Additionally, Munywoki and Noor (2015) found that trust relationships, supplier development, collaboration amongst suppliers and information communication and technology affected the performance of supply chain of a firm, in line with this study.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the main findings, conclusions, recommendations and gives suggestions for further research. The chapter has been organized based on the objectives of the study.

5.2 Summary of the Result Findings

This section presents the summary of the findings that were obtained in the study and presented in the previous chapter. The objectives entailed; to investigate the dimensions of information technology integration in the Kenyan motor vehicle supply chains; to investigate to investigate the IT technologies used in the different functional areas of the Kenyan motor vehicle supply chains and to determine the extent to which supply chain performance of motor vehicle companies in Kenya is affected by information technology integration.

On the dimensions of information technology integration in the Kenyan motor vehicle supply chains, the study found that the various dimensions of information technology had been put in place in the firms and thereby companies used IT to establish the needs of customers, IT had been integrated in the management of suppliers and to manage upstream procurement, their companies had integrated IT in the management of internal processes, to manage sales, provide customer services, predict the needs of their suppliers and predict the needs of their customers.

On whether the different IT technologies were used in the functional areas of the Kenyan motor vehicle supply chains, the study further found that it had been integrated in the planning of resource use and was used to manage the firms' relationships with suppliers. It was also found that IT had been integrated in the product design process at their companies, in fulfilment of customers' demands, in managing customer relationships and finances.

On the extent to which supply chain performance of motor vehicle companies in Kenya is affected by information technology integration, the study found that the association between information technology integration and supply chain performance of the motor vehicle firms was positive and significant. Information technology integration

increasing in these firms was associated with increase in supply chain performance by 67.6%.

5.3 Conclusions

The study concluded that through IT integration, the firms could predict customer services, supplier needs as well as customer needs.

The study also concluded that the functional areas of supply chain were used in the motor vehicle firms enabled the firms to effectively manage supply, demand and product development. Further, it was concluded that through the dimensions of supply, demand and product, the firms could effectively fulfil the customer needs, manage their resources including finances, optimize supplier networks and effectively improve product design processes.

The study finally concluded that information technology integration positively affected supply chain performance of the motor vehicle firms in Kenya. Improving information technology integration across these firms will therefore improve performance of supply chains, which improve the overall performance of the firm.

5.4 Recommendations

Based on the findings and conclusions of the study, the study made the following recommendations;

The study recommends that the management of the motor vehicle firms need to adopt information technology integration to improve customer, supplier and internal process needs. It was determined that when IT dimensions are used, firms can reap more in terms of customer management, supplier management and internal firm management which improve organizational performance.

The study also recommends that the management of the motor vehicle firms should consider fully implementing the functional areas of supply chain management of supply, product and demand in the firms where they are lacking. If fully implemented, these areas can help the organizations to improve resource use and planning, product development and customer relationship experience.

The study found that information technology integration was adopted by the firms in motor vehicle industry. However, the integration improved supply chain performance

by 67.6%. Therefore, the study recommends need for motor vehicle organizations to have enhanced supply chain integration so as to improve supply chain performance even further and therefore have a competitive advantage over other firms.

5.5 Suggestions for Further Research

The study suggests that further research can be conducted to assess information technology integration in supply chains and performance of automotive companies outside Nairobi in Kenya. In addition, from a methodological point of view, the sample and context are considered a limitation. This study was limited to 100 motor vehicle firms selected from the Kenya Association of Manufacturers. More studies can be conducted on the same subject on other sectors such as the agricultural, banking, insurance, health and other sectors for comparative results. The study also suggests that further research can be conducted on IT integration in management of supply chains at both the national government and county governments.

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APPENDICES

Appendix I: Letter of Introduction


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DATE 11/09/2018

TO WHOM IT MAY CONCERN


The bearer of this letter NDUTA DAVID MWAGURI
Registration No. DG1/81479/2015

is a bona fide continuing student in the Master of Business Administration (MBA) degree program in this University.

He/she is required to submit as part of his/her coursework assessment a research project report on a management problem. We would like the students to do their projects on real problems affecting firms in Kenya. We would, therefore, appreciate your assistance to enable him/her collect data in your organization.

The results of the report will be used solely for academic purposes and a copy of the same will be availed to the interviewed organizations on request.

Thank you.


PROF. JAMES M. NJIHIA
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Appendix II: Questionnaire

Section A: Company's Basic Information.

Please answer the following questions concerning information about your organization.

1. How long your firm has been operating?
 - a) Less than 5yrs []
 - b) 5-10 years []
 - c) 10-20 years []
 - d) More than 20 years []
2. What is the size of the staff of your company?
 - a) Less than 25 []
 - b) 25-100 []
 - c) 300-1000 []
 - d) More than 1000 []
3. What is your company's average level of production per month?
 - a) Less than 500 units []
 - b) 500 – 2500 units []
 - c) 2500 - 5000 units []
 - d) More than 5000 units []
4. What is the organizational structure of your company?
 - a) Centralized []
 - b) De-centralized []
5. How many customers does your company serve per year?
 - a) Less than 500 []
 - b) 500- 1000 []
 - c) 1000- 2500[]
 - d) More than 2500 []
6. How many suppliers does your company have per year?
 - a) Less than 50 []
 - b) 50 -100 []
 - c) 100- 150 []
 - d) More than 150 []
7. Does your company use Information Technology in Supply Chain Management?
 - a) Yes []

b) No []

SECTION B: DIMENSIONS OF INFORMATION TECHNOLOGY INTEGRATION

In the scale of 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree, to what extent has your company integrated the following dimensions of information technology?

	1	2	3	4	5
My company uses IT to establish the needs of customers					
IT has been integrated in the management of suppliers					
IT is used to manage upstream procurement					
My company has integrated IT in the Management of internal processes					
My company uses IT to manage sales					
My company uses IT to provide customer services					
My company uses IT to predict the needs of its suppliers					
My company uses IT to predict the needs of its customers					

8. In what other areas has your company integrated IT in its supply chain?

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.....

C: FUNCTIONAL AREAS OF SUPPLY CHAIN MANAGEMENT AND THE TECHNOLOGIES USED

In the scale of 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree, to what extent has your company integrated information technology in the following dimensions of supply chain management?

SUPPLY	1	2	3	4	5
My company uses IT in the sourcing of its resources					
IT has been integrated in the planning of resource use					
My company uses IT to manage its relationship with suppliers					
My company uses IT to optimize its supplier networks					
PRODUCT	1	2	3	4	5
IT has been integrated in the product design process at my company					
My company has integrated IT in the product manufacturing process					
DEMAND	1	2	3	4	5
IT has been integrated in the fulfilment of customers; demands					
My company uses IT to manage customer relationships					
My company uses IT to manage its finances					

9. Which IT technologies does your company use to manage supply?

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10. Which IT technologies does your company use to manage demand?

.....

11. Which IT technologies does your company use to manage its production?

.....

D: SUPPLY CHAIN PERFORMANCE

To what extent has your company's supply chain performance changed in the last one year?

	Worse			Improved		
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communication along the supply chain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Data management along the supply chain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Efficiency of the supply chain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Resource allocation and utilization in the supply chain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Costs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Profits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Operating profit to income ratio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. In what other ways has IT integration affected your company's supply chain performance?

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