

**ENTERPRISE RESOURCE PLANNING APPLICATIONS AND SUPPLY CHAIN  
PERFORMANCE OF LARGE SCALE MANUFACTURING FIRMS IN  
NAIROBI, KENYA**

**BY**

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## DECLARATION

This research project is my original work and has not been presented for an award of a degree in any other university.

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

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## **DEDICATION**

I would like to express my gratitude towards my parents, am forever indebted for their understanding, endless patience and encouragement when it was most required during the home stretch. To my siblings for their love, understanding and support during my study. You have been a great source of inspiration to me. May God bless you abundantly.

## ABSTRACT

Manufacturing organizations are facing intense pressure to provide customers with shorter times between order and delivery and between product conceptualization and realization, greater product customization, and higher product quality and performance, at the right price. To meet this challenge, companies in the manufacturing industry are being forced to implement ERP systems to better their supply chain performance in order to remain competitive. This study focused on ERP applications and supply chain performance of large scale manufacturing firms in Nairobi, Kenya. It had three objectives: to determine the extent of ERP application in the supply chain of large scale manufacturing firms in Nairobi, to establish the impact of ERP on the supply chain performance for large scale manufacturing firms in Nairobi, and lastly to determine the challenges that are faced in integrating ERP applications in the supply chain of large scale manufacturing firms in Nairobi. This study adopted descriptive survey design where the target population was the large scale manufacturing firms in Nairobi. Stratified random sampling technique was used to select the firms. The questionnaire was used as the research instrument which was self-administered and collected after completion by the researcher. Collected data was analyzed using SPSS frequencies, percentages, means, standard deviations and regression analysis. The findings were presented using pie chart, bar graph, and frequencies tables. Study findings revealed that a majority of the manufacturing organizations were using ERP applications, and in most organizations there were common modules that were preferred by the companies. In as much as the ERP applications are being used, about 70 percent of the capacity of the applications is utilized. This shows there is still much room for improvement in the way the applications can be used. The findings of this research indicated that there's a positive significant relationship between ERP applications and supply chain performance despite the challenges that are faced by organizations when it comes to implementation. From the study, the following recommendations were made: there is need for manufacturing organizations to apply all the ERP functionalities if they are to improve their supply chain performance. The study findings imply that the successful implementation and the effective usage of ERP applications can contribute toward enhancing supply chain performance in many ways. This study recommends the need for manufacturing organizations to apply all the ERP modules if they are to improve their supply chain performance.

## TABLE OF CONTENTS

<b>DECLARATION</b> .....	<b>ii</b>
<b>ACKNOWLEDGEMENTS</b> .....	<b>iii</b>
<b>DEDICATION</b> .....	<b>iv</b>
<b>ABSTRACT</b> .....	<b>v</b>
<b>TABLE OF CONTENTS</b> .....	<b>vi</b>
<b>LIST OF TABLES</b> .....	<b>viii</b>
<b>LIST OF FIGURES</b> .....	<b>ix</b>
<b>ABBREVIATIONS AND ACRONYMS</b> .....	<b>x</b>
<b>CHAPTER ONE: INTRODUCTION</b> .....	<b>1</b>
1.1 Background of the Study .....	1
1.1.1 Manufacturing Planning Systems .....	2
1.1.2 ERP in the Supply Chain .....	3
1.1.3 Supply Chain Performance .....	5
1.1.4 Large Scale Manufacturing Firms in Nairobi .....	7
1.2 Statement of the Problem.....	9
1.3 Objectives of the Study .....	12
1.4 Value of the Study .....	12
<b>CHAPTER TWO: LITERATURE REVIEW</b> .....	<b>14</b>
2.1 Introduction.....	14
2.2 Theoretical Framework.....	14
2.3 ERP Systems in the Manufacturers’ Supply Chain .....	15
2.3.1 Procurement Management .....	17
2.3.2 Sales and Distribution Management .....	18
2.3.3 Inventory and Material Management.....	18
2.4 Supply Chain Performance .....	23
2.4.1 Key Performance Indicators of Supply Chain Performance.....	25
2.6 Challenges of Implementing ERP Systems within the Supply Chains.....	29
2.7 Summary of the Literature Review.....	31
2.8 Conceptual Framework.....	32

<b>CHAPTER THREE: RESEARCH METHODOLOGY .....</b>	<b>34</b>
3.1 Introduction.....	34
3.2 Research Design.....	34
3.3 Target Population.....	34
3.4 Sampling Design.....	34
Table 3.1 Sampling Frame .....	35
3.5 Data Collection .....	36
3.6 Data Analysis .....	36
<b>CHAPTER FOUR: DATA ANALYSIS, INTERPRETATION AND PRESENTATION OF RESULTS .....</b>	<b>38</b>
4.1 Introduction.....	38
4.2 Response Rate.....	38
4.4 Extent of ERP Application in the Supply Chain.....	44
4.5 Supply Chain Performance .....	51
4.6 Challenges of Implementing ERP Systems .....	54
4.8 Implication on Policy, Theory and Practice.....	60
<b>CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS</b>	<b>62</b>
5.1 Introduction.....	62
5.2 Summary .....	62
5.3 Conclusions.....	64
5.4 Limitations of the Study.....	65
5.5 Recommendations.....	66
5.6 Suggestions for Further Research .....	67
<b>REFERENCES.....</b>	<b>69</b>
<b>APPENDICES .....</b>	<b>79</b>
Appendix I: Introduction Letter .....	79
Appendix II: Questionnaire.....	80
Appendix III: List of Large Scale Manufacturing Firms in Nairobi, Kenya .....	89

## LIST OF TABLES

Table 3.1 Sampling Frame .....	35
Table 4.1: Response Rate.....	39
Table 4.2 Level of Education of the Respondents .....	39
Table 4.3: Age of the Respondents .....	40
Table 4.4: Years of Working in the Organisation.....	41
Table 4.5: Number of Employees in the Organisation .....	42
Table 4.6: Number of Years the Firm has been in Operation.....	42
Table 4.7: Ownership of the Organisation.....	43
Table 4.8: Turnover of the Organisation.....	43
Table 4.9 ERP Applications used by Manufacturing Firms .....	45
Table 4.10: Extent of Application of ERP on Procurement Management.....	46
Table 4.11: Production, Planning and Control Management.....	46
Table 4.12: Sales and Distribution Management .....	47
Table 4.13: Warehouse Management .....	48
Table 4.14: Quality Management .....	48
Table 4.15: Inventory and Material Management.....	49
Table 4.17: Customer Relationship Management.....	50
Table 4.18: Quality Indicators on Supply Chain Performance .....	52
Table 4.19: Time Indicators on Supply Chain Performance.....	53
Table 4.20: Financial Indicators on Supply Chain Performance .....	53
Table 4.21: Productivity Indicators on Supply Chain Performance .....	54
Table 4.22: Challenges of Implementing ERP Applications .....	56

## LIST OF FIGURES

Figure 2.1: Conceptual model.....	33
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## **ABBREVIATIONS AND ACRONYMS**

ARM	Athi River Mining
BSC	Balanced Score Card
CRP	Capacity Requirements Planning
ERP	Enterprise Resource Planning
GDP	Gross Domestic Product
JIT	Just in Time
KAM	Kenya Association of Manufacturers
KISM	Kenya Institute of Supplies Management
KPI	Key Performance Indicator
MRP	Material Resource Planning
MRP II	Manufacturing Resource Planning
SAP	System, Application, Product in data processing
SCM	Supply Chain Management
SCOR	Supply Chain Operations Reference
TOC	Theory of Constraints
TQM	Total Quality Management
VSAT	Very Small Aperture Terminal

## **CHAPTER ONE: INTRODUCTION**

### **1.1 Background of the Study**

The goal for any manufacturing operation be it a discrete or a process manufacturing business is to produce quality products at the lowest possible cost while striving to exceed customer expectations. Lately, manufacturers' supply chains are growing enormously complex. With sourcing, manufacturing, engineering and distribution operations spread increasingly across the globe, shorter product life cycles and ever increasing customer demands, companies large and small have found it ever more difficult to synchronize the pieces ( O'Connor, 2004). The solution to these challenges lies in implementing Enterprise Resource Planning (ERP) systems.

