

**INFORMATION AND COMMUNICATIONS TECHNOLOGY AND
OPERATIONAL EFFICIENCY IN SUPERMARKETS IN NAIROBI**

BY

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DECLARATION

I, the undersigned, declare that this research project is my original work and has never been submitted to any other university for assessment or award of a degree.

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

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DEDICATION

This research is dedicated to all seekers of academic knowledge and all that struggle to make education the key to personal improvement and national economic development. I take the opportunity to dedicate this document to all lecturers that took their time to sacrifice to impart knowledge in me with regard to this course of study. My family members that believed in me and gave me moral support to undertake this study are also acknowledged.

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ABSTRACT

The aim of this research was to find out the role of various ICT applications in the improvement of operational efficiency for supermarkets in Nairobi. It aimed to answer the questions of ICT applications that are adopted by supermarkets in Nairobi and the relationship between the level of adoption of these applications and operational efficiency that was attained.

A sample of 58 supermarkets was chosen from the list of 110 supermarkets to which structured questionnaires were issued by drop-and-pick method. The forty-two questionnaires were duly filled and returned. This constitutes 72.4% response which according to Stacks (2011) was adequate for use in analysing and presenting findings for the identified research objectives.

The findings indicated that applications that were simple and cheap to install and implement such as CCTV cameras, electronic point-of-sale systems and bar code readers were most prevalent while advanced and relatively expensive ICT applications such as ecommerce, supply chain systems and enterprise resource systems were least used. The size of supermarkets also determined ICT equipment that were used. Coefficient of correlation of 0.52 was obtained from the regression analysis that measured the strength of the relationship between dependent and independent variables. The relationship was direct, meaning that supermarkets with largest extent of ICT application in their premises had the highest operational efficiency.

It was recommended that supermarket owners acquaint themselves with ICT applications that are available in the market and evaluate those that are suitable for their needs. Supermarkets that had a wide array of application in their premises had high operational efficiency. It is therefore necessary that they use all available ICT applications depending on their needs. Given that some ICT applications were expensive to buy and implement, it was suggested that developers make applications that are suitable for local needs, with regard to supermarkets.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Innovation in Information and Communications Technology (ICT) is without doubt one of the most remarkable developments in recent times. Virtually, no field can claim irrelevance of ICT in any of their operations. Equally, in operations management, ICT has an array of applications that enable organisations to achieve various objectives. Tomar (2009) observed that information technology is the most effective tool in decision-making process in operations management.

Prevalence of ICT in modern operations has often obviated its definition partly because of differences in level of usage and an assumption of its necessity. Hence, the definition of the term in supply chain management differs from the working definition in finance, though both fields appreciate the basic aim, which is to achieve operational efficiency. In business, the general definition of ICT is the application of technology to coordinate various players where knowledge is created and shared seamlessly, hence obviating or reducing transactional costs (Carugati & Rossignoli, 2011). Lindgren (2011) noted that utilisation of ICT technologies can help a firm to achieve competitive advantage due to high speed of development, ability to visualise business performance and reduction in cost of doing business. Use of information technology in data collection and analysis can be used to gain information on customer preferences and business performance, which can be used to answer the ever begging question of meeting customer satisfaction (Grant, 2011).

1.1.1 Operational Efficiency

In Operations Management, operational efficiency is a necessity rather than a choice as it forms the basic goal of operational managers. According to Schniederjans and Cao (2002), the goal of operational managers in achieving operational efficiency is narrowed down to application of e-commerce which provides advantages such as cutting operational costs on resources usage, increasing flexibility and improving speed of service delivery. Operational efficiency was defined by Dymski (1999, p. 63) as “how much output is produced per unit of input”. While explaining the concept, Hasenpusch (2009) mentioned cost as a key determinant when deciding to increase efficiency.

Operational efficiency is related to profitability of a business, which increases with the decline of transactional or operational costs. Misra (2009) and Roy (2005) also mentioned of the ratio between input and output of resources in determination of operational efficiency of a process, within an organisation or industry in general. In other words, operational efficiency is used to assess how much customers or businesses gain from inputs applied in a given transformational process in an organisation. It is all about how cost effective the process of delivering desired outputs is. It differs in different organisations, depending on their goals and objectives. For example, in the with respect to supply chain management, a comprehensive definition is given by Slack, Chambers, and Johnston (2010, p. 426) as:

“...the efforts that each operation in the chain can make to reduce its own complexity, reduce the cost of doing business with other operations in the chain and increase throughput time...”

1.1.2 Information and Communication Technology (ICT)

Development of ICT has been breath-taking in the past few decades and its ubiquitous applications have changed operations in many industries today. The main beneficiaries have been those that have applied it to their usual operations to make work easier through automation and reducing the cost of undertaking various operations. In the supermarket service industry, effective application and adoption of ICT is likely to have many advantages, like has been the case in emerging economies and in developed economies. In the scenario of supermarket service-based business, the main beneficiaries are the stakeholders that include the suppliers, customers and business owners.

In countries where internet penetration is high, e-commerce has succeeded significantly and major businesses have been able to achieve operational efficiency. However, businesses that need to apply assistive ICT technologies need to be sure about relevance of the technology and how it fits in their operations. Some ICT applications are expensive and need time to learn before they can be fully integrated into systems of an organisation. Without earnest consideration, the very technology can be their downfall. In such cases, ICT implementation needs deep understanding of the specific need that ICT would achieve and drafting of effective and workable policies and that should also be implemented in an organisation for the objectives to be achieved (OECD, 2004).

1.1.3 Role of Information and Communications Technology in Supermarkets

Retail sector has an onus task of meeting customer satisfaction owing to the fact that they interact with them in the process of delivering a product or service. Supermarkets are major players in the retail industry. Retail businesses with reference to supermarkets have workers, finances, suppliers and goods to manage in their operations and these can be daunting tasks that can greatly impact on their efficiency and ability to meet the needs of their customers.

Efficiency in the case of a supermarket is desirable where the services to customers need to be standardised as is the case in fast food industry. One of the means to achieve operations efficiency is by separating services that need customer contact from those that do not and hence do not require interaction with the service attendants (Greasly, 1999). To achieve cost efficiency, capacity for stock and inventory has to be fully utilised, overheads have to be minimised as much as possible, usage of equipment that can do different functions and they have to achieve higher productivity ought to be used (Rowbotham, Azhashemi, & Galloway, 2007).

ICT has been applied in achieving operational efficiency in many operations of supermarkets. One of main reasons for using ICT is achieving cost efficiency where businesses cut on costs of doing business (Tsai, 2003). In many businesses and equally in supermarket retail operations, there are functions such as supply chain management, inventory management, advertising, point-of-sale management and actual service to customers that need application of ICT to achieve operational efficiency.

Supermarkets, especially in the developed world are adopting ICT with the main goal of achieving operational efficiency. Wal-Mart was one of the first companies to apply ICT in its management practices where it used innovative ICT platforms to link the business to suppliers, hence helping it achieve operational efficiency (Breznitz & Zysman, 2013).

1.1.4 Supermarkets in Kenya

Kenya has 110 supermarkets, 8 of which are have more than one branch, according to Yellow Pages (2013). Most of these supermarkets are concentrated in Nairobi where they are headquartered. Only the government-linked supermarket, Uchumi is listed in Nairobi Stock

Exchange, while the rest are privately owned and a number such as Nakumatt operate in several East African countries. There are a number of operations that are linked to ICT that are practiced in some of the supermarkets. According to the website, Balancing Act (2013), Uchumi installed an Enterprise Resource Planning system that took a period of 18 months and a cost of over USD 1.2 million for license and an additional USD 2 million for implementation and an annual maintenance cost of USD 150,000. Besides improvement in coordination and communication, there were no immediate benefits noted from this installation. Vendor Managed Inventory (VMI) was also found to have improved stock management, cash flows and risk management in the sampled supermarkets in Nairobi-based supermarkets, according to Irungu and Wanjau (2011). Generally, there is fast development of supermarkets in Kenya, most of which are based in Nairobi. One of the reasons for this is fast development of Kenyan economy which has the second most advanced supermarkets in sub-Saharan Africa (Neven & Reardon, 2003).

