

**INVENTORY MANAGEMENT AUTOMATION AND THE  
PERFORMANCE OF SUPERMARKETS IN WESTERN KENYA**

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**BY**

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Business, University of Nairobi**

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## **DECLARATION**

I declare to the best of my knowledge that this is my original work and has not been presented for a degree in any university. No part of this proposal should be reproduced without prior permission of the author and /or University of Nairobi.

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Date: 9<sup>TH</sup> NOVEMBER 2012

## **DECLARATION BY SUPERVISOR**

This research project has been submitted for examination with my approval as the university supervisor.

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## **DEDICATION**

This project is dedicated to my parents James Kitheka and Jackline Kitheka. This is for their sacrifices in educating me and instilling in me all the appetite that I have for knowledge.

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## ABSTRACT

In today's highly competitive business environment, organizations are striving to achieve effectiveness, cost efficiencies and economies of scale. Most of these organizations hold inventory so as to meet their customers' needs. However, managing these inventories in order to achieve their objectives has posed a great challenge to the firms. Many firms have not yet established how much to invest in inventories and the right inventory levels to hold so as satisfy customers. Organizations have therefore turned to using modern technology to overcome such challenges. Specifically, the study sought to address the following two objectives; to establish the extent of inventory management automation and to determine the effect of inventory management automation on the performance of supermarkets in Western Kenya. The study employed a survey design and targeted all the supermarkets in Kisumu, Kakamega and Bungoma. Data was collected from 11 out of the 12 operational supermarkets and a response rate of 90.9% was achieved. Data was gathered using structured questionnaires and analysed using both descriptive and inferential statistics, with the help of Statistical Package for Social Sciences (SPSS). The findings of the study revealed that inventory management automation affected the performance of the supermarkets and that there was a positive linear relationship between inventory management automation and the performance of the supermarkets. The linear regression model used revealed that 56.7% of the supermarkets' performance could be explained by inventory management automation ( $r^2=0.567$ ). The extent of inventory management was found to be high among the supermarkets, with an overall mean score of 3.94, and the performance was also found to be high with an overall mean score of 4.1 both variables being rated on a scale of 1 to 5. The study recommended that supermarkets should automate their inventory management systems so as to improve customer service delivery levels and reduce operational costs. It was also recommended that the supermarkets should decentralize their management structures, encourage specialization of labour and do enough research before investing in any new technology. The study suggested that further research should be conducted on the effect of inventory management automation on inventory investment and profits, effect of automation on demand forecasting accuracy as well as challenges faced by the supermarkets in automating their inventory management systems and how to overcome them.

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## **ABBREVIATIONS AND ACRONYMS**

**BOM:** Bill of Materials

**EDI:** Electronic Data Interchange

**E-POS:** Electronic Point of Sale

**ERP:** Enterprise Resource Planning

**FFV:** Fresh fruits and vegetables

**IT:** Information technology

**MPS:** Master Production Schedule

**MRP:** Materials Requirement Planning

**NIMIS:** Networked Inventory Management Information Systems

**RFID:** Radio Frequency Identification

**VMI:** Vendor Managed Inventory

**WIP:** Work in Progress

# CHAPTER ONE

## INTRODUCTION

### 1.1 BACKGROUND OF THE STUDY

Inventory is a very critical component in every organization and it requires serious managerial consideration since it ties up a lot of firms' capital. However, Inventories are essential for keeping the production continuous whereby moving inventories keep the market going and the distribution system intact. According to David and David (2002), these functions include providing a cushion to prevent against stock-outs and therefore if there is a constant and efficient supply of inventory, it will reduce the chances of uncertainties or lack of stocks and the costs that relate to stock-outs and if this is well achieved, it will enable any firm to attain a competitive advantage over competitors. Donald (2006), points out that there is failure in the firms' systems since most of them are not computerised and such firms tend to have huge inventories due to poor planning and also in anticipation that they will beat the competition from the jua kali sector. The failure leads to problems of daily sales accounting since there can be errors in the amounts received in relation to the amounts sold and numerous problems are also encountered in demand forecasting since material managers are not able to predict the exact amount of inventory to maintain so as to meet the customer's demand.

Automated inventory systems usage has had little application and this has resulted in problems that come as a result of stock shortages and it is for this reason that various researches have been carried out pertaining to Inventory Management Control Systems. Godwin (2003) researched on the impact of telecommunication in inventory management and established that telecommunication and inventory control systems are directly related. For instance, Just-in Time System helps in improving the lead-time since orders are made on time and there is just-in-time delivery and therefore this helps in improving the production scheduling and planning of most companies. Every organization holds something in stock; organizations such as manufacturers, healthcare institutions and other service providers place stock in a subsidiary position rather than a central position. Inventory is still an important element in operational effectiveness and often appears in the balance sheets as the

biggest of the current assets, holding up a lot of cash. Current stock is very expensive and it is unacceptable in many organizations to hold up excess stock (Adams, 2005)

For products in high demand, a continuing drive to reduce stock to the desired levels is needed to combat the natural tendency of increasing stock unnecessarily. Some of the advancements on constructive approaches to minimizing of the stock quantities in an organization as advanced by Donald (2006) include making forecasts more accurate and this is done by ensuring that records are right and that there is better planning and arranging for inventories to be delivered just in time instead of stock piling. This can also be done by devising ways of reducing ordering costs, production setup costs and lead-times so that optimum quantities are maintained. Various ordering policies can also be used, like blanket (call of) orders, capacity booking orders, part period balancing and economic order quantity. The method used depends on the industry, the usage, the production technique and the cost of ordering (Andrew and Whitney, 2006). Such ordering policies are also helpful in inventory management because they help firms in maintaining the right inventory levels and it is now clearly evident that firms are taking every opportunity available to ensure that such policies are implemented with the help of automated systems.

Many companies' inventory policy is to hold sufficient finished stock to meet the market demand while minimizing the holding costs, and to enable them meet their objectives, computerized inventory management systems are introduced. Although commercial packages have done much to the discipline of inventory management, the mathematical techniques embodied in the software have not kept pace with developments. The systems can give the companies opportunities to maintain detailed stock records, but one of their major limitation is that they rely on accurate setting of various control parameters not calculated by the software and therefore they should be improved by calculating and monitoring the value of the relevant control parameters (Liu and Keith, 1995).

Automated inventory management also requires a lot of information processing within and outside the organization and the transformation, storage and communication of information about the inventory in the stock points as well as in the intermediate processes across the supply chain is highly complex. The driving

forces for automated inventory management are increasing customer requirements, the need for networked organizations and the opportunity of networked inventory management. In networked firms where the inventory managers have to deal with several other organizations as far as stock management is concerned, the Networked Inventory Management Information Systems (NIMIS) come in handy (Martin et. al. 1996).

### **1.1.1 Inventory Management**

Inventory is a very expensive asset that can be replaced with information which is a less expensive asset but to do this, the information has to be accurate, timely, reliable and consistent. When this happens, you carry fewer inventories, reduce cost and get products to customers faster (David, 1996). This therefore implies that inventory management is very important if a company wants to achieve a balance between efficiency and responsiveness.

David, (1996) explains the following objectives of inventory management: maximizing customer service, maximizing the efficiency of purchasing and production, maximizing inventory investment and maximizing profit. It is worth noting that meeting these objectives requires balancing short-term as well as long-term objectives. Whether used to provide customer service or to achieve efficiencies, the need to carry inventories conflicts with the management's desire to minimize inventory investments. For instance, long production runs tend to create inventories; marketing people want stocks of a larger variety of products and options to serve a broad customer demand. High levels of inventory also take up space in factories and distribution centres, thus incurring additional costs of storage, insurance, and so on. Reconciling these conflicting objectives is a primary goal of inventory management. Inventory Management systems and inventory control processes provide information to efficiently manage the flow of materials, effectively utilize people and equipment, coordinate internal activities and communicate with customers (Wolcott, 2000).

### **1.1.2 The Concept of Automation**

Vijay (2004) defines automation as a technology dealing with the application of mechatronics and computers for the production of goods and services. Automation is

broadly classified into manufacturing and service automation. The main reasons why many firms automate is to curb the problems of shortage of labour, high cost of labour, need to increase productivity and to reduce the manufacturing lead-times. All this put together, it implies that automation leads to lower operational costs and improved customer service. Inventory can appear in many places in the supply chain, and in several forms such as raw materials inventory, work- in-process (WIP) or finished goods inventory. The major challenge faced by many supply chain managers is establishing an efficient and effective inventory management system for their organizations (Brason et al, 2005).

In order to effectively automate inventory management, several systems have been developed so as to ensure that firms, supermarkets included, hold the right quantities of stock so as to strike a balance between the costs involved and customer satisfaction. Such systems include Materials Requirement Planning (MRP), Vendor Managed Inventory (VMI), Radio Frequency Identification (RFID), Enterprise Resource Planning (ERP), Electronic Point of Sale (E-POS), and E- Procurement (Ken et al. 2010; Simchi-Levi et al. 2009 and Sople, 2010).

### **1.1.3 Organizational Performance**

The performance of an organization is evaluated by how it reduces cost or increases value. Firms' performance monitoring is important; in many industries, the supply chain represents roughly 75 percent of the operating budget expense (Palevich, 1999). Three common measures of performance are used when evaluating performance: efficiency, responsiveness and effectiveness (Chase et al., 2001). Efficiency implies minimization of total system wide costs from transportation and distribution to inventories of raw materials, work in process and finished goods. To be efficient, firms should utilize strategies aimed at creating highest cost efficiency and for such efficiencies to be achieved, non-value adding activities should be eliminated, economies of scale pursued and optimization techniques deployed so as to get the best utilization capacity. To be responsive means ensuring that customers' needs/demands are attended to at the right time without delays. In order to achieve responsiveness, the firms should be flexible to the changing and diverse needs of the customers and also build to order and mass customization processes as a means to

meet the specific requirements of the customers. Effectiveness on the other hand means doing the right thing at the right time. Firms should ensure that they do enough research to know what their customers need and should also get the right resources so as to serve their customers satisfactorily (Janat, 2009).

Organizational performance can therefore be best measured through operational cost reduction and customer service delivery levels. As more manufacturers struggle with global markets, competition from low cost countries and faltering home economies, the attention of many manufacturers and retailers have naturally turned to cost and waste reduction. It is therefore very important to understand the best cost reduction strategies, and identify the main cost drivers in a firm's operations. While an obvious need for cost reduction arises, the reality is that many firms do not know where most of the cost of a product occurs. It is also equally important to understand the overhead structure, as this can help to identify perverse incentives that may affect later decisions (Meeker and James, 2004).