An Enterprise Resource Planning (ERP) system is a large-scale standard software package developed to meet the business requirements of several users. Rashid, Hossain and Patrick (2002) give the following as some of the core ERP modules that are found in the successful ERP systems: accounting, financial, manufacturing, production, transportation, sales and distribution, human resources, customer relationship and e-business among others. The five dominating ERP software suppliers are SAP, Oracle, PeopleSoft, Baan and J.D. Edwards.

The most popular reasons that have been given by firms for implementing ERP systems include the need to standardize and improve processes, to improve information quality, and to improve systems integration (Jacobs, Chase & Aquilano, 2009). Other firms considered extending their system scope to integrate their suppliers, customers or both to the system in order to increase their supply chain functionalities (Olhanger & Selldin,

2003). ERP solutions can be said to be the vital backbone on which effective, cost efficient and dynamic supply chain collaboration can take place.

The benefits that manufacturing firms are expected to achieve when they fully utilize ERP systems in their supply chain processes are reduction of cycle time, better financial management, faster transactions, the linking of the entire organization together seamlessly, responding swiftly to customers, providing instantaneous information, the laying of the ground work for e-commerce, and making tacit knowledge explicit (Mabert, Soni & Venkatachalam, 2001).

### **1.1.1 Manufacturing Planning Systems**

Manufacturing Planning Systems were first achieved in industries such as semiconductors, aerospace, defense and pharmaceuticals. These industries are characterized by high-value products, complex or unstable processing, or heavy governmental regulations. The Manufacturing Planning Systems are an online integrated computerized system that's the accumulation of the methods and tools used to accomplish production. The general functions that they seek to serve include: the management of machine resource availability, prioritization of production schedules, control of the flow of production units between machines, management of available labor, automated document control, and provision of quality process, and maintenance management support (Monk & Wagner, 2006).

According to Drexel and Kimms (1998) Manufacturing Planning Systems provide for the flexible, real-time execution, feedback, and control of a wide range of manufacturing related processes to better meet future market requirements. Their implementation has

significantly extended many firms' current manufacturing capabilities supporting greater vertical and horizontal integration within their manufacturing function.

Material Requirements Planning (MRP) and Manufacturing Resource Planning (MRP II) are predecessors of Enterprise Resource Planning (ERP). MRP is concerned primarily with manufacturing materials while MRP II is concerned with the coordination of the entire manufacturing production, including materials, finance, and human relations. The goal of MRP II is to provide consistent data to all players in the manufacturing process as the product moves through the production line (Ho & Chang, 2001).

### **1.1.2 ERP in the Supply Chain**

Chopra and Meindl (2004) state that a supply chain consists of all parties involved directly or indirectly in fulfilling a customer request. This means that the supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves. The scope of the supply chain begins with the source of supply and ends at the point of consumption. It extends much further than simply a concern with the physical movement of material and is just as much concerned with supplier management, purchasing, materials management, manufacturing management, facilities planning, customer service and information flow as with transport and physical distribution (Mentzer et al., 2001).

ERP is a computer system that integrates application programs in accounting, sales, manufacturing, and other functions in a firm through a database shared by all the application programs (Jacob et al., 2009). The adoption of ERP has made possible the sharing of large amounts of information along the supply chain, and has enabled real time

collaboration between supply chain partners, providing organizations with forward visibility, thus improving inventory management and distribution. ERP can be said to be an essential enabler of SCM competencies (Akkermans, Bogerd, & Yucesan, 2003).

For an organization to provide effective ERP integration to the supply chain management, it should encompass all the functions responsible for development and execution of each of the core functions: plan, source, make, deliver, and return processes, as well as the supporting infrastructure (Cohen, 2006). It has been seen that ERP applications in the supply chain are able to ensure real-time production data exchange with suppliers, eliminate the need for excess stock through demand planning, supply planning, forecasting, automatic allocation, and continuous replenishment programs. This in turn will increase inventory turnover, reduce inventory levels and increase on-time program deliveries. Customer service levels will improve, since an organization is able to track inventory throughout its life cycle and to know at all times what is available-to-promise at all locations (PwC, 2012).

Other benefits of ERP systems implementation include timely deliveries across the supply chain and reduced costs (Mabert et al., 2003), enhanced collaboration among the suppliers and distributors and, standardization, transparency and globalization (Akkermans et al., 2003). Through ERP applications, manufacturing firms are able to recognize where new opportunities for lower costs exists through having a comprehensive supplier database. This means that manufacturers will have real-time connections to respond to changing production demands.

Some of the ERP system modules that are being integrated in the supply chain processes include sales and distribution which helps supply chains in managing the customers' orders day by day, procurement module which helps automate the process of procuring. The production, planning and control module which supports the utilization of manufacturing capacity, parts, components and material resources using historical production data and sales forecasting ([www.eresourceerp.com](http://www.eresourceerp.com)). Other modules include inventory and material management, customer relationship management, quality management, warehouse management, plant and maintenance, excise management, and demand planning module which helps to improve customer service levels and decrease operational costs.

Savvy manufacturing firms have recognized the benefits of integrating ERP systems into their supply chains in order to gain a competitive advantage, by attempting to make products that satisfy customer specific needs, in limited quantities and short production cycles with just-in-time deliveries.

### **1.1.3 Supply Chain Performance**

A supply chain is a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and or information from a source to a customer.

The overall performance of the supply chain significantly affects the financial health of all member companies. According to Van der Vorst (2000) supply chain performance is the degree to which a supply chain fulfills end user requirements concerning the relevant performance indicators at any point in time and at what total supply chain cost.

Srinivasan, Mukherjee and Gaur (2011) defined supply chain performance for a firm as the performance of the various processes included within the firm's supply chain function.

To identify the performance that a supply chain should deliver, there is need to measure different indicators and analyze them. According to Van der Vorst (2000), performance indicators are the criteria with which the performance of products, services and production processes can be evaluated. Davis (1993) came up with the following key performance indicators (KPIs) that can be used for assessing the supply chain performance of a firm; customer satisfaction, inventory costs, number of on-time deliveries, product availability performance, cost reduction and customer response time.

Frazelle (2001) also came up with a model for measuring supply chain performance that is more holistic and consists of four types of indicators which are: quality, time, financial and productivity indicators. Other performance indicators that have been developed over time include indicators from the SCOR model which are; order fulfillment, order fulfillment cycle time, flexibility, adaptability, supply chain management costs, cash-to-cash cycle time and return on fixed assets (Supply Chain Council, 2010).

According to Hsu and Chen (2004) ERP systems can be a useful tool for manufacturing organizations to build a strong information system infrastructure to improve not only the organizational efficiency but the whole supply chain performance. This is because competition today is not limited between companies only, but it has extended to the supply chains as well. These systems are essential in order to improve product quality and customer responsiveness and also enhance information sharing and information

quality among different departments inside the company, as well as extended beyond the company's boundaries to suppliers, customers and other partners in the supply chain. This will eventually enhance the overall supply chain performance.