1.2 Statement of the Problem

ICT is useful in most operations including supermarkets that have many stakeholders such as customers, suppliers, government and owners. Different operations are needed to efficiently serve these people and ICT is used to meet these needs efficiently. These businesses need to coordinate with suppliers upstream to ensure inventory levels are optimum and supply chain management is efficient. Coordination among various stakeholders in the industry includes information sharing to achieve common predetermined objectives, often to minimise costs and maximise on profits. Ecommerce has been developed in the recent to be one of the most useful platforms for achieving operational efficiency. In this case, information can be shared seamlessly and decisions making can be not only quick but also effective and smart decisions.

The main strength of ICT is that operations can be automated such that a customer can interact with the machine without employee necessarily attending to them. Businesses using automated machines reduce on the cost of employees and time for serving customers. In a typical case of banking business, ATMs (Automated Teller Machines) have been successfully deployed by banks world over to achieve operational efficiency. This was aimed at increasing flexibility such that customers would access their cash any time of the day and in easily accessible locations. Banks have been able to reduce the need for employees performing

simple transactions such as depositing and withdrawing of cash, checking of balances and requesting of mini-statements for their accounts. Other applications such Managed Inventory (VMI) technology, electronic point of sale (EPOS) and supply management systems are needed to achieve the stated goal of operational efficiency.

Research into adoption of Information and Communications Technology in supermarkets has been done in Kenya and elsewhere in the world. Yu and Ramanathan (2008) did a similar research in UK and found out that out of 41 retail businesses that included supermarkets, 20 had installed high technology in ICT and had achieved significant operational efficiency. Gichoya (2005) assessed factors that affected ICT adoption in government administration. This research found out that ICT was beneficial in several areas such as improvement of service delivery to citizens, reduction of cost of operations, transparency, faster decision making, improved access to information and file management system.

Otiso, Chelangat, and Bonuke (2012) carried out a research that aimed at establishing effectiveness of ICT in service quality delivery at Kenya Power and Lighting Company. The study found out that ICT boosted service quality and improved customer satisfaction but to do this, an appropriate ICT system had to be put in place and the organisational manpower had to be trained and prepared to put these changes in into practice.

In health-related SMEs in Kenya, Makau, Wawire, and Ofafa (2013) found that although there was a general perception of positive benefits of adoption of ICT, the rate of adoption and implementation was slow. Organisations did not achieve their perceived expectations due to low informational intensity, low ICT specialisation, such as low skills in the sector and poor organisational readiness.

Despite the perception of the benefits of ICT in both public and the private sectors, there is a sluggish rate of ICT adoption in the country to achieve operational efficiency. Only few studies have been done on supermarkets in Nairobi where ICT is linked to operational efficiency. An example is where Vendor Managed Inventory (VMI) technology was found to increase effectiveness in stock management and cash flow management (Irungu & Wanjau, 2011). Besides, the studies have been concentrated on the constraints and assessment of rate of adoption of ICT in the country. There is paucity of research that has been conducted to assess how supermarkets or at close, retail businesses have to benefit from adoption of ICT to

improve operational efficiency. The study aims to fill this gap by conducting a research to establish the role of ICT in achieving operational efficiency among supermarkets in Nairobi. The study sought to answer the following questions: what is the extent of ICT adoption among supermarkets in Nairobi? What is the role of ICT in achieving operational efficiency in supermarkets in Nairobi?

1.3 Objectives of the study

The aim of this research is to establish the role of ICT in achieving operational efficiency in supermarkets in Nairobi.

Specific objectives

- i. To explore the extent of ICT adoption among supermarkets in Nairobi.
- ii. To determine the relationship of ICT and operational achieving operational efficiency among supermarkets in Nairobi.

1.4 Importance of the Study

Supermarket owners would gain from learning about opportunities that ICT offers in achieving operational efficiency. The research provided a benchmark on how various organisations in other sectors and countries have used ICT to attain operational efficiency through means such as reducing cost of handling customers directly through automation, usage of ecommerce mode of shopping.

This research would benefit the government that facilitates ICT infrastructure in the country. The government would gain information on how technology influences supermarket business and hence draft policies that would ensure its adoption rate in the country increases to a significant level.

Members of academia would gain from the findings of the research by using the compiled report for furthering their research, referencing their own work and also critiquing it. Students usually use past works to base their respective studies and this research would provide a background of their work. They would either seek to further the research or use a different context to compare the findings to suit their individual needs.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter describes adoption of ICT sector and presents opportunities that lie in implementation of various technologies in the supermarket retail context. It presents a conceptual framework that were adopted in finding solutions to the identified objectives of the study. It was also be useful in comparing methodologies adopted in previous researches and how the same can adapted or borrowed to this research. Besides, literature review is important to recognise works of the other people in the subject so that the same research is not replicated in this study. Finding out what has been done guided the researcher in justifying this study by identifying the unfilled gap by other researchers. The issues discussed include general overview of ICT and operational efficiency and the role of ICT in achieving operational efficiency. The chapter concludes with the summary of the reviewed literature and the knowledge gap.

2.2 Overview of Information and Communications Technology

Development of ICT is increasing at a rapid pace in effort to fill gaps in the market that are identified and which promise to meet needs of users in various fields. New software and matching equipment have been developed and adapted to daily lives of people. Examples of developments in ICT include smartphones, tablet computers, cloud computing, fast internet speeds now in Fourth Generation (4G) stage among others. These can be adopted to fit into operations of supermarkets to increase operational efficiency. Some of the areas where ICT is applied in a business context include linking business partners and players through network, fast generation of information and seamless decision making by multiple stakeholders.

Today, some organisations are dependent on ICT for deploying e-commerce platforms to increase business presence and link to customers, data mining where patterns can be used to guide firms to make timely decisions and simplification of tasks that otherwise could be unwieldy to manage by humans. Because businesses are dependent on ICT in improvement of service delivery, they have incorporated it into their strategic plans to give it deserved attention (Kodama, 2013). Applications of ICT are as wide as are the needs of an organisation; they can range from simple point of sale unit to a whole organisation where Enterprise Resource Planning system is installed to manage almost every aspect of the

organisation. Some of these areas include supply chain management, human resources, customer management and accounts (Duggan, 2012).

2.3 Operational Efficiency in Supermarkets

Operational efficiency is essential in improving service delivery and customer satisfaction in businesses. Supermarkets need operational efficiency whereby operations managers strive to reduce the cost of doing business and aim at maximisation of profits from input resources into their operations. Operational efficiency in the context of supermarket business refers to the ratio of output to inputs and effectiveness in realisation of outputs. Depending on the goal to be achieved, there are equipment that can reduce sluggish, repetitive and error prone procedures to enable an organisation realise its goals efficiently and effectively.

According to Neves, Trombin, and Fonseca (2011), one aspect of achieving operational efficiency for units of products that are sold is ascertaining the unit of floor space achieves high turnover and optimal profits, hence, greater operational efficiency. To do this, retail prices have to be lower, number of consumers has to increase and customers have to access goods available for sale easily. Adoption of relevant information technology can be used to improve operational efficiency in the case of a supermarket hence increasing customer satisfaction (Khosrowpour, 2006). In this case, operational managers would analyse performance of different goods by collecting data and assessing behaviour of customers with respect to the said variables.

2.4 ICT and Operational Efficiency in Supermarkets

ICT is often used in various operations of supermarket business and common applications from the literature include Universal Service & Cash Order System (USCOS), automated supply chain management, bar codes, loyalty cards, online stores and automated teller machines. These are typical operations that are easily found in supermarkets where the aim is to provide efficient service to customers while aiming at reaping optimal returns.