(Scott and Brian, 1996) explain that measuring customer satisfaction has become an increasingly important factor for successful business operation today. Many businesses in different countries have shifted from a predominantly manufacturing economy to a service oriented economy. The ability to evaluate the level of customer satisfaction effectively a company provides is critical: this evaluation can be used to compare operating effectiveness against competition, identify areas which require improvement and to make adjustments to gain market share. According to Parasuraman et. al. (1993), many retail stores perform an undercover investigation of various outlets once a year and the information is used by top management to determine which outlets need attention or even to help determine if there is a generic problem permeating throughout the company and how such a problem may affect the services offered to the customers.

#### **1.1.4 Retail Industry in Kenya**

The issue of the retailer's role in the marketing channel was raised by McVey (1960) about four and half decades ago and he argued that retailers tended to view themselves as the buying agents for their customers than as the selling agent for their suppliers. According to Pitkin (1996), the retail industry is heavily influenced by

changes within the consumer market and the retailers therefore have an opportunity to present products to their customers in an informative way. The rise of supermarkets in developing countries has received considerable attention in the development economics literature over the past few years (Reardon et al., 2003). That literature shows that: supermarkets are spreading quickly in urban areas and that supermarket chains are modernizing their product procurement systems, differentiating them from those used by traditional retailers and wholesalers. In Kenya for example, Neven and Reardon (2004) showed that supermarkets are growing at an annual rate of eighteen percent (18%) and have a twenty percent (20%) share of the urban food market overall. Supermarket chains in Kenya have recently begun to modernize their procurement systems by centralizing their procurement over the country into distribution centres (away wholesalers dedicated to sourcing from farmers as well as the wholesale markets).

The advent of supermarkets in the rural communities has opened up unprecedented opportunities for a considerable number of (mostly large) farmers, albeit generating negative impact on small producers unable to meet the stringent requirements of supermarket chains and other modern food supply channels. Inevitably, the food security of this latter group is impaired. It is therefore imperative that development policies and national as well as international assistance programmes take this factor into account and include actions that will enable this disadvantaged group to benefit from the new opportunities opening up in the food trading system. Most studies conducted with regard to supermarkets in Kenya have focused on fresh fruits and vegetables (FFV) (Reardon et al. 2003).

Over the last 5 years, Western Kenya has experienced an immense growth in the number of supermarkets. Economic growth within the area has greatly contributed to this growth and this is probably due to the establishment of several universities and constituent colleges in Kisumu, Bungoma and Kakamega towns. In the three towns mentioned, there are twelve (12) supermarkets, most of them with more than one branch, most probably with an objective of reaching out more customers in the region. Many other shopping malls are still under construction and have already been earmarked by other big supermarket chains and this greatly implies that the future of the retail industry in the area is a bright one.

## **1.2 Statement of the Research Problem**

Inventory management entails all the unified management of those internal activities associated with the acquisition, storage, issue, use and internal distribution of inventory used in the production and provision of services. It is the activity of determining the rate, quantities and the procedures of materials to be stocked in an organization and regulation of receipts and issues of those stocks (Sople, 2010). Many firms have had a persistent problem in establishing the right inventory levels and they have thus turned to computerizing their systems so as to achieve a balance between responsiveness and efficiency.

Leading supermarkets in Kenya have moved towards the use of more centralized procurement systems for FFV. More recently, however, Kenyan supermarkets are focusing on offering a one stop shopping service by providing everything that a customer wants, all under one roof and it is quite difficult to achieve this using manual inventory management systems (Neven and Reardon, 2004). However, the use of automated inventory management systems has had little application in most organizations. This has resulted in problems that come as a result of stock-outs and stoppage in inventory flow. This in turn leads to dead inventory and the firms end up incurring huge losses in terms of opportunity costs associated with holding inventory (Wolcott, 2000).

Allan and Remko (2002) researched on how to establish inventory levels of gifts and decorative accessories in beauty shops and established that companies that make good use of Electronic Data Interchange (EDI) are far much better equipped to succeed than those which rely on outdated methods of inventory control. The research however fails to explain how using such a powerful system would assist the firms increase their profits, improve their service delivery levels and reduce the total operation costs for the firms. Godwin (2003) also did a research on the performance driven in production planning and inventory control to process choice, and established that inventory tracking system might constitute a wasteful use of financial resources. But for the other firms operating in industries, it can result in effective inventory management. It has been established that there are many benefits that accrue from efficient utilization of computerised inventory control systems, the

major one being meeting anticipated customer requirements. However, many manufacturing and retail firms are not aware of the systems that can assist them in managing inventory (Eskow, 2005).

It's therefore apparently clear that inventory management automation has a positive impact on organizational performance. However, many practitioners still believe that inventory management automation automatically leads to a reduction in the firms' operations cost as well as enhanced customer service. The question is: is this really true? Supermarkets in Western Kenya are growing at an alarming rate because of the bulging population in the area and there are no notable studies have been conducted in such supermarkets as far as inventory management automation is concerned. This study will try to address this issue because many firms invest a lot of their capital in automation but still fail to realize their objectives because of the low level of usage of the installed systems. This study therefore sought to answer the following question:

What is the effect of inventory management automation on the performance of supermarkets in Western Kenya?

### **1.3 Research Objectives**

The objectives of this study were:

- a) To establish the extent of inventory management automation in supermarkets in Western Kenya.
- b) To determine the effect of inventory management automation on the performance of supermarkets in Western Kenya.

### **1.4 Research Hypothesis**

**H<sub>0</sub>:** Inventory Management automation has no significant effect on the performance of supermarkets in Western Kenya.

### **1.5 Value of the Study**

This study will help the supermarkets' management in understanding the implications of automating their inventory management on the performance of the

entities. The study will also provide a framework for sound decision-making as far as inventory management is concerned.

The area of inventory management automation in almost all organizations has been either lagging behind or neglected by most scholars. Much of their focus has been on manual and mathematical models of inventory management. This study will therefore be of great help in making the scholars of inventory management understand the benefits of using automated systems in managing inventory. Lastly, the study will form a basis for further studies in the field of inventory management and performance of organizations, especially supermarkets. This will probably generate and develop new knowledge and ideas to narrow the gap in the area of inventory management automation.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Theory of Inventory Management**

Managing all kinds of assets in an organization can be viewed as an inventory problem. Nearly all the literature on optimal inventory management uses the criteria of cost minimization or profit maximization. An inventory manager's goal for example is modelled as minimizing cost or maximizing profit while satisfying customer's demands. Too much inventory consumes physical space, creates a financial burden, and increases the possibility of damage, spoilage and loss. Further, excessive inventory frequently compensates for sloppy and inefficient management, poor forecasting, haphazard scheduling, and inadequate attention to process and procedures. In this context the lean production principle pioneered by Womack et al. (1990) has been linked to reduced level of inventories. However, (Rajagopalan and Kumar, 1994; Herer et al., 2002; Wickramatillake et al., 2006) argue that volatility of demand may limit the application of this principle. On the other hand, too little inventory often disrupts manufacturing operations, and increases the likelihood of poor customer service. In many cases good customers may become dissatisfied and take their business elsewhere if the desired product is not immediately available.

Boute et al. (2006) concluded that companies with very high inventory ratios have more possibilities to be bad financial performers and this is consistent with the findings of Shah and Shin (2007), who reported a strong negative relationship between the cash conversion cycle and corporate profitability for a large sample of public American firms. Chen et al. (2005) by examining how the market values the firms with respect to their various inventories policies, reported that firms with abnormally high inventories have abnormally poor stock returns, firms with abnormally low inventories have ordinary stock returns while firms with slightly lower than average inventories perform best over time. Furthermore, in another study, Shah and Shin (2007) examined the empirical associations among three constructs -inventory, IT investments and financial performance – using longitudinal data that span four decades. They concluded that reducing inventories has a

significant and direct relationship with a firm's financial and operational performance.

## **2.2 Inventory Management Automation**

To fully realize the reviewed benefits of proper inventory management, firms have opted to automate their inventory management operations. The major systems that have been put in place to automate inventory management are discussed in the following section:

### **2.2.1 Materials Requirement Planning (MRP)**

The materials requirement planning concept was developed in the 1970's following the introduction of high speed computers. MRP does the work of the materials manager to control inventory of items to lean the supply chain. The forecast of inventory items is controlled by the production item on which their demand is dependent. MRP is typically applied to manage inbound material movement in the enterprise and is based on the production requirements and scheduling (Sople, 2010). MRP was developed and refined by Joseph Orlicky at IBM and Oliver Wight, a consultant in the late 1960s and 1970s. A materials requirement plan is derived from the master production schedule (MPS), inventory records and the product structure. The product structure refers to a diagram or a list of materials and their quantities; usually called a bill of materials (BOM) needed to produce one item of output (Brason Steve et al, 2005). Lysons and Farrington (2006), point out that an MRP system has the following elements:

- i) Master production schedules (MPS): The MPS uses the inputs from marketing and sales to forecast demand for quantities of the final product over a planned time horizon known as time buckets.
- ii) The bill of materials (BOM): also known as the product structure, this lists all the items that comprise each assembly and subassembly that make up the final product.
- iii) The inventory file: This is the record of individual items of inventory and their status.

Research by Krupp (2004) showed that traditional inventory management systems have been too complex to use successfully for many managers. A suitable planning and control system has to be put in place. Real time MRP comes in handy to reduce

the effects of forecasting errors which are a major source of problems to any firm's performance. Real time MRP approach has been modified by using route lead-time to estimate the customers' order lead-time which would be less cumbersome.

### **2.2.2 Vendor Managed Inventory (VMI) Systems**

This is a new concept that has been made popular by the Bose Corporation. It is now widely used in the industry with encouraging results. In VMI, the supplier takes charge of the inventory management of products and manages the replenishment process based on the consumption pattern of the consumer. They use EDI or other inter-organizational software packages or place the supplier's representative at the customer's place. Therefore in VMI, the manufacturer is given the responsibility for monitoring and controlling inventory at the retailer's distribution centre and in some instances at the retail store level as well. Specific inventory targets are agreed and it is the responsibility of the manufacturer to ensure that suitable inventory is always available. Such arrangements depend on accurate and timely information, and suitable computerised systems have only become available in recent years.

The main advantage for the retailer lies in the reduction of the operating costs and also the delay in the payment for the products in question. For manufacturers, it is suggested that running a VMI system for a retailer provides the opportunity to develop a much closer and hopefully more binding relationship with the retailer as well as giving much better visibility of real demand. This can make the planning of production much easier and can lead to significant reductions in inventory holding right through the supply chain (Allan et al., 2006). Using the right technology, a firm would tend to offer better services to its customers as well as reducing the operational costs because in VMI systems, there will be real time sharing of information among the customers, the firm and the suppliers.