#### **1.1.4 Large Scale Manufacturing Firms in Nairobi**

Manufacturing is the art of transformation of raw materials into either intermediate goods or final products through mechanized process. Kenya's manufacturing sector forms the core of the industry for economic growth and development because of its immense potential for wealth, employment creation, foreign exchange, foreign investment and poverty alleviation (Bigsten, Kimuyu & Soderbom, 2010). Manufacturing accounted for about 9.4 percent of the country's GDP in the year 2012. This sector is comprised of various sub-sectors and the main dominance is on food-processing industries (Kenya, 2007).

Several ways of classifying manufacturing firms have been used in studies; based on the number of employees and total assets. Bigsten, et al., (2010) used the number of employees to classify manufacturing firms in Kenya. Large scale manufacturing firms have more than 100 employees; medium sized manufacturing firms have between 51-99 workers while small sized manufacturing firms between 11-49 workers. Micro sized manufacturing firms are those with 10 or fewer workers. Haron and Chellakumar (2012) classified Kenyan manufacturing firms in terms of their total assets. Large sized companies are those with total assets above Kshs. 100 million, medium sized companies have total assets worth more than 40 million and small sized companies have total assets below Kshs. 40 million. There are 455 large scale manufacturing firms in Nairobi (KAM, 2012).

Manufacturer supply chains are information intensive supply chains, where the need for, information sharing and coordination is very high. The basic steps in manufacturing processes includes; creating the design for the products, sourcing raw materials, processing the raw materials, production and quality control and distribution. Manufacturer supply chains are likely to benefit from improved information processing, and sharing capabilities enabled by the availability and integration of ERP within the supply chain (Nagery, 2012).

In Kenya, manufacturing companies such as Bidco Oil refineries Ltd, Bamburi Cement Limited, Athi River Mining (ARM), Kenafric and Antarc are some of the manufacturing firms that have deployed ERP systems. Benefits they have gained are better financial control, production planning, plant maintenance, sales and distribution, quality, increased visibility in the supply chain, material payroll management and business intelligence foresight (Okuttah, 2014).

Even as new markets and technologies open up fresh opportunities for manufacturing companies, a series of changes in the environment creates new challenges and uncertainty. The growth of global value chains has increased exposure of many companies to the impact of natural disasters, as Japan 2011 earthquake has demonstrated. After years of focusing on optimizing their value chains for low cost, many manufacturing companies are being forced to reassess the balance between efficiency gains from globally optimized value chains and the resilience of less fragmented and dispersed operations.

Manufacturers also face fluctuating demand and commodity prices, currency volatility, and various kinds of supply chain disruptions that chip away at profits, increase costs, and prevent organization from exploiting market opportunities. Price increases in many commodities in the past decade have all but erased the price declines of the past century. Volatility in raw materials has increased by more than 50 percent in recent years and is now at an all-time high.

Long term shifts in global demand are accompanied by long significant upswings and downswings in demand, driven by changes in customer preferences, purchasing power, and events such as quality problems. Government action is another source of uncertainty. Governments continue to be active in manufacturing policy, even as the path of economic growth and the outlook for fiscal and financial market stability remain (McKinsey and Company, 2012). There is need for manufacturing firms to transform their operations through an integrated solution that directly addresses manufacturing processes within the supply chain.

## **1.2 Statement of the Problem**

Manufacturers in Kenya are facing more competition, more product variables, more regulations, and more cost pressures than ever before. To remain competitive, today's manufacturing firms are looking for ways to drive efficiencies throughout their supply chain processes by reducing costs associated with producing and distributing products in order to compete for market share without eroding their margins. All this is dependent on firms improving their time to market and reducing cycle time by producing products faster and bringing them to the market faster (Milwaukee, 1993).

Going by the recent trends, organizations are moving towards a vertical integration of their technology by paring down the number of software packages they use and maximizing functionality under one roof. This will lead to the integration of the supply chain in the most seamless way and will free companies from the integration challenge with legacy systems that are far from current. This is already being seen in Kenya with Bidco Oil Refineries Ltd which has partnered with some of its suppliers to restock its supplier's outlets directly (Otieno, 2010).

ERP and supply chain performance has attracted attention from many researches as two separate research areas; however few researchers have combined the two. Su and Yang (2009) discussed the reason why ERP systems are indispensable to the SCM. Their results confirm that ERP has a positive relationship on the operational, managerial and strategic performance of an organization but a negative impact on the IT infrastructure and organizational performance.

A survey conducted by Mabert et al. (2000) done on 500 business executives revealed that some of the outcomes of ERP include: quickened response time, increased interaction across the enterprise, improved order management, improved customer interaction, improved on-time delivery, improved supplier interaction, lowered inventory levels, improved cash management, and reduced direct operating costs. On the challenges of implementing ERP a view is expressed by Themistocleous, Irani and O'Keefe (2001) who concluded that in fact up to 70% of Enterprise Systems implemented fail to meet estimated benefits and can result in serious conflicts with business strategies, there are even extreme cases where a company, FoxMeyer Drugs, a \$5 Billion pharmaceutical company filed for bankruptcy over a failed ERP System (Chen, 2001).

In the past decade, most literature in Kenya has focused on reasons for ERP implementation and on the challenges of the implementation itself. Cheboi (2010) established that organizations adopt ERP either for business or technical related reasons in selected corporations. Some of the reasons are to introduce efficiency, to eliminate bureaucracies, to merge processes, and for real-time availability of information for decision making. Nagery (2012) did a study on IT and supply chain integration at BAT and concluded that it increases the information processing capabilities of the suppliers. Kutswa (2012) did a study on the challenges of implementing ERP systems at Kengen. Some of the major challenges identified included, organizational structure incompatible with ERP, ineffective communication, inadequate allocation of resources and high implementation costs.

Most of the studies reviewed did not find any significant performance differences between ERP system adopters and non-adopters both at the supply chain level and overall firm level. From a Delphi Study conducted by Akkermans, et al., (2003), they saw only a modest role for ERP in improving supply chain effectiveness and a clear risk of ERP actually limiting progress in SCM from a strategic perspective because of their low flexibility and their single company scope. Another study by Crumbly (2012) reported that ERP simply did not manage the entire supply chain, leaving significant functionality gaps and information “black holes”. But going with the recent trends, organizations are implementing ERP systems in their supply chain processes expecting improvements in their supply chains such as reduction of cycle time, seamless link to the organization, and

swift response to customers among other benefits. This is a shift from the past, and this presents the knowledge gap which needs to be filled.

This research aims to analyze ERP applications and supply chain performance of large scale manufacturing firms in Nairobi.

### **1.3 Objectives of the Study**

- a) To determine the extent of ERP application usage in the supply chain of large scale manufacturing firms in Nairobi.
- b) To establish the impact of ERP on the supply chain performance for large scale manufacturing firms in Nairobi.
- c) To determine the challenges that are faced in integrating ERP applications in the supply chain of large scale manufacturing firms in Nairobi.

### **1.4 Value of the Study**

This study is important as it contributes to the body of knowledge on ERP systems and their impact in the supply chain performance of manufacturing firms; whose supply chains are growing enormously complex. Academicians and practitioners will use this research as a reference for future studies.

The importance of this study also lies on the role played by the manufacturing sector as a dynamic engine of growth and development as experienced in developed countries. In this way bodies such as the Kenya Association of Manufacturers (KAM) which have been charged with the mandate of formulating strategies that will improve the performance of manufacturing firms will have the right information in enabling Kenyan manufacturing companies to become competitive. The same applies for the Kenya

Institute of Supplies Management (KISM), which oversees all the supply chains management; it can provide the strategy direction towards policies which are important for better supply chain performance.