Universal Service & Cash Order System (USCOS) system was developed and found to be quite efficient in achieving operational efficiency. It is an improvement to usual POS system. This system is placed at distribution outlets to dispense required change and manage transaction funds such that the attendants do not have to manually count change or calculate

deposited cash in the collection box. There are separate slots for change and deposits and the user may not need to access any of the stored cash. According to Takahashi, Hirai, and Kaneko (2006), the system can improve fund management, efficiency of operations of tasks, and efficiency of management where errors could be incurred in manual counting of cash or when issuing change to customers.

The system eliminates need for reconciling cash at the end of the day which can be laborious and sluggish to supermarket managers. The trio did a short survey where USCOS machines had just been installed and to their satisfaction, 90% of common errors had been eliminated, time for processing funds has been reduced tenfold and operations had significantly improved. In this case, operational efficiency is improved in saving of time for operations and increasing effectiveness in fund management at the point of sale. These machines are especially applicable in large stores where customers queue to be served and expect to be served correctly at the least time possible.

Monitoring and controlling of stock is one of the many operations that is basic to supermarket business. These are businesses that have multiple suppliers and thousands of products for sale and make reorders at certain designated periods. Through automated supply chain management (SCM) system, electronic communication is made between the suppliers and the mainframe computer of a supermarket such that upon reaching a certain level, a reorder request is triggered and effected automatically. It is possible to make faster decisions in this scenario where operations can be remodelled within the system to reflect the wishes of the specific company (Emmett, 2005). A supermarket can use the system to perform other functions such as tracking order of goods as soon as they enter their warehouse and preventing overstocking of goods where depending on movement of specific items.

Bar codes, which identify products, their origin, manufacturer details and other specific details such as price and quantity, are used at the point of sale where EPOS system is often installed. Bar codes are useful in improving time of serving customers and enabling the business to do other functions such as performance analysis of various goods and maintaining stock levels of particular goods. At POS, scanned products send a message to the central computer that has data about all goods in a store which can be retrieved at will. Information such as country source, the manufacturer, specific products details are useful in making reference to the product in future and especially at the point of sale where usually quantity

and price are needed. At the same time of scanning, there is a system that runs seamlessly and helps in monitoring movements of the specific products within the store (ISACA, 2009).

Bar codes and automated stock performance and monitoring control system aid in making a store to be efficient and effective. Operational efficiency is achieved in several ways such as accuracy of records, saving of costs, better integration and coordination among workers within the business and other stakeholders such as suppliers, easy to control and also ability to offer better service. At the end of the day, a business that utilises these opportunities achieves competitive advantage in the market. To achieve full benefits, it means that a business has to install an appropriate software application as required such as warehouse management system (Tompkins & Smith, 1998).

Loyalty cards are used to collect data about customer spending habits where preferences and other analytics are done to help a business better satisfy its customers. Almost all major supermarket chains have loyalty cards that are used to collect customers spending data thus enabling them to serve customers depending on their shopping preferences (Yeshin, 2012). Operations at customer service at the supermarket are thus made possible using loyalty cards with customer details stored in the system within the business. Instead of analysing manually what specific customers shop and at what frequency, ICT automates this process and makes the otherwise laborious exercise to be achieved easily, accurately and effectively. A supermarket business can then ensure preferences of certain orders are made in advance to meet needs of specific clientele as analysed by product analysis systems. Customers prefer to be served as individuals rather than being lumped together as if their needs and preferences were universal. This is the essence of customer relationship management function which aims at identifying customers as individuals and anticipating their needs to serve them better (Kracklauer, Mills, & Seifert, 2004). This is in line with objectives of businesses to increase customer satisfaction.

Online stores are applicable where ordered goods using internet platform are delivered at the homes of customers, saves time for customers that due to their nature of work or condition are unable to leave their physical locations. Gupta and Jaroliya (2008) aptly captured application of ICT in retail environment by linking operational efficiency to competitive advantage. According to the duo, ICT is used to better serve customers hence maintaining a competitive edge in business. E-commerce is one of these ICT applications that enables

customers to compare prices of products in various stores. This improved flexibility enables them to buy products of their preference and also make payment on the same without necessarily leaving the comfort of their homes or places of works. This could be due to personal privacy or health reasons that may prevent customers from doing shopping at supermarket premises as usual. However, this platform may be a disadvantage to some shoppers where they are not able to check goods before buying them physically and chances businesses of misusing of customer data that is collected at the time of placing an order online. This may influence online shoppers to avoid going online for shopping for fear of especially their credit card data being abused.

Automated Teller Machines (ATMs) in some of the developed countries such as UK are often used within precincts of supermarkets (Pond, 2007). Plastic money usage is on the increase in Kenya and other of parts of the world, where ATMs linked to Visa or MasterCard are used as debit cards; supermarkets have systems where they are 'swiped' and payments made automatically (Mugwe, 2012). A client's ATM card is 'swiped' in a magnetic detection machine that reads customer's information and helps banks to make deductions of specific cost of goods due for payment (Ryan, 2011). This saves customers need for withdrawing cash from the ATM machines and also helps in reducing time to issue change. The exact amount of money is deducted sometimes customers withdraw limited amounts of cash from the supermarkets. However, this system is also fraught with risks such as using skimming devices to impersonate ownership of debit card privileges (Byron, 2012). For security reasons, debit cards should be used sparingly since they are not as secure as credit cards. Customers are often advised against using them for online shopping since their funds are not protected (Ryan, 2011).

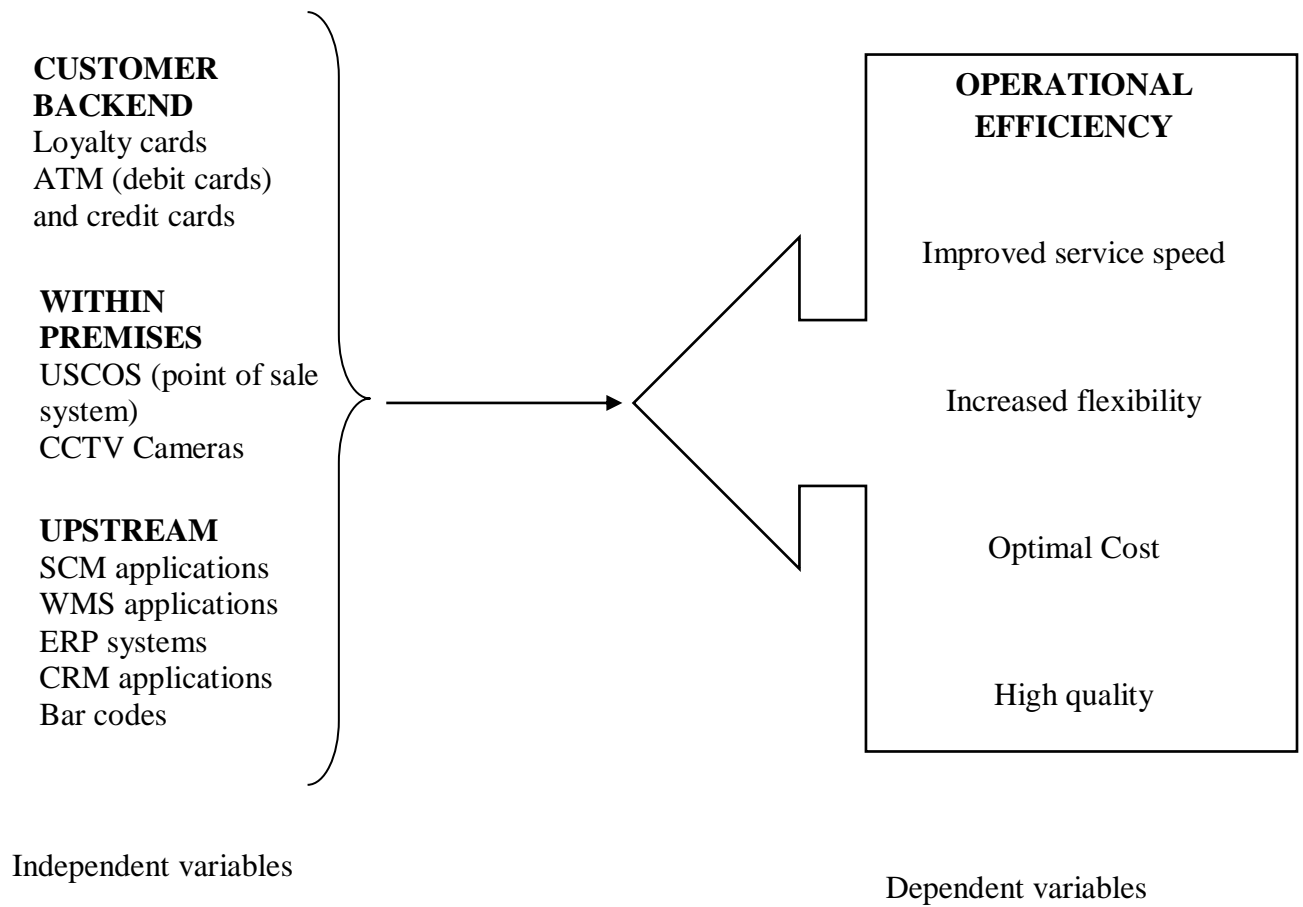
Despite the much hyped advantages of ICT and its myriad ways of applications in various industries, benefits from the same are not often quite visible in some of the places where they are applied (Cagliano, Caniato, & Spina, 2003). An example is ERP installation at Kenya's Uchumi supermarket where despite massive investment of over USD 3.2 million and annual maintenance fee of USD 150,000, there as little to be accounted for despite reports of increased collaboration, coordination and communication among employees within the supermarket and its stakeholders such a suppliers (Balancing Act, 2013). Some of the benefits of ICT take a long time to before they are fully realised due to issues such as skills, regulations, organisational change inertia (Rocha, 2008).