### **2.2.3 Radio Frequency Identification (RFID)**

The RFID systems provide a powerful technology for tracking the movement of goods throughout the supply chain. RFID systems use tiny tags with embedded microchips containing data about an item and its location to transmit radio signals over a short distance to special RFID readers then pass the data over a network to a

computer for processing. The RFID tag is electronically programmed with information that can uniquely identify an item plus other information about the item such as its location, where and when it was made and its status during production. Embedded in the tag is a microchip for storing the data. The rest of the tag is an antenna that transmits data to the reader (Ken et al, 2010).

In inventory control, RFID systems capture and manage more detailed information about items in the warehouse or in production. If a large number of items are shipped together, RFID systems track each pallet, lot or even unit item in the shipment. This helps the firm to improve their ability to see exactly what stock is stored in warehouses or on retail store shelves. Of course, the largest benefit can be achieved from implementing RFID at the product level. For example, with RFID, you can store information in your data base about when particular package of beef was packed, which cow it came from, which farm it was from and where it was slaughtered. Such data could be provided in real time across the supply chain as pallets roll into the warehouse or items roll off the shelves (Simchi-Levi, et al, 2009). Retailers are expected to be the main beneficiaries of RFID implementation. Researchers have found that retailers will mainly benefit in three primary areas: reduced inventories, store and warehouse labour reduction, and reduction in stock out.

#### **2.2.4 Bar-coding**

A barcode is an optical machine readable representation of data about the object to which it attaches. Barcodes are used for identification, handling, retrieval and storage of goods in warehouses and stores. It is the most popular technology in many applications. Individual inventory items, cartons or unitized packages are affixed with a barcode that can be read by a barcode scanner attached to an online computer system. Barcode is assigned to a particular inventory item to show its identity during storage, retrieval and dispatch. Barcodes are further used for communication of dispatched items for the preparation of bills by accounts departments and making periodic reports on inventory status and sales. The barcodes facilitate the tracking of specific items in the warehouse during inventory audit or material pick up. They also help in tracking a consignment during transportation/inspection at the customer end.

The information that may be required generally relates to the country code, manufacturer's name, product details, date of manufacture, material content, and so on. The details are required at the users end for inventory management and are in machine readable codes in the form of bars and spaces (Sople, 2010). Optimized use of barcodes within the supermarkets will therefore help inventory managers identify their products with ease, serve customers faster and efficiently and also reduce the time and expenses of stocktaking at the end of every financial year.

### **2.2.5 Electronic Point of Sale (E-POS)**

The point of sale (POS) system connects scanning equipment and the retailer's inventory management systems. Goods marked with a barcode are scanned by a reader, which in turn recognizes the goods. It notes the item, tallies the price and records the transaction. POS provides an instant record of transactions at the POS. Thus, replenishment of products can be coordinated in real time to ensure that stock-outs in the retail store are avoided. With EPOS technology, companies can be able to settle bills, use electronic printouts and smart sense coupons, respond to on-line alerts and information and take a more customer focused approach (Janat, 2009).

With EPOS, managers are now able to spend more time maximizing the potential of their staff and are more visible to their customers. Managers have a visible presence at the shop counter, they have the time to sell the benefits of the new technology and inform customers how they can benefit. They also have more information about the efficiency and productivity of their staff and any cash discrepancies that may arise (Pollit, 2007). Cassidy (1994) cites the benefits of EPOS as including reduced check out time and error, improvements in inventory management through reduced stock outs, inventory levels, shrinkage and forced markdowns, and an ability to track costs directly to specific products. David and Alex (1994) contend that EPOS technology allows substantial cost savings and gives more real time information on sales of goods, patterns of stores traffic, and the popularity and profitability of every line carried. It also enables the sales of any item to be calculated at any time as well as increasing customer service.

### **2.2.6 Enterprise Resource Planning (ERP)**

According to Ken et al. (2010), ERP is a business system that, supported by multi-module application software integrates all the departments or functions of an

enterprise. ERP is applicable to all organizations and allows managers to have a consolidated view of what is taking place throughout the organization. Most of ERP systems are designed around a number of modules, each of which can be stand alone or combined with others. Some of the modules are finance, logistics, manufacturing, supplier management and Human Resources Management. ERP systems collect data from various key business processes in manufacturing and production, finance and accounting, sales and marketing, and human resources and storing the data in a single central data depository. Information that was previously fragmented in different systems can be easily shared across the firm to help different parts of the business work more closely together. For example, when a customer places an order, the data flow automatically to other parts of the company that are affected by them. The order transaction triggers the warehouse to pick the ordered products and schedule shipment. The warehouse informs the factory to replenish whatever has been depleted. The accounting department is notified to send the customer an invoice. Customer service representatives track the progress of the order through every step to inform customers about the status of their orders. Improved coordination between these different parts of the business lowers costs while increasing customer satisfaction (Ken et al, 2010). Initially, ERP systems were enterprise centric. The development of the internet and e-business has, however, made the sharing of accurate real time information across the whole supply chain essential to business success. (Lysons and Farrington, 2006). Even though implementation of an ERP system is viewed as costly, time-consuming, risky and challenging (Bingi et al 1999, Booth et al 2002), many organisations have introduced them. Some are embarking on the next wave of web-enabled ERP systems with decision-support capabilities; others are consolidating and attempting to derive the promised benefits.

While some of the consequences of ERP systems could become apparent immediately, others come to the surface only after a relatively long period. Given the time required for learning and adjustment, it will normally take several years to realise the full benefits of any information technology- based innovation (Willcocks and Ixster 1999). First generation ERP systems were viewed as IT projects and considered “complete” when they went live; in contrast, second-generation ERP systems are treated as business projects (Brown and Vessey, 2003). While the

benefits of ERP systems are not disputed, it is considered difficult to separate them from the effect of other organisational and IT changes (Staeher et al 2002).

In today's world, most organizations are becoming customer centric and customer responsive, and thus they use business intelligence information systems like ERP to help attain the expected benefits (Balsmeier and Nagar, 2002). They argue that ERP software must address all the enterprise needs of an organization within the social context in which the enterprise operates which includes the local accounting practices, customs, sales tax and income tax. As per Frost and Sullivan (2008), it has been found that due to rising competitive pressure many Indian companies are looking forward to equip themselves with modern business processes like ERP solutions that can further provide unlimited access to information and enable them to compete effectively

Katerrattanakul et al. (2006) studied ERP systems in Korean manufacturing firms and inform that the area most benefited from the ERP implementation were the availability and quality of information and integration of business operation/processes. On the other hand, the area that least benefited from ERP systems were IT costs and personnel management. Compared to Shang and Seddon (2002) five-dimensional ERP benefits, they found that operational benefits come first, managerial benefits follow, while IT infrastructure benefits are in third position. Besides, they argue that the Korean manufacturing firms do not show any strategic or organizational benefits. Spathis and Ananiadis (2005) observed that ERP systems significantly contribute towards increased flexibility in information provision and improved decision-making when they examined the impact of decisions on the accounting and information management implemented in a large public university in Greece. They conclude that the implementation of ERP system show that managerial benefits come first, operational benefits follows, while IT infrastructure benefits are in third position. This order of benefits is slightly different from Shang and Seddon (2002).

### **2.2.7 E-Procurement**

E-procurement is using the internet to operate the transactional aspects of requisitioning, authorising, and ordering and payment processes for the required

services or products. E-procurement is typically the focus of local business administrators and covers the following areas of the buying process: requisition against the agreed contract, authorisation, order, receipt and payment. The key enabler of all the above is the ability of the systems to communicate across organizational boundaries (Lysons and Farrington, 2006). In implementing the e-procurement technologies, companies ought to choose the right vendors for the provision of the appropriate software after a thorough cost benefit analysis. Maureen and Eric (2000) however, pointed out that the e-commerce market is changing so fast that whatever decision you make today, no matter how much due diligence is applied, will be the wrong one tomorrow

According to Neef (2001), “E-procurement means a giant leap forward in the long sought-after development of the extended enterprise, where the supply chain becomes a continuous, uninterrupted process extending from buyer through selling partners.” Neef regarded e-procurement as one of the major enablers for supply chain management. Breite and Vanharanta (2001) went a step further and stated that “information technology changed the supply chain management concept more radically than any other technology.”

Research conducted by Aberdeen Group indicates that early adopters of e-procurement strategies have realized significant reductions in purchasing costs, with most user organizations realizing a return-on-investment of greater than 300% in internet procurement automation within the first year of deployment (Weil 2000a). E-procurement solutions help buyers to reach a large number of potential suppliers and thus negotiate better contract pricing. In addition, automating direct procurement reduces the cycle time, making a manufacturer more responsive to the market. Given the low vendor search cost, implementing an e-procurement strategy is likely to result in higher profits (Weil, 2000b).

### **2.3 Performance of the Supermarkets**

The performance of the supermarkets can be broadly classified into customer service delivery levels and the operational costs of the firm. These two aspects if well monitored can ensure responsiveness and efficiency as discussed below:

### **2.3.1 Customer Service Delivery Levels**

A competitive advantage accrues to those firms that can quickly respond to changing market conditions (Mecker, 1999). Since the Internet allows near instantaneous transfer of information between various links in the supply chain, it is ideally suited to help firms keep pace with their environments. Many businesses have placed a priority upon real-time information regarding the status of orders and production from other members of the supply chain (Demers, 2001). Federal Express is an example of such a business (King, 1999). Federal Express allows customers to track packages easily and quickly in real-time. This makes Federal Express a critical member of other organizations' supply chains. With automated inventory management system, a firm is able to manage the right inventory levels and deliver what is needed by the customer at exactly the right time.

### **2.3.2 Operational Cost Reduction**

Organizational automation helps reduce costs by decreasing the use of paper and labour, reducing errors, providing better tracking of purchase orders and goods delivery, streamlining ordering processes, and cutting acquisition cycle times. Recent research by the Aberdeen group, an Internet research firm, has shown that an automated inventory system can cut average costs from \$100 (when done manually) to \$33 (Williams, 2002). One survey of large companies by an IT research and consulting firm found that Internet-based inventory management can save roughly 5 percent on high-cost strategic goods, allow a reduction in stores staff by 10 percent, and offer a high return on investment (Konicki, 2002).

## **2.4 Organizational Factors**

The organizational factors discussed in the study will be the contextual factors that moderate the relationship between inventory management automation and the performance of supermarkets. Such factors include size of the organization, age of the organization, calibre of management, organizational structure and organizational culture.

### **2.4.1 Size of the firm**

Organizations range from single person businesses to multinational corporations employing hundreds of thousands of people. Generally, the sophistication and importance of people management is greater in larger organizations (Price, 2007). Price further argues that size brings problems in meeting the need for comprehensiveness, coherence, control and communication resulting in the possibility of remote and conflict-ridden relationships between people at the top and the bottom of the firm. The size of the firm will in most cases involve the number of employees, the branch network, and the level of development of its information technology. Size of the firm would therefore inevitably affect the level of inventory management automation hence performance.