To the Government of Kenya, the study is an important source of relevant information for formulating policies for industry specific strategies which will increase the efficiency of the manufacturing companies that will enable Kenya to become an industrialized country by 2030 as envisioned in the Vision 2030 document (Kenya, 2007).

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter introduces the review of contextual and theoretical literature relating to ERP adoption and its impact on the supply chain performance in the manufacturing sector. The section documents the critical points knowledge and attempts made in this line by other scholars.

### **2.2 Theoretical Framework**

Currently there is a gap in the literature on SCM and ERP studies present, and no theoretical support for explaining the existence of their boundaries. Few studies have tried to provide theoretical foundations for different areas related to the supply chain and ERP by employing organizational theories. Some of these theories include: Theory of Constraints (TOC), Total Quality Management (TQM), Just in Time (JIT), Porter's Value Chain Model, among others.

The TOC takes a scientific approach to improvement. It hypothesizes that every complex system, including manufacturing processes, consists of multiple linked activities, one of which acts as a constraint upon the entire system. The total process can only be improved when the constraint is improved. This theory can be applied to overcome difficulties in realizing the potential benefits of the manufacturers' supply chain (Forslund & Jonsson, 2013).

TQM is a manufacturing program aimed at continuously improving and sustaining quality products and processes by capitalizing on the involvement of management, workforce, suppliers and customers, in order to meet or exceed customer expectations.

TQM practices identified in the studies are cross-functional product design, process management, supplier quality management, customer involvement, information and feedback, committed leadership, strategic planning, cross-functional training and employee involvement (Min & Zhou, 2002).

JIT is a philosophy aimed at producing and delivering finished goods just in time to be sold, subassemblies just in time to be assembled into finished goods, fabricated parts just in time to go into assemblies, and purchased materials just in time to be assembled in to fabricated parts. The primary goal is to continuously reduce and ultimately eliminate all forms of waste and for full utilization of people equipment, materials and parts (Frohlich & Westbrook, 2001).

Michael Porter came up with a value chain model in 1985 which helps organizations analyze specific activities through enhancing a firm's ability to compete in at least the following areas: infrastructure, human resource management, procurement, technology development and on the primary activities. By evaluating a company based on the value chain framework, organizations have the opportunity of evaluating their entire business in different activities. This gives managers an opportunity to analyze which activities creates the greatest value, and which help to secure competitive advantages, and those that don't add value (Umble & Umble, 2002).

### **2.3 ERP Systems in the Manufacturers' Supply Chain**

ERP and SCM have grown in popularity particularly in the manufacturing sector as the role of data evolves, hence the keen interest by researchers to study this area. A study by Tarn, Yen and Beaumont (2002) on ERP and SCM states the importance of integration in order to foster greater collaboration across multiple enterprises and as a new source of

competitive advantage. The benefits of linking the supply chain functions with the ERP systems, is that an organization can trim down cycle times, reduce inventory, and better connect with suppliers, distributors, and end customers (Stein, 1999).

The use of IT provides the basis for supply chain integration by providing efficient, timely, and transparent business information to the appropriate parties. Sharing of this information enables multiple firms to engage in synchronous decision making and can lead to improvements in production, planning, inventory management, and distribution. Due to its ability to provide vital information to the appropriate parties, Sanders (2007) dubbed IT the "backbone of supply chain business structure."

Shields (2001) indicated in his findings that firms expand the scope of their implementations by web enabling their ERP systems to facilitate self-service usage and link their supply chain activities so as to obtain increased performance benefits. This is as a result among firms that fully integrated system deployment across the supply chain and effective system usage would help garner synergistic benefits. For an organization to provide effective ERP integration to the SCM, it should encompass all the functions responsible for development and execution of each of the core activities: plan, source, make, deliver, and return processes, as well as the supporting infrastructure (Cohen, 2006).

McAfee (1998) from the conclusion of his study envisioned a future where the integration of the ERP systems would extend into transportation, warehousing, sales-force automation, and even beyond that into other areas, and consequently this is possible and feasible since the two systems can integrate and rely on very much alike framework,

such as intranet, extranet and electronic data interchange. This is evident in the current supply chain trends.

In Swedish manufacturing firms Olhager and Selldin (2003) noticed that to implement these ERP systems up to 94% customization on the modules had to be done, for them to function properly with the supply chain processes. The study also found out that the manufacturing firms planned to extend their ERP systems with functional support for upstream and downstream supply chain operations.

Studies indicate that ERP systems are comprised of integrated modules that support intra-firm and inter-firm business activities, and firms implement those ERP system modules, which ensure the availability of full system functionality for meeting all their business needs (Appelrath & Ritter, 2000). Some of the ERP systems that are commonly being implemented include: procurement, sales and distribution, inventory and material management, quality management, manufacturing, planning and control, plant and machine maintenance, warehousing systems and customer relationship systems. They are discussed below.

### 2.3.1 Procurement Management

Procurement management module in ERP streamlines procurement of required raw materials, packaging material, sub assembly and other non-inventory materials (Rai, Patnayakuni & Seth, 2006). It automates the processes of identifying potential suppliers, supplier evaluation, and supplier quote evaluation, awarding purchase order to the supplier, and billing processes. The procurement module is tightly integrated with the inventory and material management and production planning and control modules. This

is the most widely implemented module amongst firms as observed by Olhager and Selldin (2003) on Swedish manufacturing firms. Kiragu (2010) points out that the procurement system will enable an organization analyze the purchasing history, which will help them calculate the total cost of ownership rather than just the purchase price.

### **2.3.2 Sales and Distribution Management**

It comprises of contact management and sales order processing management. Bose, Pal and Ye (2008) state that this function gives users access to aggregated operational data from all sources, and helps them complete their sales cycle from price quotation to invoicing the payment. It is an integrated solution comprising of marketing and sales activities. Organizations can act immediately to improve sales, service and marketing effectiveness by using this module. With this module, it is all about retaining customers, improving customer loyalty and gaining customer insight.

This module also helps an organization to get their customer order management easier day by day through maintaining customer information, quickly creating a quote or migrating the sales order or being responsive to their customers (Olhager & Selldin, 2003). It includes online information tracking and handling at every distributor level, automatic invoice generation and handling of transactions, customer credit control and analysis using customer profiling tools, and printing, editing, and managing sales reports.

### **2.3.3 Inventory and Material Management**

This module provides a powerful and flexible set of features to help a firm manage and report their inventory information. PwC (2012) named inventory as one of the most dangerous assets that a company can have. This is because the risk of it becoming

damaged or obsolete due to a new product design or a customer's changing requirements increases every day that a company holds onto it.

The activities of inventory control involves identifying inventory requirements, setting targets, providing replenishment techniques and options, monitoring item usages, reconciling the inventory balances, and reporting inventory status (Tarn & Beaumont, 2002). Inventory and material management module facilitates processes of maintaining the appropriate level of stock in a warehouse. The inventory and material management module helps the manufacturing process flow more smoothly, and it improves the visibility of the order fulfillment process inside the company (Deloitte Consulting, 1998).

This application provides unsurpassed real-time visibility and control of materials and products, extremely detailed and automatically-captured tracking and traceability data linked directly to raw material, production and quality records. Other benefits include dramatically improved cycle count speed and accuracy (Goyal, 2006).

#### **2.3.4 Quality Management**

This module enables a firm to monitor quality by control plans in purchasing and manufacturing and also provides real-time process capability index for quick review. This application uses tools and techniques such as product specifications, and control plans to maintain accuracy. Other elements of this application include defect and deviation tracking as well as check sheets and process instructions are used to drive inspection data collection for statistical process control. Madapusi (2008) states that firms must deploy the quality management module since it contribute significantly to all performance measures.