2.5 Summary and conceptual framework

There is significant development in ICT in the general retail sector that if applied effectively, a business can gain in operational efficiency and customer satisfaction. Most of the information gathered was from developed countries that have significant differences in ICT infrastructural development from the current scenario in the country. Whereas there is documented literature of ICT application in retail sector, it is assumed that level of adoption and its effectiveness is the same for all regions. However, there is little to show for success in achieving operational efficiency in developing countries in the biggest retail segment, supermarkets or convenience stores. Through this research the level of adoption and gains in operational efficiency would fill this gap.

The conceptual framework of the research is represented diagrammatically in the figure below. Various applications such as supply chain management system (SCM), enterprise resource planning (ERP), customer relationship management (CRM) and bar code systems are used by the supermarkets at the backend of operations of a supermarket. Others such as closed circuit televisions (CCTVs) and point of sale systems are used within the premises while loyalty cards and ATM cards that are used as debit cards are used interactively by the customers in the process of doing their purchases in the supermarkets. The end goal of effective application of ICT is attainment of operational efficiency that is used to increase customer satisfaction and company profitability. Operational efficiency is explained using variables of speed, flexibility, reliability and cost efficiency.

**Diagrammatic presentation of research conceptual framework
Supermarket ICT applications**



CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research design

The research intended to use cross-sectional survey and descriptive research designs. These research designs are adequate since data collection was done once and were used to develop a regression model. The resulting equation were used to explain the relationship between operational efficiency and extent of ICT usage in the sampled supermarkets in Nairobi.

3.2 Target Population

The researcher targeted supermarkets operating in Nairobi. At the moment, the total number of supermarkets operating in Nairobi, (provided in the appendix), according to the Official Yellow Pages Kenya are one hundred and ten (110) (yellowpageskenya.com, 2013). These supermarkets therefore formed the target population for this study. It is from the 110 supermarkets that the researcher sampled the ones that were considered for the study. Nairobi was chosen because of high density of supermarkets where most of them are also headquartered. Besides, Nairobi is the capital city of Kenya its high population with relatively high incomes attracted most investment in supermarkets to meet the needs of the residents.

3.3 Sample Design

According to Cooper and Schindler (2008), the ultimate test of a sample design is how well it represents the characteristics of the population it purports to present. Yamane (1967) provided a simplified formula to calculate sample sizes. The researcher utilised Yamane (1967)'s formula as provided here below to calculate the sample size for this study.

$$n = \frac{N}{1 + N(e)^2}$$

Stratified sampling was used in this study due to variations in the population that were targeted. There are supermarkets that have one branch and those that have multiple branches, which could affect complexity of ICT usage. Proportional stratified sampling or proportionate

sampling is used where a certain size is used to select samples from each of the represented stratum in the population, but selection from those selected is done randomly (Gideon, 2012). Using the formula above, “n” is the sample size, “N” is the population size, and “e” is the level of precision. The study assumed a precision level of 10%. Supermarkets that have more than one branch are 8 while those with one branch were 102. Using the formula above for two different populations yields the size of each stratum.

Therefore:

$$n \text{ for "branched" supermarkets} = 102 / ((1 + 102 * (0.1)^2)) = 50.5$$

$$n \text{ for "unbranched" supermarkets} = 8 / ((1 + 8 * (0.1)^2)) = 7.4$$

Thus, 51 supermarkets were selected randomly from “one-branch” supermarkets while seven supermarkets from the “branched” stratum was also be selected. The total sample were 58 with each sample being equal to its stratum size.

3.4 Data collection

Primary data were used because of its reliability over secondary data. This is because of recency of information and better reliability of the study as the researcher had the opportunity to control the process to ensure veracity of results. This was done using questionnaires where the researcher formulated questions intended to be used to achieve the specified research objectives.

The design of the questionnaire was such that Part A dealt with demographic data where information that contained business details was recorded. This section was essential in identifying supermarkets that submitted the completed questionnaire and when it was done. This is especially useful for clarification purposes if needed at the time of data analysis. Number of employees, number of branches and number of years in business was helpful in getting information on size of the business and possible complexity of business operations associated with specific supermarkets.

Section B of the questionnaire addressed the specific objectives of the research and it contained two tables with various questions. The first objective was addressed by listing several ICT applications where supermarket managers or their equivalents were expected to respond the extent to which they used them. The second objective was addressed using a list

of statements that aimed at assessing the level of operational efficiencies that was realised as a result of using the ICT applications provided in the previous table of the questionnaire.

3.5 Data Analysis

Descriptive statistics that include means, percentages and frequencies were used to analyse both section A and B of the questionnaire. Information from section A is about demographics while section B addressed the specific research objectives. These were exploration of business operations and determining extent to which supermarkets in Nairobi adopted ICT to improve their operational efficiencies. These inferential statistics enabled the researcher to measure and determine the state of the sample regarding the study objectives which was useful in studying and understanding large population of supermarkets in Nairobi in this case. Tables and graphs were used to present and describe the number of operations of supermarket and also extent of use of ICT in these operations. In this case, the means of various ICT applications were presented in figures that made it easier for interpretation.

Frequencies were used to present numerical data on the number of operations that are found in supermarket in Nairobi and the extent to which they are applied. This assisted in ascertaining operations that need ICT to be applied in order to improve operational efficiency.

Means and standard deviations were calculated from Likert scale where the resulting mean indicated the extent to which ICT applications are used by various supermarkets in Nairobi. This was done specifically by assessing the extent to which various ICT applications are used in different supermarket operations. Means also rated the level of agreement by the respondents on operational efficiency achieved by using specified ICT applications.

Regression analysis was used for the second objective which sought to determine the relationship between ICT applications and operational efficiency among supermarkets in Nairobi. Statistical Package Social Sciences (SPSS) was used in calculation of descriptive statistics and also running of regression analysis.