### **2.4.2 Age of the Organization**

Mintzberg, (1979), states that the older an organization is, the more standardized will be its behavior, policies and procedures. Due to these factors, changes are more difficult to implement in older and larger organizations. However, in most cases, organizations that have been operating for relatively long periods of time have accumulated enough resources to enable them meet the expenses associated with automating their operations. It is also evident in our Kenyan supermarkets that older supermarkets like Nakumatt Holdings and Uchumi Supermarkets have automated almost all their operations leading to improved organizational performance.

### **2.4.3 Calibre of Management**

Bourke (1989) and Molyneux and Thrornton (1992) explain that there is a positive relationship between better quality management and profitability of organizations. Changes in modern organizations will result in the need for training personnel to maximize the potential of each individual, including basic skills and support programmes for unskilled young people who will need to perform more cognitively complex tasks. Training will also be necessary to help managers work with more diverse workforce including helping individuals understand how to provide support for persons who have not traditionally been a part of their organization. The calibre of management in any given organization will determine the level of usage of the

systems that have been put in place so as to automate operations and seeing to it that they are used in fully achieving organizational objectives.

#### **2.4.4 Organizational Structure**

The organizational structure of an enterprise refers to an internal model of links and relationships between and within its factors, at all levels of the organization, in precisely defined quantities (Zehanovic and Zugaj, 1997). Structuring includes policies and activities occurring within the organization members, such as formalization, centralization, specialization, professionalization and vertical differentiation, that have received a great deal of attention because of their impact on organizational performance (Stank et al., 1994).

Formalization refers to the degree to which decisions and working relationships are governed by formal rules and standard policies and procedures (Tsai, 2002; Iyer et al., 2004). Centralization, on the other hand, refers to the focus of decision-making authority and control within an organizational entity (Tsai, 2002). Maximum centralization implies decisions taken at the highest level possible (Andersen, 2002). Specialization includes the division of tasks and activities across positions within the organizational entity (Tsai, 2002). Professionalization refers to the percentage of professional staff members with certain educational backgrounds and noteworthy experience (Miller et al., 1991). Vertical differentiation, finally, refers to the number of levels in the firm's hierarchy below the chief executive level (Damanpour, 1991). Organizational structure is generally believed to be associated with financial performance (Meijaard et al., 2005).

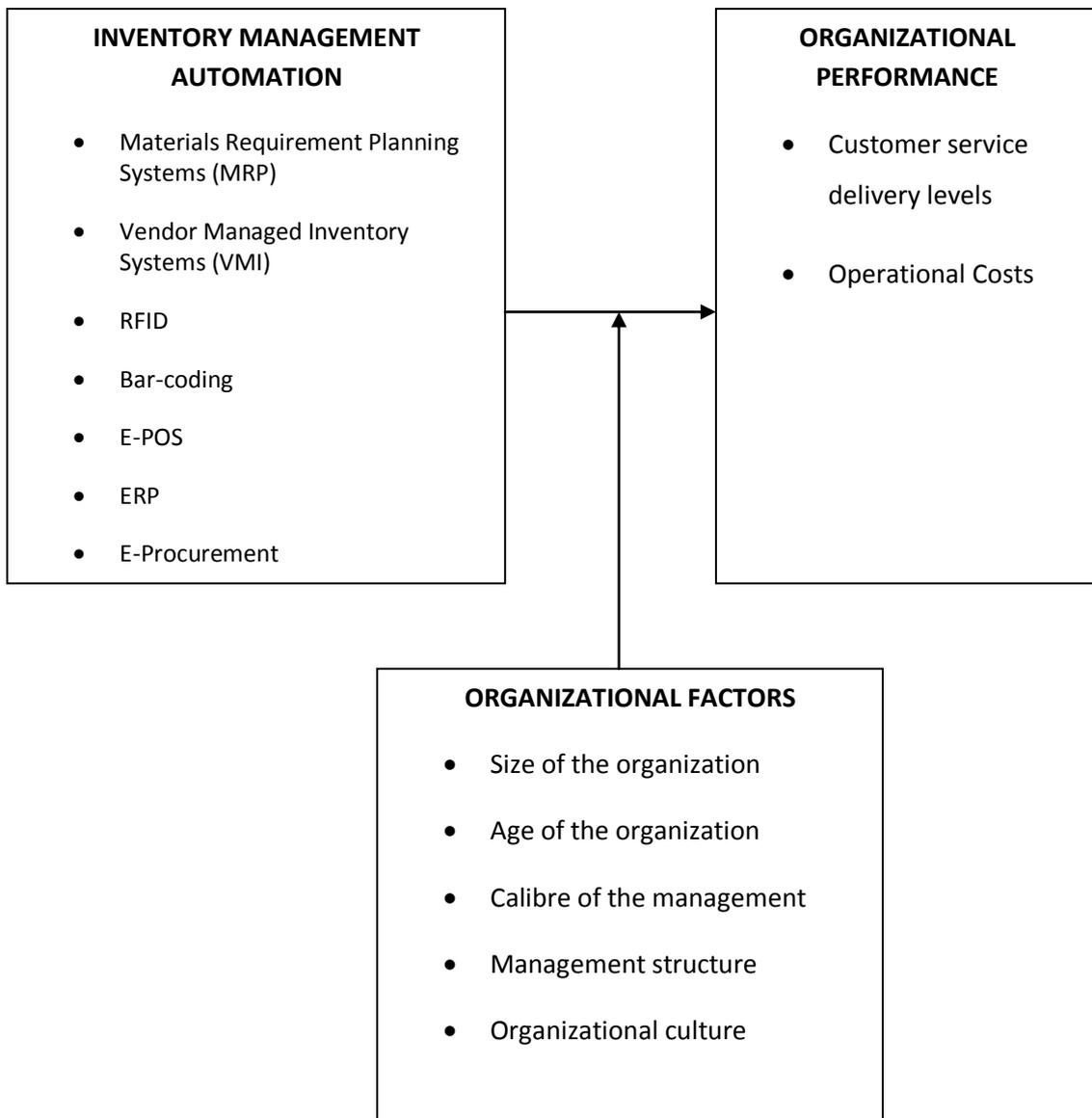
Spanos et al. (2004) indicated a significant influence of business structure on firm profitability, while Tang et al. (2006) found that indeed the characteristics of organizational structure affect organizational performance. Furthermore, Tsai (2002) claims that three of the structuring components, formalization, centralization and specialization, are commonly considered to be important influences on organizational performance. Organizational structure therefore will definitely moderate the relationship that exists between automation and firm's performance.

## **2.4.5 Organizational Culture**

Torrington et al (2008) explain that organizational culture affects the behavior of the people within it and develops norms that are hard to alter and which provide a pattern of conformity. For example, if everyone is in the habit of being punctual, then a new recruit who often arrives late will come under strong social pressure to conform, without need for recourse to management action. In so doing, the impact of culture on organizational performance becomes positive. According to Biswajeet (2005), culture refers to the basic assumptions like beliefs, values, norms and traditions that pre-exist in the organization or society and are shared by all members. The activities of the government and competitors, changes in technology, customer demand and general economic conditions are instrumental in shaping the cultures of organizations with survival potential (Price, 2007). If handled well, culture will therefore influence the relationship between inventory management automation and performance of supermarkets positively.

## 2.5 Conceptual Model

Figure 1: Conceptual Model



Source: Author, 2012.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Research Design**

A research design is an arrangement of conditions for collection, measurement and analysis of data in a manner that aims to combine relevance to the research purpose with economy and procedure (Kothari, 2010). This study used a survey design as it sought to explain the relationship between the study variables. Survey design was the most appropriate because the study was concerned with finding out what relationship existed between the independent and dependent variables by collecting quantifiable data (Mugenda and Mugenda, 1999). The data was collected from the target population in order to determine the current status with regard to inventory management automation and supermarkets' performance. The research sought to obtain information that described the phenomena that existed at the time of study.

#### **3.2 Population of the Study**

The study was a census study since it focused on all the twelve (12) supermarkets that are operational in Kisumu, Kakamega and Bungoma towns. A list of the operational supermarkets in the three towns (Appendix 2) obtained from the respective Municipal Councils indicated that some of the supermarkets had two or more branches.

#### **3.3 Data Collection**

The study used both primary and secondary data and the main instrument for data collection was a structured questionnaire. The questionnaire was divided into three sections. Section A involved the contextual factors, section B involved inventory management automation and section C involved organizational performance. Secondary data was obtained from secondary sources notably existing literature on supermarkets.

The study used the key informant approach where the warehouse managers were targeted in every supermarket. The key informants were suitable because they were

deemed to be the most knowledgeable in the aspects of the study for which they are responsible or execute them personally. The researcher administered the questionnaires through a ‘drop and pick’ technique.

### **3.4 Validity and Reliability of the Research Instrument**

To ensure construct validity, the questionnaire was guided by the conceptual model in order to reflect and measure the key elements of inventory management automation, organizational performance and organizational factors. Content validity was ensured by conducting a pilot study which enabled the researcher to revise the questionnaire based on the results of the piloting process. Cronbach’s  $\alpha$  reliability test was used to assess internal consistency of measurements.

### **3.5 Data Analysis**

The generated data was analyzed using descriptive and inferential statistics. Data was coded to enable categorization of the responses. Thus, interpretation of the data was done by drawing inferences from the computed frequencies, percentages and means. The findings were presented using standard methods such as frequency distribution tables. Statistical Package for Social Sciences (SPSS) computer software was used to compute, analyze and present the findings.

The research hypothesis was tested using the chi-square test ( $\chi^2$ ). The test was at a significance level of 5% ( $\alpha=0.05$ ) and forty degrees of freedom ( $v=40$ ). An error term in the regression model was used to test the effect and magnitude of organizational factors and the relationship between inventory management automation and organizational performance.

The study used a regression model of the following nature:

$$P = a + Ax \pm \epsilon$$

Where: P= Performance of the supermarket

A= Inventory Management Automation

*a and x* are constants

$\epsilon$ = Error term arising from the effect of organizational factors

## CHAPTER FOUR

### DATA ANALYSIS, RESULTS AND DISCUSSION

#### 4.1 Response Level

The study obtained 10 questionnaires out of the targeted 11 i.e. 90.9% of the questionnaires that were administered were returned which represents a reliable response rate, since it is above the minimum acceptable threshold of 70% (Garland and Tweed, n.d.).