Dudgikar, Kumthekar, and Khot (2012) also agree that the quality module nurtures the seeds of lasting improvements in firm performance. The module handles tasks relating to quality planning, inspection and control, and compliance with international quality standards to ensure that firms employ a unified approach to total quality management throughout the entire product life cycle. The key areas covered by the module are inspection, control, certification, notification, and tools. This module also takes care of quality control in various business activities throughout the firm such as procurement, production, financials, controlling, and marketing (Appelrath & Ritter, 2000).

### **2.3.5 Production, Planning and Control Module**

This module addresses the core logistics functions of a firm and coordinates manufacturing and supply efforts on customer orders. The module scope includes key areas such as the different phases, tasks, and methodologies used in production planning (types, material procurement, and time) and the production process itself. The typical components that form part of this module include MRP, capacity requirements planning (CRP), Kanban/JIT, master planning, assembly orders, production orders, service maintenance, sales and operations planning, and work order management (Hernandez, 1998; Appelrath & Ritter, 2000).

Bose, Pal and Ye (2008) bring out the importance of this module since 70-90 percent of a product's cost is locked in before manufacturing even begins. Therefore, it is important to manage the product's development cost early in the process. Bamburi Cement Limited and Bidco Oil Refineries Limited have reported better and enhanced control during production after implementing ERP systems (Otieno 2010).

The production planning and control module allows users to do fixed capacity planning, determine machine utilization, and perform planned vs. actual production. Some of the features this application has include production line planning where users can setup multiple manufacturing lines and specify types of machinery in each line (Reimers, 2002). The software will identify the production bottle-necks and alert if any delays are happening. Another feature is the raw material consumption which tracks at each stage of the production process any work order to determine any deviations in consumption from the standards. Other features include summary reports which can be generated to review production efficiency on a daily, weekly and monthly basis. Production incentive schemes can be tied in and productivity can be tracked over any time frame (Sanders, 2007).

### **2.3.6 Plant and Machine Maintenance Module**

It is used to capture information of equipment maintenance in real time against work requests, breakdown analysis. This module lets a firm schedule maintenance task calendar for all equipment since it stores key data about each piece of equipment, such as type, capacity, service date, and even a digital image. It takes care of the complex maintenance of plant systems and supports graphical representations, connection to geographic information systems, and detailed diagrams (Gargeya & Brady, 2005).

The maintenance module focuses on areas such as planning of preventive maintenance, handling of operational and maintenance problems, equipments, costs, and purchase requisitions (Appelrath & Ritter, 2000). Recent additional functionality has extended this module to include complete lifecycle maintenance management that includes the

productive deployment of people, materials, and assets across diverse areas such as projects, contracts, procurement, property, assets, and field service.

### **2.3.7 Warehouse Management**

The warehouse management module allows the inventory in the organization to always be up to date and correctly valued. The possibility of defining the warehouse structure of the organization to the unit level (bins) facilitates the exact location of the company stock at any time. As a result, inventory monitoring can be improved and the entire supply chain can be designed more efficiently (Obal, 2007).

This module supports integrated functionality that automates inbound, warehousing and outbound operations, resulting in improved productivity, space utilization and customer satisfaction. It provides support to linked facilities, as a result, the inventories of several warehouses can be balanced with one another or particularly high-quality items can be distributed only upon notification from centrally located warehouses. Lee, Zhang and Au (2009) indicate how organizations can benefit from this module by allowing items to be easily tracked with respect to the basic warehousing handling activities such as receiving, putting away, picking and shipping.

### **2.3.8 Customer Relationship Management**

This module is necessary for automating and streamlining of front-office functions such as sales, marketing, collaborative order management, and customer service. Recent functionality additions include real-time availability checks, contract management, billing management, fulfillment visibility, and order tracking besides facilitating marketing

planning, campaign management, telemarketing, lead generation, and customer segmentation (Chalmers, 1999).

This module is useful as it offers consistent and readily available customer and prospect data, allowing an organization to manage pre-sales activities, perform automated sales processes, deliver consistent customer service, and evaluate sales and service successes by identifying trends, problems and opportunities. The importance of this module has been emphasized by Rashid, Hossain & Patrick (2000) for providing information on key customers' needs, values and costs throughout the business life cycle for better understanding of their customers in order to satisfy its customers.

## **2.4 Supply Chain Performance**

Srinivasan et al. (2011) defined supply chain performance for a firm as the performance of the various processes included within the firm's supply chain activity. Companies of all sizes have realized that they no longer have complete control over their market success. This is because they rely heavily on the performance of their supply chain trading partners.

Integrated ERP systems affect all aspects of a business (Hong & Kim, 2001), and the impact is studied at different levels of analysis, including the firm, strategic, organizational, business and financial levels. Mabert et al., (2000) surveyed about 500 business executives, and revealed the following performance outcomes of ERP on the supply chain: quickened response time, increased interaction across the enterprise, improved order management, improved customer interaction, improved on-time delivery,

improved supplier interaction, lowered inventory levels, improved cash management, and reduced direct operating costs.

Madhavan (2000) examined the ERP system implementation in a multinational firm. He reported that successful deployments resulted in benefits such as information availability and quality, integration of processes, inventory management, on-time delivery, productivity, customer satisfaction, cost savings, accurate forecasts, and capacity utilization.

Akkermans et al., (2003) did a Delphi Study with 23 Dutch supply chain executives on the future impact of ERP system on supply chains. The study concluded that ERP had both positive and negative contribution to the supply chain. The positive aspects include the customization of products and services, standardization of processes and information, and transparency. The negative impact included insufficient extended enterprise functionality in crossing organizational borders, inflexible nature towards the dynamic supply chain needs, and their lack of functionality beyond managing transactions and their closed non-modular system architecture.

Su and Yang (2009) in their study based on a Taiwanese industry that manufactures electronics interviewed users, IT technicians, engineers, production planners, supervisors, managers and consultants on the benefits of ERP systems. They confirmed that ERP systems benefitted the operational, managerial, and strategic competencies of a supply chain, but not the IT infrastructure and organizational performance.

A survey on Australian manufacturing, wholesale and, retail companies done by Wieder, Booth, Matolcsy and Ossimitz (2006) on the impact of ERP system revealed that

companies which had implemented ERP systems failed to achieve higher supply chain performance, both in the short and in the long term.

Bose, Pal and Ye (2008) in their research concluded that manufacturing firms were able to get real time inventory information update, better picking activities, and establishment of effective collaboration with vendors and customers, when they installed ERP systems. A study by Crumbly and Fryling (2012) concluded that ERP systems brought about both positive and negative implications. Companies were able to eliminate their paper based systems so orders could be processed much more quickly, therefore improving some business processes, but the supply chain functionality was deficient.

Martin and Cheung (2000) in their case study reported that the ERP systems failed to deliver the expected changes in a supply chain. Rizzi and Roberto (1999) studied the impact of ERP on the efficiency of a manual warehouse. The result presented is that those successful implementations require a balanced approach, whereby the implementation is followed by business and organizational change.

#### **2.4.1 Key Performance Indicators of Supply Chain Performance**

To identify the performance that a supply chain should deliver, there is need to measure different indicators and analyze them. El Sayed (2013) defines KPIs as quantifiable measurements, agreed to beforehand, that reflect the critical success factors of an organization. Neely and Gregory (1995) define a performance indicator as a measure used to quantify the efficiency and effectiveness of an action. Whatever KPIs are selected, they must reflect the organization's goals, they must be key to its success, and they must be quantifiable (measurable).