The regression model was in the form:

$$y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5$$

Where:

y = operational efficiency

b_0 = constant

x_1 = extent of usage of ICT variable 1

x_2 = extent of usage of ICT variable 2

x_3 = extent of usage of ICT variable 3

x_4 = extent of usage of ICT variable 4

x_5 = extent of usage of ICT variable 5

A regression model was used to explain the linear relationship between operational efficiency as the dependent variable and independent variables of speed, cost, flexibility and service quality as enabled by various ICT applications in supermarket operations.

Table 1: Summary of methodology

Objectives	Data to be collected	Method	Analysis needed
To explore the extent of ICT adoption among supermarkets in Nairobi.	<ul style="list-style-type: none"> • Number of operations in supermarkets • Extent of ICT adoption 	Structured questionnaire	Descriptive statistics (frequencies)
To establish the relationship of ICT and operational achieving operational efficiency among supermarkets in Nairobi	Response rating of various operational efficiency measures	Structured questionnaire	Regression analysis

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

The aim of this chapter is to present data analysis, results and discussions of the study in line with the research objectives. The data was collected from the supermarkets in Nairobi and analysed using Statistical Packages for Social Sciences (SPSS). Fifty-eight (58) questionnaires were distributed through a drop and pick method to respondents (the operational managers or their equivalents) in various supermarkets as indicated in appendix i, of which 42 were returned. These included 30 with single branches while 12 had more than one branch. This represents a response rate of 72.41%, which was considered adequate for analysis and to generalise the findings to the general population. Means and standard deviations were utilized in analysing the extent of ICT adoption in supermarkets in Nairobi while regression analysis was used to determine the relationship between ICT applications and operational efficiency in supermarkets in Nairobi.

4.2 Demographic Data

Data that was collected from the first section of the questionnaire aimed at understanding the business profile of the supermarkets in Nairobi in terms of size and experience in usage of ICT. Number of employees and the duration in years the supermarkets have been using Information and Communications Technology were used as a proxy for examining business profile of the supermarkets in Nairobi. The findings of the study are presented and explained in the subsequent sub-sections.

The respondents were required to indicate the duration in years the supermarkets in Nairobi had been using Information and Communications Technology. The study findings as presented in Table 2 shows that 16.7% of the surveyed supermarkets had used ICT for a period of less than 1 year, 42.9% for 1- 3 years, 16.7% for 4-5 years and 23.8% for above 5 years. This implies that all the supermarkets in Nairobi used ICT in their operations with majority of them having utilized it for a period of 1-3 years. This is an indication that the study respondents were aware of the importance of ICT in supermarkets, thus they were better placed in providing appropriate responses to the study questionnaire.

Table 2: Number of years ICT has been used by the supermarkets in Nairobi

Response	Frequency	Percent
Below 1 year	7	16.7
1-3 years	18	42.9
4-5 years	7	16.7
Above 5 years	10	23.8
Total	42	100.0

Source: Survey data (2013)

From Table 2, 42.9% of the businesses were between 1-3 years old while those that were established within the past year (Below 1 year) were 16.7%. This implied that only a few supermarkets managed to stay for more than five years. 76.3% of the supermarkets between 1 and 5 years old were in the process of establishing themselves.

The researcher also wanted to ascertain the number of employees among the supermarkets in Nairobi. The study findings as presented in Table 2 reveal that 16.7% of the supermarkets in Nairobi had less than 20 employees, 35.7% had 20- 50 employees, 28.6% had 51-100 employees and 19.0% had more than 100 employees

Table 3: Number of employees

Response	Frequency	Percent
<20	7	16.7
20-50	15	35.7
51-100	12	28.6
>100	8	19.0
Total	42	100.0

Source: Survey data (2013)

Supermarkets that had more branches were likely to have more employees. 35.7% of the supermarkets that had between 20 and 50 employees were businesses that had between 1-5

branches, meaning that they were expected to have more complex operations, hence the need for more ICT applications.

4.3 Extent of ICT Adoption among Supermarkets in Nairobi

In this section, the study sought to establish the extent of ICT adoption among supermarkets in Nairobi. Using a Likert scale of 1-5 where 1 = Never; 2 = Almost Never; 3=Occasionally/Sometimes; 4= Almost every time and 5= Every time, the respondents were required to indicate the extent to which they agreed with various statements concerning the usage rate of ICT among supermarkets in Nairobi. The study findings are presented and explained in the following sections.

Table 4 indicates the means and standard deviations of 12 ICT applications from all the 42 respondents.

Table 4: Extent of ICT adoption among Supermarkets in Nairobi

Usage of ICT	N	Mean	Std. Deviation
Ecommerce or online selling platform	42	1.62	.825
Electronic display and advertisement	42	2.26	.964
Warehouse management system	42	2.52	1.311
Accounting system	42	2.62	1.103
Credit card swiping machines	42	2.83	1.324
Customer management system	42	3.02	1.239
Supply chain management system	42	3.07	1.045
Universal Service & Cash Order System	42	3.19	1.087
Loyalty cards	42	3.24	1.008
Bar codes and bar code reading machines	42	3.38	1.378
Electronic point of sale (EPOS) system	42	3.45	.993
CCTV cameras for security purposes	42	4.02	1.047

Source: Survey data (2013)

The findings of the study as presented in Table 4 show that the use of CCTV camera for security purposes had a mean score of 4.02. This implies that the respondents agreed that

almost every time ($3.50 \geq \text{Mean} \leq 4.49$), supermarkets in Nairobi utilized ICT for security purposes through the use of CCTV camera. The respondents also indicated that occasionally/sometimes ($2.50 \geq \text{Mean} \leq 3.49$) supermarkets in Nairobi utilized ICT in warehouse management systems (mean score = 2.52); accounting systems (mean score = 2.62); credit card swiping machines (mean score 2.83); customer management system (mean score = 3.02); supply chain management system (mean score = 3.07); universal service & cash order system (mean score 3.19); loyalty cards (mean score = 3.24) and bar codes and bar code reading machines (mean score 3.38) as well as in electronic point of sale (EPOS) systems (mean score = 3.45). On the other hand, the respondents indicated that the supermarkets in Nairobi almost never ($1.50 \geq \text{Mean} \leq 2.49$) employed the usage of ICT to carry out e-commerce or online selling platform (mean score = 1.62) as well as facilitate electronic display and advertisement (mean score = 2.26).

The findings of the study correspond to the observation made in the literature by Duggan (2012), that the applications of ICT are as wide as are the needs of an organisation. They can range from simple point of sale unit to a whole organisation where Enterprise Resource Planning system is installed to manage almost every aspect of the organisation such as supply chain management, human resources, customer management and accounts. Kodama (2013) concurs with Duggan (2012) by asserting that businesses are dependent on ICT in improvement of service delivery, they have incorporated it into their strategic plans. Therefore, based on the study results it can be argued that supermarkets in Nairobi used ICT in various business operations and common applications to provide efficient service to customers while aiming at reaping optimal returns.

4.4 The relationship between ICT usage and operational efficiency in supermarkets in Nairobi

This was the second objective of this research that aimed at finding relationship between extent of ICT usage and operational efficiency that was achieved by the supermarkets. There were 12 applications in ICT that were asked to the 42 respondents and 4 measures of operational efficiency that were thought to result from these applications. Using regression analysis, this relationship was tested using SPSS software and output from this was presented in tables and a figure. Given that the number of ICT applications was high at 12 and that they all varied in extent of usage among the 42 respondents, only applications with highest extent

of usage were used as independent variables in the regression equation. In this case, only five were applications with highest means, representing highest extent of adoption were used.

Table 5 shows means of all various statements that were aimed to measure operational efficiency in supermarkets in Nairobi. The measures of operational efficiency were classified into time, flexibility, cost and quality.