#### 4.2 Reliability of Study Measures

Cronbach's  $\alpha$  reliability test was used to assess internal consistency of measurements. For inventory management automation, the Cronbach's alpha coefficient was 0.85 while that of supermarket's performance was 0.89 (See appendix 3). The measures for the independent and the dependent variables were therefore found to be highly reliable because the Cronbach's  $\alpha$  coefficients were greater than the minimum acceptable coefficient of 0.70 (Santos, 1999).

#### 4.3 Findings on Contextual Factors

The contextual factors in this study were organization based and they basically described the characteristics of the supermarkets. They were size of the supermarket, age of the supermarket, calibre of the management, management structure and organizational culture.

##### 4.3.1 Size of the supermarket

On a nominal scale, the respondents were asked to state their supermarkets' approximate sales turnover level and the approximate investment level.

**Table 1: Sales Turnover Level of the Supermarket**

Sales	Frequency	Percent	Cumulative Percent
Kshs 100,000-200,000	2	20.0	20.0
Kshs 200,001-500,000	2	20.0	40.0
Over kshs 500,000	6	60.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

Table 1 show that only 20% of the supermarkets had a monthly sales turnover of between kshs. 100,000 and 200,000, and another 20% with a monthly sales turnover level of between kshs 200,001 and 500,000. 60% of the supermarkets depicted a sales turnover of more than ksh. 500,000. This implies that most of the supermarkets (60%) are fairly large and this was supported by statistics on the investment levels shown in the table below, which shows that 80% of the supermarkets had invested more than ksh 1000,000 as compared to only 20% with a lesser investment. Higher levels of sales turnover are a source of income that can assist the supermarkets increase their automation levels hence improving on productivity.

**Table 2: Investment Level of the Supermarkets**

Investment Level	Frequency	Percent	Cumulative Percent
Kshs 500,001-1,000,000	2	20.0	20.0
Over Kshs 1,000,000	8	80.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

### 4.3.2 Age of the Supermarket

The age of the supermarkets was determined by asking the respondents to state on a nominal scale for how long their supermarkets had been in operation. Out of the 10 responses, it was observed that 40% of the supermarkets had been operational for over twenty years, 20% were aged between 11-15 years and 40% less than 5 years. This implies that most of the supermarkets were able to automate their operations to a certain extent because of their experience of the market and customer needs and also due to the fact they had the capital to automate their systems.

**Table 3: Age of the Supermarket**

Age	Frequency	Percent	Cumulative Percent
5-10 years	4	40.0	40.0
11-15 years	2	20.0	60.0
over 20 years	4	40.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

### 4.3.3 Calibre of the Management

The calibre of the supermarkets' management was ascertained by asking the respondents to state on a nominal scale the experience of their stores in charge or those in charge of the warehouses. This helped in determining the experience levels of the personnel managing the supermarkets' inventories and the results were as shown in the table below:

**Table 4: Experience Level of Warehouse In-charge**

Experience	Frequency	Percent	Cumulative Percent
less than 5 years	1	10.0	10.0
5-10 years	6	60.0	70.0
11-15 years	3	30.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

The results indicated that only 10% of the supermarkets' warehouse in charge had less than 5 years experience, 60% had experience level of between 5-10 years and 30% with 11-15 years of experience. This is an implication that most of the people managing inventories in the warehouse had good experience, an indication, that they could use automation to enhance performance.

### 4.3.4 Specialization of Labour

The respondents were asked to state whether their supermarkets strictly adhered to specialization of labour and the results were as follows:

**Table 5: Specialization of Labour**

Specialize	Frequency	Percent	Cumulative Percent
Yes	8	80.0	80.0
No	2	20.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

Table 5 shows that 80% of the supermarkets adhered to strict specialization of labour while only 20% did not. This is an indication that most of the employees in the supermarkets are hired to perform duties which they are qualified to do. Employees

performing duties that they are best at improves employee motivation and organizational performance in the long run. Such decisions to employ qualified employees could also assist the supermarkets achieve high levels of automation because they are able to acquire the best people to operate the systems.

### 4.3.5 Management Structure

The nature of the supermarkets' management structure was determined by asking the respondents whether it was centralized or decentralized. The results obtained were as shown below:

**Table 6: Nature of Management Structure**

Management Structure	Frequency	Percent	Cumulative Percent
Centralized	4	40.0	40.0
decentralized	6	60.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

Table 6 shows that 60% of the supermarkets that responded had a centralized management structure while only 40% had a decentralized management structure. The quality of decisions made by the management and the speed of decision making is highly depended on the nature of management's structure. Employees in a decentralized management structure are usually more motivated since they have the autonomy to make faster and quality decisions on their own and this positively affects the level of organizational performance, both financial and non financial.

### 4.3.6 Organizational Culture

The respondents were asked to state the level of resistance they faced from their employees as a result of introducing new technology. This was important in knowing how supportive the employees were as far as inventory management automation is concerned. The results were as shown in table 7:

**Table 7: Level of resistance to Automation**

Resistance	Frequency	Percent	Cumulative Percent
No resistance	4	40.0	40.0
Moderate	4	40.0	80.0
Strong	2	20.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

The results showed that 40% of the supermarkets' did not experience any resistance, only 40% experienced moderate resistance and 20% experienced strong resistance. This implies that most of the supermarkets can achieve a high level or full automation because there is no much resistance from the employees. Cumulatively, 80% of the respondents indicated no resistance to automation and this leads to high performance levels because it is an indication of a workforce that is ready to accept change.

#### **4.4 Extent of Inventory Management Automation**

Inventory management automation was the independent variable and was operationalized by Materials Requirement Planning (MRP), vendor managed inventory (VMI), Radio Frequency Identification (RFID), bar-coding, electronic point of sale, Enterprise Resource Planning (ERP) and electronic procurement.

##### **4.4.1 Level of Inventory Management Automation**

To determine the level of inventory management automation, the respondents were asked to state on a five point likert scale whether their supermarkets had fully automated their inventory management systems or not. The results were as shown in the table below.

**Table 8: Level of Automation**

Automation	Frequency	Percent	Cumulative Percent
To a moderate extent	4	40.0	40.0
To a great extent	4	40.0	80.0
To a very great extent	2	20.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

The results showed that 40% had automated to a moderate extent, 40% to a great extent and 20% to a very great extent. This implies that most of the supermarkets had at least reached a certain level or extent of inventory management automation with a cumulative 80% being moderately automated. Highly automated organizations would tend to have better performance than those with low level of automation.

#### **4.4.2 Sufficiency of inventory management systems and tools**

The respondents were asked to rate whether their supermarkets had sufficient inventory management systems and tools. 20% said to a moderate extent, 60% to a great extent and 20% to a very great extent. This is as summarised in table 9 below:

**Table 9: Sufficiency of Inventory management systems and tools**

Sufficiency	Frequency	Percent	Cumulative Percent
To a moderate extent	2	20.0	20.0
To a great extent	6	60.0	80.0
To a very great extent	2	20.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

The results indicate that cumulatively, 80% of the supermarkets had automated their inventory management systems to a great extent, but there was still room for more, that is they had not had enough and they could still invest more on inventory management automation.(i.e. they still had a chance of increasing their level of automation).

#### **4.4.3 Use of Materials Requirement Planning (MRP)**

The respondents were asked to state whether they use MRP in managing their inventories and how it affected the roles of the materials managers. The results obtained were as shown in table 4.14 below.

**Table 10: Change in Roles of Materials Managers**

Use of MRP	Frequency	Percent	Cumulative Percent
To a low extent	1	10.0	10.0
To a moderate extent	3	30.0	40.0
To a great extent	3	30.0	70.0
To a very great extent	3	30.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

The table shows the extent to which the roles of the materials managers had shifted to top level decision making or not, as a result of using MRP. 10% of the respondents said to a low extent, 30% to a moderate extent, 30% to a great extent and another 30% to a very great extent. This is therefore an implication that using MRP alters the roles of materials managers, enabling them to spend more time on top level decision making. This was supported by asking the respondents whether using MRP eases the work of a material's manager and the results were presented as follows:

**Table 11: Ease of Materials Managers' Work Due To Automation**

Ease of work	Frequency	Percent	Cumulative Percent
To a low extent	1	10.0	10.0
To a moderate extent	3	30.0	40.0
To a great extent	4	40.0	80.0
To a very great extent	2	20.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

10% indicated that MRP eased materials managers' work to a low extent, 30% to a moderate extent, 40% to a great extent and 20% to a very great extent. It is therefore clear that most of the respondents were in agreement that using an MRP system in inventory management made the work of the material manager easy and this is in agreement with the findings of Krupp (2004) which showed that traditional inventory management systems have been too complex to use successfully for many managers. A suitable planning and control system has to be put in place. Real time MRP comes in handy to reduce the effects of forecasting errors which are a major source of problems to any firm's performance.

#### 4.4.4 Application of Vendor Managed Inventory (VMI)

The respondents were asked to respond on a five point likert scale if they used their suppliers to manage inventory levels in their supermarkets. The results obtained were as follows:

**Table 12: VMI application**

Use of VMI	Frequency	Percent	Cumulative Percent
To a low extent	1	10.0	10.0
To a moderate extent	3	30.0	40.0
To a great extent	4	40.0	80.0
To a very great extent	2	20.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

10% of the supermarkets used VMI to a low extent, 30% to a moderate extent, 40% to a great extent and 20% to a very great extent. The results showed that all the supermarkets had their suppliers managing the levels of their inventories at the supermarkets and this is a strong indication that vendor managed inventory has numerous benefits for the supermarkets as far as customer satisfaction and the performance of the supermarkets were concerned.

#### 4.4.5 Use of Radio Frequency Identification (RFID)

To ascertain the usage of RFID systems in the supermarkets, the respondents were asked to state if the inventory managers are able to identify what is being shipped in or out through the use of silicon chips without unpacking boxes of cargo. 20% used RFID to a very low extent, 10% to a low extent, 40% to a moderate extent and 30% to a great extent. These results are summarised in table 13. They imply that this kind of technology is not very common among the supermarkets, and this could be due to complexity in usage and the expenses involved in installing such a system.

**Table 13: Use of Radio Frequency Identification (RFID)**

Use of RFID	Frequency	Percent	Cumulative Percent
To a very low extent	2	20.0	20.0
To a low extent	1	10.0	30.0
To a moderate extent	4	40.0	70.0
To a great extent	3	30.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

RFID being a very important technology for communication and inventory management should be fully exploited and therefore the low level of RFID application in the supermarkets means low level of automation and this could adversely affect the performance of the supermarkets.

#### **4.4.6 Application of Barcode Scanners**

The respondents were asked whether the supermarkets made good use of barcode scanners in counting goods at the stores/warehouse. Their responses were as shown in table 14.