KPIs usually are long-term considerations. Examples of indicators specifically used to assess the supply chain performance of a firm according to Davis (1993) include: supplier performance, customer satisfaction, inventory costs, number of on-time deliveries, product availability performance and customer response time. Other studies that have been done came up with the following indicators as summarized by Halm (2012): cost minimization, sales maximization, profit maximization, inventory investment minimization, return on investment maximization, stock-out probability minimization, and buyer-supplier benefit maximization among others.

From the SCOR model, the following five KPIs are used: perfect order fulfillment, order fulfillment cycle time, flexibility and adaptability, supply chain management costs, cash-to-cash cycle time and return to fixed assets among others which are linked with the five management processes: plan, source, make, deliver and return (The Supply Chain Council, 2010). Stadler and Kilger (2008) also proposed some KPIs that are applicable in supply chains. They grouped the KPIs into 4 categories: delivery performance, supply chain responsiveness, assets and inventories, and costs. Frazelle (2001) came up with a more holistic model for measuring supply chain performance that consists of four types of indicators: quality, time, financial, and productivity that need to work together.

The KPIs are important in enabling firms to benchmark supply chain performance both internally and externally. This can be through eliminating the non-value adding activities, reducing order variations, having faster product flows, efficient use of time, material and human resources (Frohlich & Westbrook, 2011). It is important to measure the

performance of a supply chain in order to manage and develop the supply chain by controlling, communicating and improving the processes. Performance measurement can be defined as the process of quantifying the efficiency and effectiveness of an action (Gunasekaran & Kobu, 2007). Effectiveness is the extent to which a customer's requirements are met and efficiency measures how economically a firm's resources are utilized when providing a pre-specified level of customer satisfaction. Gunasekaran et al. (2001) classified his model for measuring supply chain performance into: financial and non-financial measures, strategic, tactical and operational measures, and according to supply chain activities which are plan, source, make/assembly and deliver.

The SCOR model is another supply chain performance measurement model that is based on five core processes: plan, source, make, deliver, and return used in conjunction with five performance attributes: reliability, responsiveness, flexibility, cost, and asset metrics (The Supply Chain Council, 2010). The Balanced Scorecard (BSC) is another model that has been adapted to measure supply chain performance by Bhagwat and Sharma (2007). They adapted the BSC model Kaplan and Norton (1992) developed to measure organization performance from four perspectives. These are customer, internal business, financial, and innovation and learning.

## **2.5 ERP Relationship with Supply Chain Performance**

ERP systems are widely believed to contribute to the better performance of the supply chain. The most highly-rated perceived benefits for firms that have adopted ERP applications and their impact on the supply chain performance are in technical areas such as standardization, transparency and globalization. When ERP systems are fully realized in a business organization, they can be expected to yield many benefits to the supply

chain, such as reduction of cycle time, faster transactions, better inventory management and control, the laying of the groundwork for e-commerce, linking the entire organization together seamlessly, providing instantaneous information, and making tacit knowledge explicit (Mabert et al., 2001). ERP can provide the digital nervous system and the backbone in an organization to respond swiftly to customers and suppliers.

Various studies indicate that ERP system implementers can gain sizable inventory reduction and increased inventory turnover benefits by standardizing their inventory management processes and improving performance to industry benchmark levels (Madhavan, 2000). Microsoft Dynamics (2008) in their case study on Southern Power Equipment Company (SPEC), a leading manufacturer of power and distribution transformers in India; after implementing ERP found out that they were able to optimize their inventory. With the help of the new solution, inventory management is more accurately controlled which in turn helps streamlines activities and operations. This gives the organization a clear view of its business, thereby reducing the need to buffer stocks at each process.

Companies such as Bidco and Bamburi Cement Limited have reported that they were able to standardize entire document flows and achieve better inventory quality inspections after ERP implementation (Otieno, 2010). This is because ERP applications impose discipline and consistency on the business processes of the firm. This results in uniform ERP system information outputs available across the firm (Mabert et al., 2001). Kenafic Industries one of the leading manufacturers of footwear and confectionery products, deployed a comprehensive SAP Enterprise Resource Planning (ERP)

management tool, managed to raise its customer satisfaction levels, standardize its processes and cut production costs (Makari, 2014).

ERP has enabled the sharing of information and automation of processes between companies and its customers. The system has also enabled companies to make proper sales forecast and monitor warehouse stock of finished goods. This has led to improved stock monitoring system, while the lead-time for raw materials has also been reduced.

A study by Akkermans et al., (2003) reports that when it comes to the impact of ERP on supply chain, it is deficient and did not manage the entire supply chain. The study concludes that ERP has a clear risk of actually limiting the progress in supply chain management. A study by Hunton et al. (2003) provides evidence on the impact of ERP adoption and overall firm performance by comparing return on assets, return on investments and asset turnover for ERP adopters and non-adopters. Their key results do not indicate a performance improvement for ERP adopters. Some organizations have experienced some problems with unreliable data which can be traced back to data conversion problems experienced during implementation. . It emerged that the figures generated by ERP for one organization were wrong which led to employees underpaying income tax which did not go well with the (Otieno, 2010).

## **2.6 Challenges of Implementing ERP Systems within the Supply Chains**

So many studies have covered the challenges that organizations go through when implementing ERP systems. The cost and time it takes to implement the system is a major challenge. Kirkpatrick (1998) observed that ERP systems can cost a Fortune 500 company \$30 million in license fees and \$200 million in consultation fees, which is not

inclusive of the process design, data conversion, training, integration and testing and it can take three years or more before the system yields its maximum benefit.

Lack of proper “fit” between the technology and the organization’s strategy is another challenge. Chalmers (1999) did a study of SAP R/3 users and he reported that at least 20 percent of their need functionality is missing from the packages. Unreliability of data remains high on the list of challenges. Reimers (2002), while studying Chinese organizations noticed that the managers did not trust the system in terms of data quality, and also in terms of appropriateness of suggested decisions. They preferred to make decisions according to their intuition and experience.

The local legislation does not have a great impact on ERP implementation and usage. Otieno (2010) noted that companies had to configure the ERP system to conform to the taxation policy in Kenya which is cumbersome due to the country's complex taxation policy. Consultants can pose a challenge when implementing ERP systems by causing delays in the going-live of the ERP systems, through bickering among themselves over how to approach the project, rather than partnering with the manufacturing firm (Gargery and Brady, 2005).

Loss of flexibility is another challenge studies have reported. By implementing ERP systems Bidco Oil Refineries Ltd lost one of its competitive advantage of responding quickly to customers’ customization request because of the tightly integrated system, which initially they could meet (Otieno, 2010). Resistance to change is another challenge due to the fears that ERP could lead to loss of jobs during the project initiation stage, or employees may be opposed to the amount of time and money it will cost to get the

project up and running therefore leading to resistance to accept the new systems (Mabert et al., 2001).

Lack of infrastructure poses as a challenge for implementing ERP systems. This is because the soundness of the entire infrastructure is necessary to facilitate complete value chain management enabled by ERP. Bidco Oil Refineries Ltd faced this challenge when it needed to link the various plants within Kenya and other plants in East Africa, but because of the poor network infrastructure it had to set up its own Virtual Small Aperture Terminal (VSAT) which added to the implementation cost (Otieno, 2010).

Bureaucracy in the organization hinders the implementation of ERP in that it slows down the procurement process for new technologies and equipment required for the implementation process (Moturi, 2013). Inadequate training results to major problems such as the system ending up with 'dirty data' which reduces the reliability of the information. This also causes end users at the organization to have low control over ERP system and work processes, and they will not be comfortable with ERP (Mabert et al., 2001).