Table 5: Means of measures of operational efficiency

Operational efficiency Attribute		Means	Standard Deviation
Time	Time in counting of cash	3.00	1.036
	Accuracy of counted cash	3.61	0.882
	Time to identify products	3.57	0.941
	Time in stock management	3.64	0.727
	Time to serve customers	3.64	0.759
Flexibility	Sharing and access business	3.50	0.526
	In-house Advertisement	2.26	0.964
	Ecommerce flexibility	1.67	1.058
	CCTV security	3.62	0.935
	Check-out options	3.00	1.104
Cost	Order management	2.69	1.024
	Cost in wastages	2.67	1.052
	Specialised acc. Services	3.07	0.894
Quality	Inventory management	2.83	0.961
	Loyalty card and prod.	2.93	0.894
	Itemised receipts	3.52	1.087
	Temp. regulation automation	2.55	1.214
	Employee management	3.10	1.055
	Pilferage (cases of theft)	3.31	0.975
	Communication	3.74	0.857

Source: Survey data (2013)

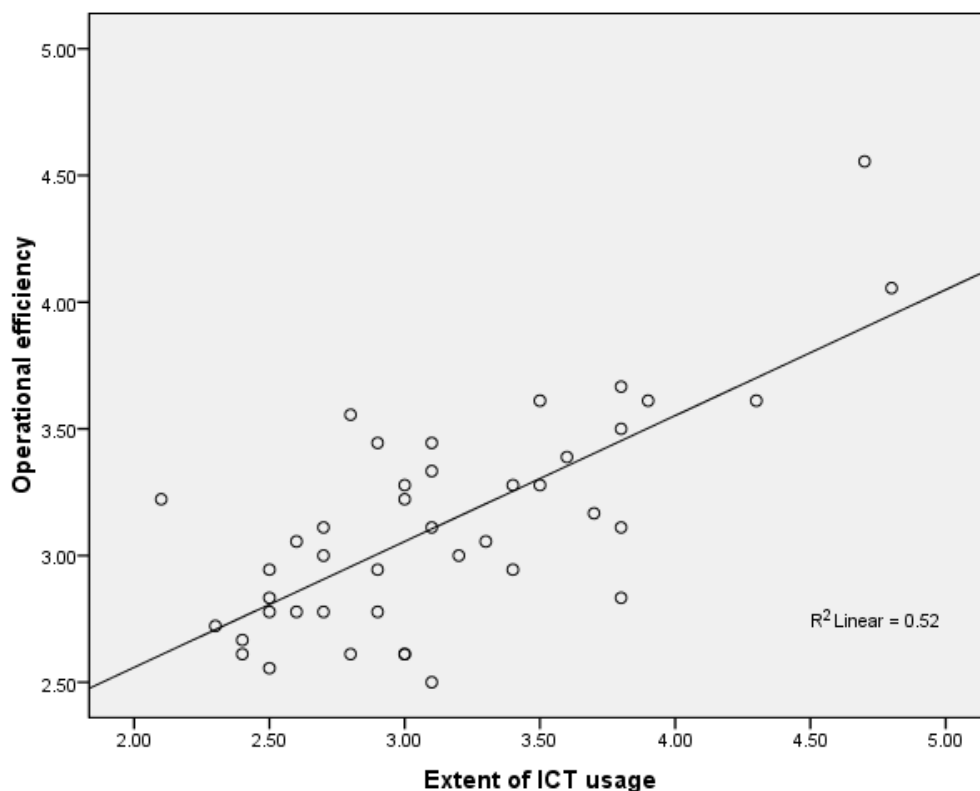
The results indicate the means and standard deviations of operational efficiency that was realised from different ICT applications in supermarket applications. Communication had the

highest mean of 3.74 followed by time that was taken to serve customers at 3.64. This implies that the respondents agreed that almost every time ($3.50 \geq \text{Mean} \leq 4.49$), supermarkets achieved operational efficiency through increasing service quality in communication within the business and also external stakeholders. E-commerce had the least mean at 1.67 while in-house advertisement followed by 2.26. The standard deviations were fairly small, which implying almost similar responses from all respondents. All the statements in Table 5 indicated means and standard deviations from the 42 respondents which measured operational efficiency. Thus, operational efficiency for all the respondents formed the dependent variable that was used in regression equation.

The means from operational efficiency measures (time, flexibility, cost and service quality) were all averaged to yield a single mean that represented the dependent variable used in this relationship. For the independent variables, means from descriptive statistics in Table 4 were used where only top five were used.

Figure 1 indicates the goodness of fit graph which highlights the relationship between extent of ICT usage and operational efficiency.

Figure 1: Extent of ICT usage



Source: Survey data (2013)

The graph indicates that there is a direct relationship between extent of ICT usage and operational efficiency in supermarkets in Nairobi. This means that supermarkets that had most ICT applications realised the highest operational efficiency.

Table 6 is the summary model which shows results that explain the relationship between ICT usage and operational efficiency. In the table, only the top five ICT application in the order of highest means were used in development of a regression equation. R-Square or the coefficient of determination explains how much independent variables explain the dependent variable, operational efficiency.

Table 6: Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
				R Square Change	F Change	df1	df2	Sig. F Change
.680 ^a	.463	.388	.467	.463	6.204	5	36	.000

Source: Survey data (2013)

a. Predictors: (Constant), Universal Service & Cash Order System , CCTV cameras for security purposes, Electronic point of sale (EPOS) system, Loyalty cards, Bar codes and bar code reading machines

At 0.463, it means the relationship in this equation was moderate. It can be used to explain appropriateness of the independent variables in explaining the dependent variable, where the smaller the value (far from 1), the poorer it is in explaining the relationship (Feibel, 2003). In this case, 46.3% of the independent variables (ICT applications) can be used to explain operational efficiency. The degree of non-determination ($1-R^2$) is greater than that of R^2 , which makes it to be a fair predictor.

However, using all of the 12 independent variables in explaining the variation in operational efficiency, R^2 increases to 0.52 or 52%. This variation from 0.463 is due to the fact that all of the ICT applications were useful in determination of operational efficiency that was observed. However, it is low and it means to some extent, all ICT factors if used effectively can yield higher operational efficiency.

F-test was also used to explain goodness of model fit that was used. The null hypothesis in this test is that there is no relationship between response and predictor variables while the alternative hypothesis states that there is a relationship between response and predictor variables. The p -value is less than the confidence limit (0.05), hence the null hypothesis is rejected. It is concluded that the model was a good predictor of the relationship between the dependent and independent variables. F-test is generally used in determination of whether a certain hypothesis is to be rejected or not; it is appropriate in indicating if there is a difference in a variation which is the null hypothesis and in this case, it is rejected since p -value is greater than 0.05, the confidence limit used (Walker, 1999).

Coefficients of the relationship are as shown in Table 7 where each of the top five most “important” ICT applications is indicated. Each of the coefficients is interpreted as the extent to which that particular ICT application explains operational efficiency, holding other applications constant. An example is usage of CCTV cameras in supermarkets increases operational efficiency by 0.7, other variables held constant. A t-test was also run for each of the five variables to test if the samples used in this research had a different mean. In this case, often the null hypothesis is such that there is no difference between the two means. For testing, if $p\text{-value} \leq \alpha$, the test statistic is rejected. The specified $\alpha = 0.05$. On this basis, the p -value for the constant of the equation had a value of 0.05, hence, it is rejected (Utts & Heckard, 2012). Also this null hypotheses for EPOS bar codes were also rejected. The p -value for CCTV cameras was 0.36, which is more than 0.05, hence it is accepted. Equally, the p -value for loyalty cards and USCOS that were more than 0.05 were rejected.