**Table 14: Barcode application**

Use of Barcode Scanners	Frequency	Percent	Cumulative Percent
To a great extent	6	60.0	60.0
To a very great extent	4	40.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

Out of the valid responses, 60% said that they used barcode scanners to a great extent and 40% to a very great extent. To support this, the respondents were also required to state whether the bar coding technology in their supermarkets is being used by both the cashiers and the stores staff. The responses were as shown in the following table:

**Table 15: Category of Staff Using Barcode Scanners**

Staff using Barcode Scanners	Frequency	Percent	Cumulative Percent
To a moderate extent	1	10.0	10.0
To a great extent	3	30.0	40.0
To a very great extent	6	60.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

Out of those who responded, 10% indicated that such a technology was used by both cashiers and stores' staff to a moderate extent, 30% to a great extent and 60% to a very great extent. The results imply that all the supermarkets use barcodes in managing their inventory and it's widely employed by the cashiers and the stores staff. This is because barcodes and the related equipment are not very expensive and they are also very easy to use due to simplicity of the technology involved. The results also show that the supermarkets had also taken full advantage of using barcode scanners since it was being used by both the cashiers and warehouse staff, a shift from the old belief that such a system was only meant for the cashiers for tendering and this high level of usage could translate to better performance in the supermarkets.

#### **4.4.7 Use of Electronic Point of Sale (E-POS)**

The respondents were asked to state the extent to which their supermarkets make use of E-POS in managing their inventory levels. 10% said they used it to a low extent, 10% to a moderate extent, 30% to a great extent and 50% to a very great extent. The results indicate that all the supermarkets used E-POS. This is because barcode scanners are used together with the E-POS and all the supermarkets that used barcode scanners must also use E-POS both at the cashiering desks and by the stores staff for counting inventory. The results are as shown in the following table:

**Table16: Application of E-POS**

Use of E-POS	Frequency	Percent	Cumulative Percent
to a low extent	1	10.0	10.0
to a moderate extent	1	10.0	20.0
to a great extent	3	30.0	50.0
to a very great extent	5	50.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

Cumulatively, 80% of the supermarkets used E-POS to a great extent. This coupled with the high usage levels by cashiers and the warehouse staff leads to better inventory management and higher levels of customer satisfaction in the supermarkets.

#### 4.4.8 Use of Enterprise Resource Planning

To ascertain the usage of technology to integrate the other supermarkets' operations and inventory management, the respondents were asked to state on a scale, the extent to which the supermarket used electronic systems to enable it integrate all its operations from when a customer makes an order to when the order is delivered to the customer. The results showed that 20% used such systems to a very low extent, 10% to a moderate extent, and a cumulative 70% to great extent. This was an indication that all the supermarkets that were reached were taking advantage of online communication to ensure that there was always enough stock to satisfy their customer's needs and this translates to customer loyalty. The responses are as shown in table 17 below:

**Table 17: Application of ERP**

Use of ERP	Frequency	Percent	Cumulative Percent
To a very low extent	2	20.0	20.0
To a moderate extent	1	10.0	30.0
To a great extent	4	40.0	70.0
To a very great extent	3	30.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

#### 4.4.9 Use of E-Procurement

To evaluate whether the supermarkets make use of electronic procurement systems, the respondents were requested to state if their supermarkets use information technology to purchase some of its commodities (e.g.) placing orders online. The responses obtained were as shown in the table below:

**Table 18: E-procurement application**

Use of E-Procurement	Frequency	Percent	Cumulative Percent
To a moderate extent	3	30.0	30.0
To a great extent	3	30.0	60.0
To a very great extent	4	40.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

The results obtained indicated that E- procurement was extensively being used because cumulatively, 70% of the supermarkets used it to a great extent and 30% to a moderate extent. The respondents were also supposed to state if E-procurement assists them in maintaining the right inventory levels and the results were as follows:

**Table19: E-procurement and inventory levels**

	Frequency	Percent	Cumulative Percent
To a moderate extent	2	20.0	20.0
To a great extent	4	40.0	60.0
To a very great extent	4	40.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

Table 19 shows that 20% said it helped them to a moderate extent, 40% to a great extent and 40% to a very great extent. This explains the high level of usage of e-procurement in the supermarkets and this most probably positively influenced the performance of the supermarkets.

#### **4.4.10 Extent of Inventory Management Automation**

Table 20 shows the relevant statistical results for inventory management automation.

**Table 20: Mean Inventory Management Automation**

Automation	N. Statistic	Sum	Mean
Level of automation	10	38	3.80
Sufficiency of inventory management systems and tools	10	40	4.00
Work of materials managers work	10	37	3.70
Change in materials manager's roles	10	38	3.80
Use of vendor managed inventory	10	37	3.70
Online communication with suppliers	10	44	4.40
Use of radio frequency identification	10	28	2.80
Use of barcode scanners in counting inventory	10	44	4.40
Staff who use barcodes	10	45	4.50
Use of E-pos	10	42	4.20
Use of enterprise resource planning	10	36	3.60
Use of E-procurement	10	41	4.10
Effect of E-procurement on inventory levels	10	42	4.20
Valid N (List wise)	10		

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Overall Mean Score= 3.94

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The table indicates on a scale of 1-5 (where 1=to a very low extent and 5=to a very great extent), the extent to which different automated systems were being employed in the supermarkets. The results indicate that there is little application of Radio Frequency Identification (mean score=2.80) and that the mostly applied technology is that of barcode scanners (mean score=4.40). The supermarkets have however managed to automate their inventory management to a great extent (overall mean score=3.94). This implies that most of the supermarkets are aware of the different automated inventory management systems and thus the extent of automation is quite high.

#### **4.5 Supermarkets' Performance**

The performance of the supermarkets was the dependent variable and it was operationalized using customer service delivery levels and operational cost

reduction. The analysis in this section is meant to establish whether inventory management automation affected the performance of the supermarkets.

#### **4.5.1 Effect of Automation on Lead-times**

To determine the effect of inventory management automation on lead times, the respondents were required to state whether they agreed that inventory management automation influences the time taken between placement and delivery of an order. The results obtained are summarised as shown in table 20 below:

**Table 21: Time Taken Between Ordering and Delivery**

Effect on Lead Times	Frequency	Percent	Cumulative Percent
Fairly agree	2	20.0	20.0
Agree	3	30.0	50.0
strongly agree	5	50.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

The table indicates that only 20% fairly agreed, 30% agreed and 50% strongly agreed. This implies that those supermarkets that automated their inventory management systems experienced shorter lead-times, which is a very big advantage for them since customers tend to prefer suppliers who have shorter lead times (Sople, 2010).

#### **4.5.2 Effect of Automation on Responsiveness to Orders and enquiries**

So as to determine whether inventory management automation affected the supermarkets' responsiveness to customers' orders and enquiries, the respondents were required to state on a nominal scale, their level of agreement as to whether automation enhanced the level of responsiveness to orders and enquiries. The results obtained showed that 10% fairly agreed, 60% agreed and 30% strongly agreed. This implies that most of the supermarkets were able to increase their responsiveness to customers' orders and enquiries as a result of inventory management automation. These findings are summarised in the following table:

**Table 22: Level of Responsiveness to Customers' Orders and Enquiries**

Effect on Responsiveness	Frequency	Percent	Cumulative Percent
Fairly agree	1	10.0	10.0
Agree	6	60.0	70.0
Strongly agree	3	30.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

#### 4.5.3 Effect of Automation on Customer Loyalty

The respondents were asked to react to a statement on how inventory management automation affected customer satisfaction, hence influencing the loyalty of the customers to the supermarkets. Their responses were as shown in table 22:

**Table 23: Level of Customer Satisfaction and Loyalty**

Customer Loyalty	Frequency	Percent	Cumulative Percent
Fairly agree	2	20.0	20.0
Agree	6	60.0	80.0
Strongly agree	2	20.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

The results indicated that only 20% fairly agreed with 60% and 20% agreeing and strongly agreeing respectively. This implies that inventory management automation definitely leads to customer satisfaction hence loyalty and the end result is increased profitability for the supermarkets.

#### 4.5.4 Effect of Automation on Operational Processes

To determine whether inventory management automation affected the supermarkets operational processes and problem identification, the respondents were required to react to a statement to that effect, stating their level of agreement or disagreement. The results obtained indicated that only 20% fairly agreed with 50% and 30% agreeing and strongly agreeing respectively. The results are as shown in the following table.

**Table 24: Improving Operational Processes and Problem Identification**

Operational Processes	Frequency	Percent	Cumulative Percent
Fairly agree	2	20.0	20.0
Agree	5	50.0	70.0
Strongly agree	3	30.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

Cumulatively, 80% of the respondents were in agreement that inventory management automation positively affected their operational processes and ability to identify problems in the supermarkets. This therefore implies that inventory management automation in the supermarkets helped them to increase their service delivery levels and incur less operational costs.

#### **4.5.5 Effect of automation on staff competence**

To ascertain whether inventory management automation affected the competence of the supermarkets' staff, the respondents were asked to react to a statement, giving their level of agreement or disagreement. The results summarised in table 24 showed that a cumulative 90% of the respondents agreed that inventory management automation indeed improved the competence of their staff. According to (Molyneux and Thrornton, 1992), a highly committed and competent workforce helps an organization not only to serve its customers better, but also to enhance its financial capabilities.

**Table 25: Effect on the Competence of Staff**

Staff Competence	Frequency	Percent	Cumulative Percent
Fairly agree	1	10.0	10.0
Agree	7	70.0	80.0
Strongly agree	2	20.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

#### 4.5.6 Reduction in Number of Employees

The respondents were asked whether inventory management automation had any effect on the number of employees managing the stores. Their responses were as shown in table 25:

**Table 26: Reduction in Number of Stores Staff**

Reducing no. of Staff	Frequency	Percent	Cumulative Percent
Fairly agree	3	30.0	30.0
Agree	4	40.0	70.0
Strongly agree	3	30.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

The table shows that 30% fairly agreed, 40% agreed and 30% strongly agreed. This is an indication that supermarkets can automate their inventory management systems so as to reduce the number of stores staff and this translates to an organization serving its customers effectively and also incurring less labour costs due to automation.

#### 4.5.7 Reduction of errors

To ascertain whether inventory management automation helped in reducing the number of errors in the inventory management records, the respondents were required to react to a statement, indicating their level of agreement or disagreement as to whether they had experienced any difference in their inventory management records as a result of automation. The results obtained were as follows:

**Table 27: Reduction in Number of Errors**

Reducing Errors	Frequency	Percent	Cumulative Percent
Fairly agree	1	10.0	10.0
Agree	5	50.0	60.0
Strongly agree	4	40.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

The results indicated that only 10% fairly agreed, 50 % agreed and 40% strongly agreed, an implication that inventory management automation had a positive impact as far as error reduction was concerned, and reduced errors will mean that the customers will be more satisfied with the services offered at the supermarkets.

