Inventory Management Automation and The Performance of Supermarkets in Western Kenya

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Abstract
In today’s highly competitive business environment, organizations from all industries 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 to satisfy customers. Organizations have therefore turned to using modern technology so as 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 descriptive survey design and targeted all the supermarkets in Kisumu, Kakamega and Bungoma. Data was collected from 11 out of the 12 targeted 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.

Keywords
Technology; Automation; Inventory; Organizational Performance.

I. Introduction

1. General Background
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 computerized 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 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 off) 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 policies 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 and communication of information about the inventory in the stock points as well as in the intermediate processes across the supply chain. 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, 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).

A. 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).

B. 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 Soble, 2010).

C. 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 counties 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.

D. 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 began 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.

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:

A. 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, 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.

B. 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.

C. 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 firm it was from and where it was slaughtered. Such data could be provided in real time across the supply chain as pallets role into the warehouse or items roll of 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.

D. 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.

E. 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.

F. 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 organizations 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 Ixter 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 (Staehr 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 operations/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).

II. 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?
A. Conceptual Framework

![Conceptual Model]

Fig. 1: Conceptual Model

III. Methodology

The study was conducted in Western Kenya using a descriptive survey design. Data was collected from a key informant in all the twelve (12) supermarkets operating in the study area (Appendix 2) using a structured questionnaire. The instrument used a five point Likert type scale to identify the inventory management tools employed by the supermarkets, and their impact on the supermarkets. The questionnaire was piloted for validity and cronbach’s alpha coefficient used to test the reliability of the measurement scales giving a 0.89 cronbach’s alpha coefficient which is above the minimum acceptable threshold of 0.70 (Santos, 1999). The questionnaire was administered personally by the researchers and the data analysed descriptively. 90.9% of the questionnaires that were administered were returned which represents a reliable response rate. (Garland and Tweed, n.d.).

IV. Results and Discussion

The objectives of this study were to establish the extent of inventory management automation and determine its effect on the performance of supermarkets in Western Kenya.

A. Extent of Inventory Management Automation

The extent of inventory management automation was measured and summarised as shown in the table below:

<table>
<thead>
<tr>
<th>Automation</th>
<th>N. Statistic</th>
<th>Sum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of automation</td>
<td>10</td>
<td>38</td>
<td>3.80</td>
</tr>
</tbody>
</table>

Table 1: Inventory Management Automation

B. Effect of Inventory Management Automation on Organizational Performance

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.

<table>
<thead>
<tr>
<th>Effect on Performance</th>
<th>N. Statistics</th>
<th>Sum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of automation on lead times</td>
<td>10</td>
<td>39</td>
<td>3.90</td>
</tr>
<tr>
<td>Responsiveness to customers' orders and enquiries</td>
<td>10</td>
<td>42</td>
<td>4.20</td>
</tr>
<tr>
<td>Customer loyalty</td>
<td>10</td>
<td>40</td>
<td>4.00</td>
</tr>
<tr>
<td>Operational processes and problem identification</td>
<td>10</td>
<td>41</td>
<td>4.10</td>
</tr>
<tr>
<td>Staff competence</td>
<td>10</td>
<td>41</td>
<td>4.10</td>
</tr>
<tr>
<td>number of stores' staff</td>
<td>10</td>
<td>40</td>
<td>4.00</td>
</tr>
<tr>
<td>Reduction in number of errors</td>
<td>10</td>
<td>43</td>
<td>4.30</td>
</tr>
<tr>
<td>Opportunity cost due to lost sales</td>
<td>10</td>
<td>40</td>
<td>4.00</td>
</tr>
<tr>
<td>Procurement and material handling costs</td>
<td>10</td>
<td>39</td>
<td>3.90</td>
</tr>
</tbody>
</table>

Table 2: Effect of Inventory Management Automation
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 4.

C. 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:

Ho: Inventory Management automation has no significant effect on the performance of supermarkets in Western Kenya. The chi-square tests for Ho are as shown in table 3. The researcher had set the rejection criteria such that if $x^2 > 55.8$, then the study rejects the null hypothesis, otherwise, the study accepts (fails to reject) Ho.

<table>
<thead>
<tr>
<th>Number of expiries recorded</th>
<th>10</th>
<th>41</th>
<th>4.10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality and cost of communi-</td>
<td>10</td>
<td>45</td>
<td>4.50</td>
</tr>
<tr>
<td>cation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valid N (List wise)</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

D. Linear regression model

The study used a regression model of the following nature:

$P= a+ Ax + \varepsilon$

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

<table>
<thead>
<tr>
<th>Table 4: Linear Regression Coefficients</th>
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<tbody>
<tr>
<td>Model</td>
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</tbody>
</table>

A Dependent Variable: mean supermarkets’ performance

The model followed would therefore be as follows:

$P= 5.210 + 0.676A + \varepsilon$

Where: $P= Performance$ of the supermarket

$A= Inventory Management Automation$

$5.210= Constant$ intercept term

$0.676= Slope$ coefficient

$\varepsilon= Error$ 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>
<thead>
<tr>
<th>Table 5: Model Summary</th>
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<tr>
<td>Model</td>
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<td>1</td>
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</tbody>
</table>

V. Conclusions and Recommendations

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 fulfill 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 that 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.

Based on the findings, the following recommendations were made:

i. 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.

ii. 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.

iii. 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.

iv. 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.

v. 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.

VI. 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.

References

[1]. Adams, G. (2005), Marketing Research, Tata McGraw-Hill, New Delhi, India
[9]. Cassidy, P. (1994), The Point of Most Return, CIO 1, April, pp46-56
Appendix 1

Supermarkets in Kisumu, Kakamega and Bungoma Towns

<table>
<thead>
<tr>
<th>S/No.</th>
<th>NAME OF SUPERMARKET</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Ukwala Supermarkets</td>
</tr>
<tr>
<td>2</td>
<td>Tusksys Supermarkets</td>
</tr>
<tr>
<td>3</td>
<td>Nakumatt Holdings</td>
</tr>
<tr>
<td>4</td>
<td>Yatin Supermarket</td>
</tr>
<tr>
<td>5</td>
<td>Kibuye Supermarkets</td>
</tr>
<tr>
<td>6</td>
<td>Yako Mart</td>
</tr>
<tr>
<td>7</td>
<td>Mama Watoto Supermarket</td>
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<tr>
<td>8</td>
<td>Walias Supermarkets</td>
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<tr>
<td>9</td>
<td>Jilvik Supermarkets</td>
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<tr>
<td>10</td>
<td>Fomat Supermarkets</td>
</tr>
<tr>
<td>11</td>
<td>Khetias Supermarkets</td>
</tr>
<tr>
<td>12</td>
<td>New Nyanza Supermarket</td>
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</tbody>
</table>
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