## **2.7 Summary of the Literature Review**

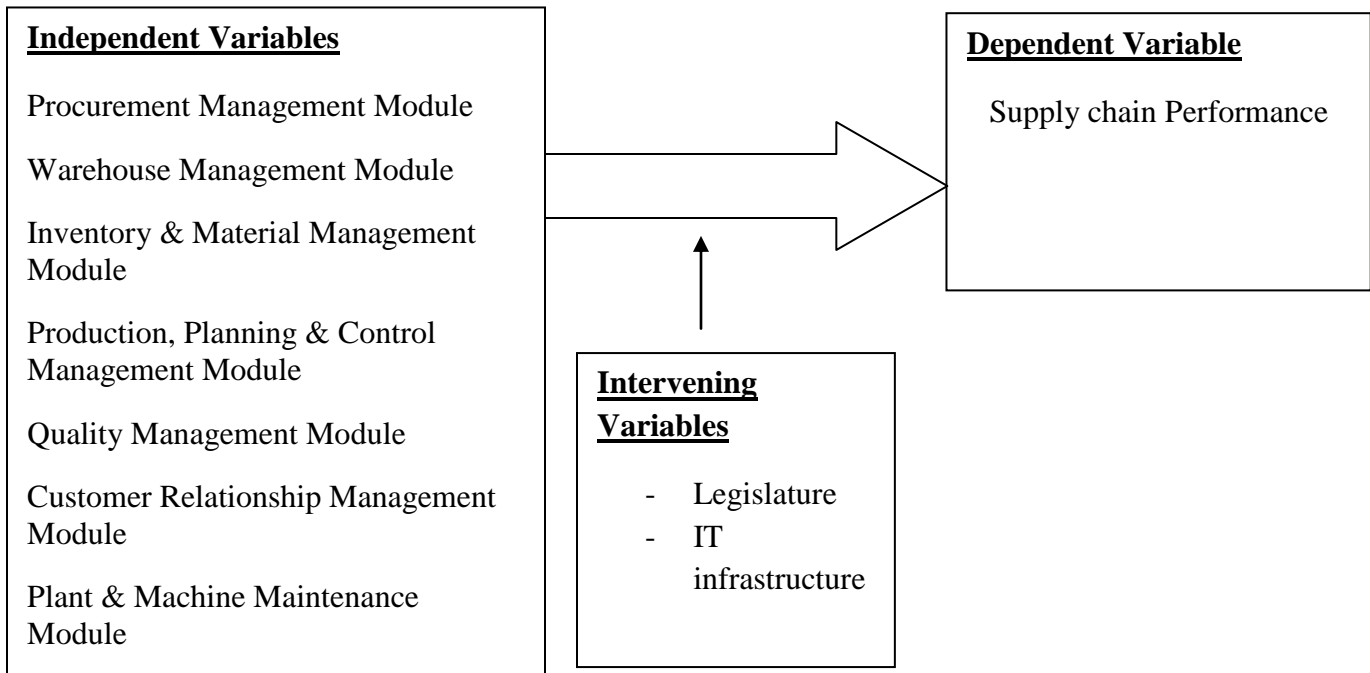
From the literature, it is clear that the impact of ERP in the supply chain has both positive and negative aspects. Initially, organizations only saw a modest role of the ERP systems for their supply chains, but with time, organizations have come to fully appreciate the importance of the system to the supply chain performance despite the challenges they face when implementing. The gains of implementing ERP seem to bear a direct

relationship to the supply chain performance which is what the research wants to establish.

## **2.8 Conceptual Framework**

From the conceptual framework below, it is clear that there are a number of ERP modules that need to be integrated in the supply chain processes of a manufacturing firm. These functions include demand forecasting, procurement, warehouse management, customer relationship management, inventory and material management, quality management, production, planning and control, plant and machine maintenance, and procurement. All these functions are independent variables that lead to supply chain performance. IT infrastructure and legislature either inhibit or enhance the use of ERP applications in an organization. The lack of infrastructure poses as a challenge; this is because the soundness of the entire infrastructure is necessary to facilitate complete value chain management enabled by ERP. The government through its taxation policies has an influence on ERP application implementation; in that organizations have to ensure that their ERP system complies with taxation policies set by the government. Kenyan taxation policies are complex and hard to understand. This has been seen to affect functionalities such as procurement, payroll and finance (Otieno, 2010).

**Figure 2.1: Conceptual model**



**Source: Researcher (2014)**

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.1 Introduction**

The procedures and techniques that were used in the collection, processing and analysis of data were identified in this chapter. The following aspects of the research methodology are discussed; research design, study population, research instruments, validity and reliability, data collection procedures and lastly data analysis.

### **3.2 Research Design**

The study used descriptive survey because of the large target population, which involves both qualitative and quantitative approaches. Cooper and Schindler (2003) state that a descriptive survey seeks to ascertain perspectives of a specified subject by describing the existing phenomena through asking individuals about their perceptions, attitude, behavior or values. The descriptive research design was deemed appropriate to enable the generalization of the study findings on the impact of ERP integration on the supply chain performance of large scale manufacturing firms in Kenya.

### **3.3 Target Population**

The target population of the study comprised all of the 455 large scale manufacturing companies operating in Nairobi. This information is listed in the KAM (2014) directory that contains the list of all the manufacturing and exporting companies that are registered in Kenya.

### **3.4 Sampling Design**

The basic idea behind sampling is that by selecting some of the elements in a population, one can draw conclusions about the entire population. The target respondents for this

study from which a sample of 10% was taken from the target population included Heads of Departments, middle level management and staff all of whom are involved in the supply chain processes of the firm. According to Mugenda and Mugenda (2003), a representative sample should be at least 10% of the population. The sample size was 46 respondents.

Stratified random sampling method was applied to come up with the sample size, since the population in different large manufacturing firms is considered heterogeneous, implying that a simple random sample would have been unrepresentative. This was done to increase the sample's statistical efficiency, and to provide the adequate data for analyzing the various subpopulations or strata. The manufacturing firms under study are divided into 12 main sub-sectors. These were listed below;

**Table 3.1 Sampling Frame**

<b>Sector</b>	<b>No. of Firms</b>	<b>%</b>	<b>Sample</b>
Building, Mining & Construction	6	1.3	1
Chemical and Allied	62	13.6	6
Energy, Electrical and Electronics	42	9.2	4
Food and Beverages	100	22	10
Leather and Footwear	8	1.8	1
Metal and Allied Sector	38	8.4	4
Motor Vehicle and Accessories	17	3.7	2
Paper and Board Sector	48	10.5	5
Pharmaceutical and Medical Equipment	20	4.4	2
Plastics and Rubber	54	11.9	5
Textile and Apparels	38	8.4	4
Timber, Wood and Furniture	22	4.8	2
<b>Total</b>	<b>455</b>	<b>100</b>	<b>46</b>

**Source (KAM, 2014)**

### **3.5 Data Collection**

This study used primary data that was collected by use of a structured questionnaire. The questionnaire had four sections. The first section contained questions on the bio data of the large scale manufacturing firms. The second section intended to answer the first objective; the third section answered objective two questions, while the last section answered objective three questions.

The questionnaires were administered by drop and pick method. The researcher targeted heads of departments, middle level management and staff from procurement, warehousing, marketing, production and operations, who are involved in the supply chain process. Section two to four used the Likert scale to allow the measuring of satisfaction, likelihood, frequency, quality and more.

### **3.6 Data Analysis**

The completed questionnaires were analyzed using descriptive statistics and regression analysis. Descriptive statistics enables the researcher to summarize, organize, evaluate and interpret the data ascertaining the relationship between ERP integration and supply chain performance among the medium and large scale manufacturing firms in Kenya.