#### 4.5.8 Reduction in opportunity costs

The respondents were asked to state whether inventory management automation has helped them to avoid losing sales because of not having enough stock or not. The results obtained showed that most of the respondents agreed that they rarely lost any sales for not having enough stock (see table 28). This implies that inventory management automation helps the supermarkets maintain the right inventory levels so as to fulfil their customers' orders at the right time and therefore, the supermarkets are in a position to avoid incurring costs by holding excess stock but ensure that the needs of the customers are effectively fulfilled.

**Table 28: Reduction in Opportunity Costs**

Opportunity Cost reduction	Frequency	Percent	Cumulative Percent
Disagree	1	10.0	10.0
Agree	7	70.0	80.0
Strongly agree	2	20.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

#### 4.5.9 Cost of Procurement and Material Handling

The performance of the supermarkets was also characterised by the costs incurred in procuring and handling materials. The respondents were therefore asked to state whether inventory management automation affected the procurement and material handling costs of the supermarkets. The results were as shown in table 29:

**Table 29: Cost of Procurement and Material Handling**

Procurement & Handling Costs Reduction	Frequency	Percent	Cumulative Percent
Disagree	1	10.0	10.0
Fairly agree	2	20.0	30.0
Agree	4	40.0	70.0
Strongly agree	3	30.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

The table shows that most of the respondents (70% cumulatively) agreed that inventory management automation had a positive influence on the procurement and material handling costs, an implication that most of the supermarkets had already taken advantage of automation so as to lower their procurement and material handling costs.

#### **4.5.10 Number of Damages (Expiries) Recorded**

The respondents were also required to respond to a statement indicating whether or not inventory management automation had helped them in reducing the number of damages as a result of expiration. The results showed that 10% fairly agreed, 70% agreed and 20% strongly agreed. This implies that inventory management automation helps identify goods that are almost expiring for faster action by the management thus reducing the number of damages in the supermarkets. The results were summarised as shown in the table below:

**Table 30: Number of Damages (Expiries) Recorded**

Damage Reduction	Frequency	Percent	Cumulative Percent
Fairly agree	1	10.0	10.0
Agree	7	70.0	80.0
Strongly agree	2	20.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

Early identification of such items helps the supermarkets to avoid selling stale goods to their customers and also avoid running into losses because of expired commodities.

#### **4.5.11 Effective and cheaper communication**

The respondents were asked to react to a statement asking whether inventory management automation has enabled them to communicate effectively and at a cheaper cost with their customers and suppliers. Their responses were as summarised in table 31 below:

**Table 31: Effectiveness in Communication**

Communication Cost Reduction	Frequency	Percent	Cumulative Percent
Fairly agree	2	20.0	20.0
Agree	1	10.0	30.0
Strongly agree	7	70.0	100.0
Total	10	100.0	

*Source: Research data, 2012.*

Out of the valid responses, 20% fairly agreed, 10% agreed and 70% strongly agreed. This was an indication that inventory management automation can assist the supermarkets achieve effective and efficient communication both with their customers and suppliers and thus helping them achieve a shorter cycle time, cost effectively.

#### **4.5.12 Mean Organizational Performance**

Table 32 below shows the relevant statistical results for the mean organizational performance.

**Table 32: Mean Organizational Performance**

Effect on Performance	N. Statistics	Sum	Mean
Effect of automation on lead times	10	39	3.90
Responsiveness to customers' orders and enquiries	10	42	4.20
Customer loyalty	10	40	4.00
Operational processes and problem identification	10	41	4.10
Staff competence	10	41	4.10
number of stores' staff	10	40	4.00
Reduction in number of errors	10	43	4.30
Opportunity cost due to lost sales	10	40	4.00
Procurement and material handling costs	10	39	3.90
Number of expiries recorded	10	41	4.10
Quality and cost of communication	10	45	4.50
Valid N (List wise)	10		

Overall Mean Score= 4.1

The table indicates on a scale of 1-5 (where 1=strongly disagree and 5=strongly agree), the level of organizational performance. The results show that the respondents agreed (overall mean score=4.1) that their organizational performance had improved. Such an improvement could be directly linked to the great extent of inventory management automation (mean score =3.94 as shown in table 20), because the linear regression model indicated a linear positive relationship between inventory management automation and organizational performance, with a slope of 0.676 as shown in table 34.

## 4.6 Hypothesis testing

One hypothesis was set in order to determine the effect of the independent variable (inventory management automation) on the dependent variable (supermarkets' performance). Chi square test was used to test the hypotheses as illustrated in the following section. The hypothesis was tested at a significance level of 5% (within 95% confidence level) and at 40 degrees of freedom. The hypothesis was as follows:

**H<sub>0</sub>:** Inventory Management automation has no significant effect on the performance of supermarkets in Western Kenya.

The chi-square tests for H<sub>0</sub> are as shown in table 33. The researcher had set the rejection criteria such that if  $\chi^2_c > 55.8$ , then the study rejects the null hypothesis, otherwise, the study accepts (fails to reject) H<sub>0</sub>.

**Table 33: Chi-Square Tests for H<sub>0</sub>**

	Value	Df	Asymp. Sig. (2-sided)	Monte Carlo Sig. (2-sided)		
				Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pearson Chi-Square	57.274(a)	40	.468	1.000(b)	1.000	1.000
Likelihood Ratio	29.416	40	.734	1.000(b)	1.000	1.000
Fisher's Exact Test	39.447			1.000(b)	1.000	1.000
Linear-by-Linear Association	4.110(c)	1	.043	.030(b)	.026	.033
N of Valid Cases	10					

Source: Research data, 2012.

At 95% confidence level,  $\chi^2$ , 40 df= 55.8. The results in the table above show that at 95% confidence level and 40 degrees of freedom, the Pearson Chi-Square value ( $\chi^2_c$ ) is 57.274. On the basis of the results the study therefore rejected the null hypothesis

since  $\chi^2_c > 55.8$  and concluded that inventory management automation had a significant effect on the performance of supermarkets in Western Kenya. This means that inventory management automation directly affected the performance of supermarkets. High levels of inventory management automation therefore leads to better customer service and reduced operational costs while lower levels of automation leads to poor customer service and poor performance in the supermarkets.

#### 4.7 Linear regression model

The study used a regression model of the following nature:

$$P = a + Ax \pm \epsilon$$

The results of the linear regression analysis performed were as shown in the following table:

**Table 34: Linear Regression Coefficients**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.210	.451		11.560	.005
	Mean Inventory management automation	.297	.114	.676	2.593	.032

a Dependent Variable: mean supermarkets' performance

Source: Research data, 2012.

The model followed would therefore be as follows:

$$P = 5.210 + 0.676A \pm \epsilon$$

Where: P= Performance of the supermarket

A= Inventory Management Automation

5.210= Constant intercept term

0.676= Slope coefficient

$\epsilon$ = Error term arising from the effect of organizational factors

The regression results of inventory management automation against performance were as shown in the model summary below:

**Table 35: Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.753(a)	.567	.389	.17385

a Predictors: (Constant), Mean Inventory management automation

*Source: Research data, 2012.*

The model summary above, explains the overall significance of the simple regression equation, that is, the percentage variation in the dependent variable being explained by the changes in the independent variable (coefficient of determination). The coefficient of determination ( $R^2$ ) equals 0.567, indicates that 56.7% of the variation in the performance of supermarkets can be explained by the changes in inventory management automation.  $R^2=56.7\% > 50\%$  hence the model is fit for forecasting (explaining how a change in inventory management automation affects the performance of the supermarkets).

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Summary of the Study**

The objective of this study was to determine the extent of inventory management in supermarkets in Western Kenya and its effect on the performance of the supermarkets. Inventory management automation was the independent variable and supermarkets' performance was the dependent variable. The study had one hypothesis that was tested using the chi-square test. Inventory management automation was characterised by Materials Requirement Planning, Vendor Managed Inventory, Radio-frequency Identification, Bar-coding, electronic point of sale, Enterprise Resource Planning and electronic procurement. The performance of the supermarkets was measured in terms of customer service delivery levels and operational costs reduction. Customer service delivery levels were characterised by lead times, responsiveness to customers' orders and enquiries, customer satisfaction, operational processes and competence of staff. The operational costs of the supermarkets was measured in terms of number of stores staff, inventory management records errors, opportunity costs, procurement and material handling costs, damages (expiries recorded) and the cost of communication with the suppliers and customers.

The study revealed that 60% of the supermarkets had a monthly turnover of more than 500,000 shillings and 80% had high investment levels of more than 1,000,000 shillings and cumulatively, more than 60% had been in existence for more than 10 years. This explains the great extent of automation (with an overall mean score of 3.94) because huge sales means that the supermarkets could get enough money to invest in automation, and this coupled with their level of experience translates to better performance, which is in line with the findings of Price, (2007).

The study also revealed that cumulatively, 70% of the warehousing staff had experience of more than five years and that 80% of the supermarkets adhered to strict specialization of labour. 60% of the supermarkets had also decentralized their management structure and there was little resistance to automation with only 20% citing strong resistance to automation. More experienced staff with the right

qualifications and little resistance to automation explains the good performance of supermarkets due to automation. On a scale of 1-5, the mean performance of the supermarkets was found to be 4.1.

The findings of this study indicated that inventory management automation positively affected the performance of the supermarkets, that is, the supermarkets enjoyed lower operational costs and high levels of customer service due to inventory management. This was explained by the linear regression model which revealed that there was a linear positive relationship (with a slope of 0.676) between inventory management automation and the performance of the supermarkets. The model showed that there was a strong correlation between the two variables with a correlation coefficient of 0.753 ( $r=0.753$ ) and 56.7% of the changes in supermarkets' performance being explained by inventory management automation ( $r^2=0.567$ ), as indicated in the regression results model (table 35). This was confirmed from the results of the hypothesis test, in which the null hypothesis was rejected (the calculated  $\chi^2_c$  of 57.274 was greater than the table  $\chi^2$  value of 55.8) and concluded that inventory management automation had a positive significant effect on the performance of the supermarkets.

## **5.2 Conclusions**

The contextual factors had a moderating effect on the relationship between inventory management automation and the supermarkets' performance. The organizational factors that were considered in this study were size of the organization, age of the organization, calibre of the management, organizations' management structure and organizational culture. The size of the organization was determined by asking the respondents the sales turnover level of the supermarkets as well as the supermarkets' investment levels. The age of the supermarkets was established by asking for the number of years the supermarket had been in existence. Calibre of management was easily known by asking the respondents their level of education and the experience of their stores/warehouse staff. Management structure was identified as being either centralized or decentralized while culture was determined by finding out the level of resistance from employees when introducing new technology in the supermarket.