Table 7: Coefficients of the independent variables

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.317	.437		3.016	.005
CCTV cameras for security purposes	.070	.075	.122	.928	.360
Electronic point of sale (EPOS) system	.229	.082	.380	2.776	.009
Bar codes and bar code reading machines	.152	.061	.352	2.498	.017
Loyalty cards	.111	.078	.187	1.420	.164
Universal Service & Cash Order System	-.038	.070	-.069	-.541	.592

The resulting regression equation is as thus:

$$y = 1.317 + 0.7x_1 + 0.229x_2 + 0.152x_3 + 0.111x_4 - 0.38x_5$$

Where x_1 =CCTV; x_2 =EPOS; x_3 =Bar Codes; x_4 =Loyalty Cards and x_5 =USCOS

The role of ICT in determining operational efficiency is appreciated in the Kenyan supermarkets as illustrated by a sample of 42 supermarkets based in Nairobi. The equation represented the top five ICT applications that has the highest usage among the supermarkets in Nairobi. From the equation, CCTV helped the businesses in various ways particularly in preventing pilferage of goods, which means less cost in hiring of security personnel to do this task.

It may not be the most important operation in supermarket but almost all organisations that were sampled reported that they used it regularly to assist them in increasing operational efficiency at the supermarket operations. According to Zhu (2012), CCTVs helped many businesses in reducing the number of workers employed in Chinese supermarkets. They also made administrative processes to be less cumbersome as one kept watch of all processes done

in a supermarket setting. As a result, it is easier to manage employees and workers to ensure service is delivered as expected and losses and other malpractices are minimised. In the long run, it is possible to achieve higher profits, improved service quality and less costs of doing business, hence operational efficiency.

EPOS or electronic point of sale were also second in importance of ICT applications that are used in supermarkets and this was so because of various reasons. They are used together with bar code systems that are used to identify products faster and generate information that is used in checking customers out. According to Coles and Kirwan (2011), modern bar code systems are linked to EPOS and loyalty cards that eases marketing and promotional campaigns of a supermarket. This can be used to generate consumer preference reports that aid in decision making on meeting their needs.

EPOS are also used to assist supermarkets in checking reliability and accuracy of accounting data from transactions at the check-out systems. They are also useful in making repetitive tasks such as printing of cash receipts tedious hence increasing increase operational efficiency (Schmidgall, Hayes, & Ninemeier, 2002). In a supermarket setting, ICT applications such as EPOS are much needed due to large number of products and customers that are served in any given day. According to Finne and Sivonen, (2009), the management needs to take effort to assign all products identification codes so as to identify them and generate appropriate information whenever they are needed. This would save on time during checking out and would also save on time for serving of customers. This was perhaps the most useful ICT application among the retailers that were sampled in this research. Nairobi being the capital city has many residents and to serve such huge number of clients, it is necessary that a system that improves operational efficiency is installed.

It should be emphasised that bar codes are used together with EPOS which are equipped to read the codes that are generated and attached to uniquely identify all products. As a result, visibility is improved and time for management of stock is saved, hence operational efficiency (Sivakumar, 2007). Time and cost of employing workers that would take orders and assess stock levels is minimised as the automated system enables the management to assess required levels and performance of individual products in a given region. Regular analysis is useful in matching supermarket services with customer needs, and this would include stocking the right types of certain products at the right place and time.

Universal Service & Cash Order System (USCOS) is the advanced form of EPOS but it was the least in the top 5 ICT applications used by businesses that were sampled in Nairobi. Despite its advanced functionalities such as eliminating the need for counting change that customers are issued with after doing their purchases, its use is limited and this is perhaps because of reasons such as the cost and knowledge of its existence. Some of the businesses saw no need for installing expensive machines where cheaper machines sufficed. It is for this reason that expensive systems such as Enterprise Resource Planning, Supply Chain Management and Warehouse Management System were not used by many companies that were surveyed. Their limited usage was the reason they are not used in developing the regression analysis.

4.5 Discussion of results

The research found out that supermarket businesses tended to adopt ICT applications that were easy to use and cheap to install and implement. Large supermarkets especially those that had more than one branch had advanced applications such as automated inventory management systems due to complexity of their operations. These were collated with findings by Irungu and Wanjau (2011) that supermarket businesses that had more than one branch installed vendor managed inventory (VMI) systems. It helped them to manage their stocks more reliably and efficiently besides facilitating sharing of information within the business and with other stakeholders such as suppliers.

There is evidence that supermarket businesses are aware of available ICT technologies in the market and there was none from the sample that did not use any of the twelve mentioned ICT applications. However, there are impediments to adoption such as lack of technical knowhow, lack of awareness of existing ICT technologies and cost of implementation of some of the advanced ICT applications such as ERP. The finding that most of the supermarkets tend to use applications that are simple and cheap such as CCTV, EPOS and loyalty cards was also comparable to the one that was conducted by Mokaya and Njuguna (2011) in Thika Town that found out cost and poor appreciation of technology were the main reasons for businesses to adopt simplistic technologies. In this research, it was ERP, e-commerce and USCOS that were not very common for the same reasons. However, in their case, it was mobile phones and internet technologies that were most prevalent and were considered as cheap and easy to implement.

The aim of the second objective was to establish the relationship between the level of ICT adoption and resulting operational efficiency. It was found out that supermarkets that had more ICT applications in places where they were needed achieved more operational efficiency especially in serving customers better and faster. However, a research that was done in Nigeria found out that whereas ICT was effective in reducing operational costs in areas where it was used, service levels did not increase significantly (Adebambo & Toyin, 2011). A research that was specifically done in developing countries where adoption of ICT and operational efficiency were analysed found out that the main areas where ICT was found useful in supermarkets was in customer service, analytics and supply chain (Hanna, 2009). This was different from the findings in this research that established that the sampled businesses used CCTV for security purposes, electronic point of sale systems, bar codes and loyalty cards. It was not clear if bar codes and loyalty cards were used in analytics by the sampled supermarkets in Nairobi.

A related study was conducted by the University of Nairobi to establish the impact of mobile phone usage on performance of supermarket businesses in Kenya using Nairobi region as target for respondents (Wambui, 2013). The results indicated that businesses used these simple technologies but there was also increased operational efficiency especially in cost savings, improved communications with stakeholders such as staff, suppliers, customers and creditors. However, results depended on the level of usage where in this case, businesses that integrated these systems in their daily activities achieved better results. This is an implication that businesses that understand their operations and select the most appropriate applications received the highest benefit as far as operational efficiency was concerned. This is parallel to the discussion in literature review where it was noted by Kodama (2013) that businesses that incorporated ICT in their daily activities achieved better levels of operational efficiency.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

The aim of this chapter is to present conclusions to the findings of the research, study limitations and recommendations to stakeholders of supermarket businesses on how to improve operational efficiency using ICT applications. Besides, issues for further research are given at the end of the chapter.

5.1 Conclusions

The aim of this chapter is to present summary of the research, conclusion and recommendations for further research. This research aimed at assessing the extent of ICT usage in supermarkets that are based in Nairobi and thereafter to find the relationship between ICT usage and resulting operational efficiency. The research was done using structured questionnaires from which 42 respondents filled and returned duly filled copies of the questionnaire. The findings suggested that there is a significant relationship between ICT and operational efficiency usage although advanced forms of ICT were not common in many of the surveyed supermarkets.

ICT is useful in attaining operational efficiency in the supermarkets that are based in Nairobi. The first objective aimed at assessing extent of ICT usage in the supermarkets where out of the 12 applications that were presented to the respondents, five were used to develop a regression equation between ICT usage and operational efficiency. Not all of the applications had the same level of usage. Applications that were complicated and expensive to implement such as ERP software were only limited to large supermarket chains. This is because of financial capability of these businesses and complexity of their operations that necessitate robust systems to ensure optimal operational efficiency. Small and cheap applications such as EPOS and CCTV cameras were found in virtually all businesses because they are easily understood, easy to implement and cost- effective.

Relationship between ICT usage and operational efficiency that was attained in supermarkets indicated an average relationship where all the 12 factors were correlated with operational efficiency at 52%. This implied that not all ICT factors contributed to operational efficiency that was attained in these supermarkets and besides, not all businesses had the capacity to have these applications installed even if they desired. Some of the systems such as USCOS

was confused with EPOS and many were not aware of the potential benefits the latter in improving operational efficiency compared to the less developed EPOS systems.

5.2 Recommendations

It was necessary to understand the level of ICT usage in the country and how much supermarkets have adopted them to suit their operations. Computers are zero-rated and IT knowledge is percolating in most organisations although cost is seemingly one of the hurdles in realising operational efficiency potential. However, depending on the size of the businesses and related operations, there is need for each business to use appropriate ICT applications to improve operational efficiency. It is recommended that cheaper applications be developed for use by the local supermarket businesses to use to improve their operational efficiency. The supermarket owners should also take an initiative of learning trending ICT applications that fit their operations. The owners of business would need to study applications that are in the market and relate with their operations so as to match with their needs appropriately.

It is also recommended that supermarket owners acquaint themselves with ICT applications that are available in the market. Their findings should inform them on the correct applications that suit their needs. Besides, the government should provide a framework to guide in research and development of possible applications that can be installed to improve operational efficiency of supermarkets and related organisations. This is especially e-commerce that had one of the least extents of usage.

5.3 Limitations of the study

The research was carried out in the supermarkets in Nairobi. The number of supermarkets that was used in the sample was limited and to improve external validity of the findings, it was necessary to use a larger sample to represent other supermarkets in other parts of the country. Due to time and cost, it was not possible to complete the study that would include a larger sample than was used.

The researcher aimed to reach out to operational managers or their equivalents to give respond to the questionnaires. However, these were not found in all supermarkets and sometimes, they delegated this duty to junior employees that were not necessarily informed to give reliable answers to the questionnaire. Hence, not all questionnaires contained accurate position of the supermarket with regard to usage of ICT applications. Even those that filled

questionnaires could not be supervised to ensure the information they filled was accurate. Lack of this accountability may have affected the outcome of the research.

5.4 Suggestions for further research

From the research that was carried out, it is necessary to further ascertain the factors that could be hindering the supermarkets in Kenya from adopting ICT to improve their operational efficiency. This research only aimed at finding out the relationship between ICT usage and realised operational efficiency and used five ICT applications that had the highest means or were used widely. Those that were not included such as e-commerce, supply chain management and enterprise resource planning need to be studied to find out reasons why they are least used in supermarkets in Nairobi.

While doing the research, it was realised that enterprise resource planning (ERP) software was used only in two supermarkets. A section of literature that was reviewed noted that this system is extremely expensive and its usage did not exceed five years. It is suggested that supermarkets that use it (particularly Nakumatt and Uchumi) be investigated to assess whether the expended cost justified the purpose of installation. It would be useful to assess the extent of operational efficiency achieved after the system is fully operational in the supermarket companies.

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Appendices

Appendix I: Research Questionnaire

The questionnaire is divided into two sections, the introductory part and the second part with questions on ICT application in the supermarket.

Section A: Business Profile

The section requires the respondent to indicate identifying information about the business unit. The name of the business is optional although the researcher may use arbitrary number to identify the questionnaire.

Date

Questionnaire number.....

Name of the business.....

Number of employees

<20	20-50	50-100	>100

1. For how many years have you used ICT (Information and Communications Technology) in your organisation?

< 1 yr	1-3 years	4-5 years	>5 years

2. How many branches does your organisation have?

1	1-5	5-10	>10

Section B: ICT usage level and Operational Efficiency

This section seeks to assess your rating on the various statements about usage of ICT in your business. Kindly tick against the correct level number you feel most appropriately represents your situation.

1. To what extent or how frequent do use following equipment or system in your organisation?

Please tick where applicable.

The scale runs from 1-5, where: 1= “Never”; 2= “Almost Never”; 3= “Occasionally/ Sometimes”; 4= “Almost every time” 5= “Every time”.

	ICT equipment/ system	1	2	3	4	5
1	Electronic point of sale (EPOS) system					
2	Universal Service & Cash Order System (USCOS)					
3	Bar codes and bar code reading machines					
4	Warehouse management system					
5	Accounting system					
6	Customer management system					
7	CCTV cameras for security purposes					
8	Supply chain management system (SCM)					
9	Customer relationship management system (CRM)					
10	Loyalty cards					
11	Credit card swiping machines					
12	Ecommerce or online selling platform					
13	Electronic display and advertisement					

2. Rate the level of agreement to the following statements.

The following key is a guide to the numerals to tick against your level of agreement to the statement.

- 5 – *Excellent*
- 4 – *Very Good*
- 3 – *Good*
- 2 – *Fair*
- 1 – *Poor*

	Operational efficiency measures	1	2	3	4	5
	SPEED					
1	Time taken in counting and reconciling cash collected					
2	The accuracy of counting and reconciling cash					
3	The business has a database that recognises all product details using bar code system					
4	Time taken in stock management					
5	Time taken to serve customers					
	FLEXIBILITY					
6	Seamless and real time access to business reports such as for products					
7	Online shopping using ecommerce platform					
8	Usage of CCTV					
9	Multiple checkout options					
	COST					
10	Cost of security to counter pilferage					
11	Order management					
12	Cost of wasted products due to overstocking					
13	Role of a specialised accounting professional					
	IMPROVED SERVICE QUALITY					
14	Inventory management					
15	Use of loyalty card to generate customer preference (behaviour) reports					
16	Completeness of itemised receipts					
17	Maintenance of temperature and chiller cabinets					
18	Management of employees records					
19	Cases of pilferage					
20	Communication and coordination among all stakeholders					

Thank you for your time in completing the questionnaire.

Appendix II: List of Supermarkets in Nairobi

Name	Number of Branches
Acacia Supermarket Ltd	1
Aflose Supermarket Ltd	1
Armed Forces Canteen Organization	1
Banshi Supermarket	1
Betccam Savers Supermarket	1
Binka Supermarket	1
Cash & Carry Ltd	1
Chandarana Supermarkets Ltd	8
City Mattresses Ltd	1
Clean Way Ltd	1
Continental Supermarket Ltd	1
Daily Basket	1
Eagles Supermarket	1
Eastleigh Mattresses Ltd	3
Ebrahim & Co Ltd	1
Esajo Supermarket	1
Fair Price Supermarket	1
Fairdeal Shop & Save Ltd	1
Fairlane Supermarkets Ltd	1
Fourty Six Supermarket	1
Galmart Supermarket	1
General Foods (Kenya) Ltd	1
Gigiri Supermarket Ltd	1
Happy Valley Supermarket Ltd	1
Horizon Ivato Supermarket (K) Ltd	1
Jack & Jill Extravaganza Ltd	2
Janamu Supermarket	1
Jeska Supermarket Ltd	1
Jopampa Provision Store	1
Jossics Suprmarket	1

K & A Self Selection Store Ltd	1
Kaaga Mini Market Ltd	1
Kalumos Trading Co Ltd	1
Kassmatt Supermarket	1
Kikuyu Selfridges Supermarket	1
Koma Rock/Kayole Rd, Nairobi	1
Leestar Supermarket	1
Lumumba Drive Supermarket	1
Marketways Ltd	1
Mesora Supermarket Ltd	1
Metro Cash & Carry (K) Ltd	1
Muthaiga Mini Market Ltd	1
Naivas Ltd	5
Nakumatt Holdings Ltd	17
New Westlands Stores Ltd	1
Safeway Hypermarkets Ltd	1
School Supermarkets Ltd	1
Skymart	1
Stagen Enterprises Ltd	1
Tesco Corporation Ltd	1
Tusker Mattresses Ltd	10
Uchumi Holdings Ltd	14
Ukwala Supermarket Ltd	4
Uthiru Fair Price Supermarket	1
Westlands General Stores Ltd	1
Total	110

Source: yellowpageskenya.com, (2012)