The great extent of inventory management automation is highly dependent on the size of the supermarket since large supermarkets have high sales turnover and profitability and can thus afford to heavily invest in automated systems. 60% of the supermarkets had a sales turnover of more than 500,000 shillings. Most of the supermarkets that had been operating for long periods were at least aware of the best systems and most of them had automated their inventory management systems. The supermarkets were also very cautious when selecting their store staff. It was found that they employed staff with relevant training and a certain level of experience with 60% citing an experience of between five and ten years.

It should be noted that a decentralized management structure is ideal for decision making since it allows the lower level managers to make quality and quicker decisions without much consultations thus enhancing quicker actions to fulfil customer orders and enquiries. This was supported by the fact that most of the respondents (60%) had and preferred a decentralized management structure, and this is in agreement with the findings of Stank et. al. (1994) that the organizational structure adopted by a firm can be directly linked to the firm's performance. The supermarkets can also control the kind of culture that exists in the organizations depending on whether they encourage strict specialization of labour or not. Qualified staff will tend to embrace change faster than non qualified staff who will think they are being replaced with any new technology's introduction. 80% of the supermarkets encouraged labour specializations and the effect was that only 20% experienced strong resistance to automation, explaining the inverse relationship between labour specialization and resistance to change.

### **5.3 Recommendations**

Based on the summary and conclusions of the study, the following recommendations were made:

The supermarkets should automate their inventory management systems so as to improve their customer delivery levels. This is because inventory management automation whether full or partial will help the supermarkets improve on their lead times and responsiveness to customer needs. This definitely will lead to customer satisfaction hence customer loyalty.

It was also recommended that the supermarkets should make use of automation so as to reduce their operational costs. The number of staff needed to operate an automated inventory management system will be lower than that of a manual system, there will be fewer errors committed by the staff, and fewer lost sales (reduced opportunity costs) as well as effective and cheaper communication with the suppliers and the customers.

The supermarkets should also decentralize their management structures. A decentralized management structure will encourage faster decision making by the lower level manager and they will also own the decisions that they make. To encourage quality decision making, the supermarkets' top level managers should also incorporate the lower level managers in planning and decision making because this will also reduce resistance to change.

It was also noted that specialization of labour increases the quality of output and the quality of services rendered. It is therefore recommended that the supermarkets should employ people with relevant educational qualifications and with some level of experience as far as inventory management is concerned.

It is highly recommended that the supermarkets invest technology that is most useful to their operations so as to avoid wasting a lot of capital on technology that will never be used. A comprehensive research is therefore very necessary to identify any recent developments in inventory management automation.

#### **5.4 Suggestions for Further Research**

Arising from the findings of the study, the following suggestions were made for further research:

- i) The effect of inventory management automation on inventory investment and profits: Further research should be carried out to determine how supermarkets can use automation to control their inventory investments and enhance profits. The results from such a study will help the supermarkets know the specific technologies to use as well as the inventory levels to maintain in their warehouses.

- ii) Further research should also be carried out to determine how information technology can be used to increase the level of forecasting accuracy in the supermarkets. Such a study would yield results that will help the supermarkets know how to accurately forecast customer demand and thus increase their responsiveness to customers' orders and enquiries.
  
- iii) It is also suggested that further research should be conducted to determine the challenges faced by the supermarkets in automating their inventory management systems. The results from such a study will help the supermarkets plan in advance on how to overcome the challenges so as to effectively achieve their objectives.

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## APPENDICES

### APPENDIX 1: QUESTIONNAIRE

My name is Kitheka Samson, an MBA student at the University of Nairobi. This questionnaire has been developed to facilitate a study aimed at establishing the Effect of Inventory Management Automation on the Performance of Supermarkets in Western Kenya. Your Organization has been identified as a critical player in this field and your input in this study would be most valuable. Any information that you will provide will be used for academic purposes only and will be treated with utmost confidentiality.

#### SECTION A- INTRODUCTION

**Q1.** What is the name of your supermarket? .....

**Q2.** What is the supermarket's approximate sales turnover level?

<Kshs 100,000[ ]    Kshs.100,000-200,000[ ]    Kshs200,001-500,000[ ]  
>Kshs500,000[ ]

**Q3.** What is the supermarket's approximate investment level?

Less than Kshs 500,000[ ]    Kshs.500,001-1,000,000[ ]    Over Kshs. 1000,000[ ]

**Q4.** For how long has your supermarket been in operation?

Less than 5 years [ ]    5-10years [ ]    11-15years [ ]    16-20 years [ ]    over 20  
years [ ]

**Q5.** What is the level of experience of your warehouse/stores incharge?

Less than 5 years [ ]    5-10years [ ]    11-15years [ ]    16-20 years [ ]    over 20  
years [ ]

**Q6.** Does your supermarket encourage strict adherence to formal specialization of labour?

YES [ ]

NO [ ]

**Q7.** What is the nature of your supermarkets management structure?

Centralized [ ]

Decentralized [ ]

**Q8.** What is the level of resistance from the employees on the introduction of new technology in the supermarket?

1. No resistance [ ]      2. Very Weak [ ]      3. Moderate [ ]      4. Strong [ ]

5. Very strong [ ]

## SECTION B

### INVENTORY MANAGEMENT AUTOMATION

Indicate by ticking in the appropriate space in the table below the extent to which the following applies to your supermarket.

No.		To a very low extent	To a low extent	To a moderate extent	To a great extent	To a very great extent
		[1]	[2]	[3]	[4]	[5]
<b>A1</b>	The supermarket has fully automated its inventory management systems					
<b>A2</b>	The supermarket has sufficient inventory management systems and tools					
<b>A3</b>	The work of the materials manager has been made easy by using information technology					
<b>A4</b>	Materials manager's roles have been shifted to top level decision making because of the level of automation within the supermarket.					
<b>A5</b>	Most of our suppliers come to the supermarkets to manage their portfolios					

	(product levels)					
<b>A6</b>	There is online communication between the supermarket and the suppliers to ensure proper inventory levels					
<b>A7</b>	The inventory managers are able to identify what is being shipped in or out through the use of silicon chips without unpacking boxes of cargo (RFID)					
<b>A8</b>	The supermarket makes good use of barcode scanners in counting goods at the stores/warehouse					
<b>A9</b>	The barcodes are used by both the cashiers and stores staff					
<b>A10</b>	Use of the Electronic Point of sale by the cashiers and stores staff assists in managing the supermarket's inventory levels					
<b>A11</b>	The supermarket has an electronic system that helps it integrate all its operations from when a customer makes an order to when the					

	order is delivered to the customer					
<b>A12</b>	The supermarket uses information technology to purchase some of its commodities (e.g.) placing orders online					
<b>A13</b>	Using technology in procurement has greatly enabled the warehousing staff maintain the right inventory levels					

## SECTION C

### ORGANIZATIONAL PERFORMANCE

Indicate by ticking in the appropriate space in the table below the extent to which you agree or disagree with the following statements.

No.		Strongly disagree [1]	Disagree [2]	Fairly Agree [3]	Agree [4]	Strongly Agree [5]
<b>P1</b>	Inventory management automation greatly influences the time taken between placement and delivery of an order					
<b>P2</b>	Use of technology in inventory management enhances the level of responsiveness to customers' orders and enquiries					
<b>P3</b>	Inventory management automation ensures customer satisfaction and repeat purchases					
<b>P4</b>	The inventory management systems used in the supermarket has greatly assisted our staff in improving operational processes within the					

	supermarket and identifying problems quickly and systematically.					
<b>P5</b>	Our staff have become more competent in customer service operations because of our automated systems.					
<b>P6</b>	Technology use in inventory management in the supermarket has led to reduction in the number of stores staff					
<b>P7</b>	The reduction of errors in inventory management records within the supermarket is directly related to use of information technology					
<b>P8</b>	Because of automation, we rarely lose sales due to failure of not having enough stock (opportunity costs incurred due to lost sales)					
<b>P9</b>	The cost of procurement and material handling has greatly been reduced due to use of technology in					

	managing inventory					
<b>P10</b>	Due to inventory management automation, there, are fewer damages (expiries) recorded in the warehouse.					
<b>P11</b>	Communication with our customers and suppliers has been made effective and cheaper due to use of technology.					

## APPENDIX 2

### SUPERMARKETS IN KISUMU, KAKAMEGA AND BUNGOMA TOWNS

S/No.	NAME OF SUPERMARKET
1	Ukwala Supermarkets
2	Tuskys Supermarkets
3	Nakumatt Holdings
4	Yatin Supermarket
5	Kibuye Supermarkets
6	Yako Mart
7	Mama Watoto Supermarket
8	Walias Supermarkets
9	Jilvik Supermarkets
10	Fomat Supermarkets
11	Khetias Supermarkets
12	New Nyanza Supermarket

*Source: Kisumu, Kakamega and Bungoma Municipal Councils, 2012*

### APPENDIX 3: ASSESSMENT OF RELIABILITY OF STUDY MEASURES

#### i) Reliability Analysis for Independent Variable (Inventory Management Automation)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Alpha if Item Deleted
AUTOMATE	47.4000	44.0444	.6962	.8344
SUFFICIE	47.2000	43.5111	.9096	.8268
MATMGR	47.5000	44.9444	.4804	.8463
ROLES	47.4000	40.0444	.8296	.8209
VMI	47.5000	46.2778	.3702	.8533
COMMUNIC	46.8000	45.9556	.8189	.8366
RFID	48.4000	51.6000	-.0572	.8861
BARCODES	46.8000	45.9556	.8189	.8366
STAFFBAR	46.7000	45.7889	.5922	.8413
EPOS	47.0000	46.0000	.3490	.8559
ERP	47.6000	36.9333	.6971	.8336
EPROCURE	47.1000	47.2111	.3306	.8550
EPROINV	47.0000	44.2222	.6778	.8354

#### Reliability Coefficients

N of Cases = 10.0                      N of Items = 13

**Alpha = .8544**

#### ii) Reliability Analysis for Dependent Variable (Performance of Supermarkets)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Alpha if Item Deleted
LEADTME	41.2000	26.8444	.6095	.8821
RESPONSI	41.3000	26.6778	.8639	.8691
LOYALTY	41.5000	27.3889	.7006	.8772
PROCESS	41.4000	25.6000	.8810	.8652
COMPETEN	41.4000	28.0444	.7245	.8778
STAFFNO	41.5000	30.7222	.1473	.9106
ERROR	41.2000	28.1778	.5706	.8842
OPPOCOST	41.5000	26.9444	.6030	.8825
PROCOST	41.6000	26.9333	.4650	.8957
EXPIRIES	41.4000	27.3778	.8455	.8721
EFFECOMN	41.0000	26.0000	.6923	.8765

#### Reliability Coefficients

N of Cases = 10.0                      N of Items = 11

**Alpha = .8912**