The first objective which was to determine the extent of ERP integration in large scale manufacturing firms in Nairobi was determined using descriptive statistics. To address the second objective, i.e. to determine the impact of ERP on the supply chain performance among large scale manufacturing firms in Nairobi, regression analysis was used to determine whether the variables could be categorized into the 8 discussed

variables. For the last objective, of establishing the challenges of ERP implementation within the supply chain of manufacturing firms it was determined by factor analysis.

Regression analysis was used to come up with a model to establish the impact of ERP integration on supply chain performance. This model was used to express the relationship between the dependent and independent variable. The regression model is of the form:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + \varepsilon$$

Where:

Y = Supply Chain performance;

a = constant;

$b_i$  = coefficient of respective independent variables;

$X_1$  = Procurement module;

$X_2$  = Production, planning & control system;

$X_3$  = Inventory management system;

$X_4$  = Warehouse system;

$X_5$  = Sales & Distribution system;

$X_6$  = Quality systems;

$X_7$  = Customer relationship system;

$X_8$  = Plant & machine maintenance system;

$\varepsilon$  = Error term

## **CHAPTER FOUR: DATA ANALYSIS, INTERPRETATION AND PRESENTATION OF RESULTS**

### **4.1 Introduction**

The purpose of this study was to look at Enterprise Resource Planning Applications and Supply Chain Performance of Large Scale Manufacturing Firms in Nairobi. The study had three objectives to achieve: to determine the extent of ERP application usage in the supply chain of large scale manufacturing firms; to establish the barriers in the impact of ERP on supply chain performance for large scale manufacturing firms in Nairobi and to determine the challenges that are faced in integrating ERP in the supply chain o the impact of large scale manufacturing firms in Nairobi. Out of 46 questionnaires administered to the respondents, 37 were returned for data analysis while 9 respondents failed to return the questionnaires.

### **4.2 Response Rate**

The Table 4.1 represents the findings of the response rate on perception of risk factors in relation to road traffic accidents in Kenya. From the table below, it's clear that the study targeted a sample size of 46 respondents from which 37 filled in and returned the questionnaires making a response rate of 80.4%. This response rate was satisfactory to make conclusions on the perceptions and awareness of risk factors underlying the growing traffic crash problem in order to inform the planning of accident countermeasures. According to Mugenda and Mugenda (2003), a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and over is excellent. Based on the assertion, the response rate was considered to excellent.

**Table 4.1: Response Rate**

<b>Response</b>	<b>Frequency</b>	<b>Percentage</b>
Response	37	80.4
Non Response	9	19.6
<b>Total</b>	<b>46</b>	<b>100.0</b>

**Source, Author (2014)**

### **4.3 Demographic Information**

The researcher presented the results in frequencies and percentages and discussed the analysis of the findings from the completed questionnaires to give an interpretation of the research questions. The aim of this information was to assist the researcher connect a few characteristics of the manufacturing organization to ERP applications and supply chain performance.

#### **4.3.1 Level of Education of the Respondents**

The researcher asked this question in order to establish the education level of respondents from the various manufacturing firms. One of the challenges faced by manufacturing firms is lack of personnel with the right training. Table 4.2 presents the frequencies and percentages of the respondents from the manufacturing firms.

**Table 4.2 Level of Education of the Respondents**

<b>Response</b>	<b>Frequency</b>	<b>Percent</b>
Postgraduate	15	40.5
Degree	16	43.2
Diploma	5	13.5
Others	1	2.7
<b>Total</b>	<b>37</b>	<b>100.0</b>

**Source, Author (2014)**

From the table above on the age level of education of the respondents, the study requested the respondents to indicate their level of education, from the findings, it is clear that most of the respondents as shown by 43.2% indicated that they had a degree, 40.5% of the respondents indicated they had a post graduate degree, 13.5% had diploma qualification whereas 2.7% of the respondents indicated they had other qualification, this is an indication that respondents were well educated. The respondent level of education determines the credibility of information they give to the study.

#### 4.3.2 Age of the Respondents

The respondents were asked to give this information to enable the researcher establish the age groups of the employees working for the manufacturing firms in Nairobi.

**Table 4.3: Age of the Respondents**

<b>Response</b>	<b>Frequency</b>	<b>Percent</b>
21-30yrs	22	59.5
31-40yrs	7	18.9
41-50yrs	5	13.5
Above 50yrs	3	8.1
<b>Total</b>	<b>37</b>	<b>100.0</b>

**Source, Author (2014)**

From Table 4.3 above on the age of the respondents, it is clear that most of the respondents as shown by 59.5% indicated that they were aged above 21 - 30 years, 18.9% of the respondents indicated 31 - 40 years, 13.5% of the respondents were between 41 - 50 years, 8.1% of the respondents were between above 50 years, this is an indication that respondents were well distributed in term of their age.

### 4.3.3 Years of Working in the Organisation

Table 4.4 shows the results of the period of working or the number of years that the respondents have worked in the manufacturing organization.

**Table 4.4: Years of Working in the Organisation**

<b>Response</b>	<b>Frequency</b>	<b>Percent</b>
0-5yrs	4	10.8
6-11yrs	7	18.9
12-17yrs	13	35.1
18-23yrs	7	18.9
24-29yrs	6	16.2
<b>Total</b>	<b>37</b>	<b>100.0</b>

**Source, Author (2014)**

It is clear that most of the respondents as shown by 35.1% had worked for 12-17 years, 18.9% of the respondents indicated they had worked for 6-11 years and 18-23 years, 16.2% had worked for 24-29 years whereas 10.8% of the respondents indicated they had worked for 0-5 years, this is an indication that respondents were in the organisation for a good period of time. Nzuve (2004) found out that respondent period of service in an organization is necessary for him or her to have better understanding of the organization.

### 4.3.4 Number of Employees in the Organisation

The study sought to establish the number of employees from each of the large scale manufacturing firms in Nairobi.

**Table 4.5: Number of Employees in the Organisation**

<b>Response</b>	<b>Frequency</b>	<b>Percent</b>
50 – 99 people	6	16.2
Above 100 people	31	83.8
<b>Total</b>	<b>37</b>	<b>100.0</b>

**Source, Author (2014)**

Results in Table 4.5 above on the number of employees in the organization, shows that majority of the respondents as shown by 83.8% indicated that they had above 100 employees whereas 16.2% had between 50-99 employees. The results therefore reveal that majority of the large scale manufacturing firms have more than 100 employees and hence are large enough to embrace the use of ERP applications to impact on their supply chain performance in their supply chain functions.

#### **4.3.5 Number of Years the Firm has been in Operation**

The study sought to establish the period the large scale manufacturing firms have been in operation.

**Table 4.6: Number of Years the Firm has been in Operation**

<b>Response</b>	<b>Frequency</b>	<b>Percent</b>
6 - 10yrs	4	10.8
11 - 15yrs	5	13.5
More than 15 years	28	75.7
<b>Total</b>	<b>37</b>	<b>100.0</b>

**Source, Author (2014)**

Table 4.6 shows that most of the large scale manufacturing firms whose percentage is 75.7% have been in operation for more than 15 years. 13.5% of the manufacturing firms

had been in operation for 11-15 whereas 10.8% of the firms had been in operation for 6-10 years; this is an indication that the firms were in operation for a good period of time.

#### 4.3.6 Ownership of the Organisation

The researcher asked this question to know the ownership structures of the large scale manufacturing firms.

**Table 4.7: Ownership of the Organisation**

<b>Response</b>	<b>Frequency</b>	<b>Percent</b>
Foreign	11	29.7
Local	14	37.8
Both	12	32.4
<b>Total</b>	<b>37</b>	<b>100.0</b>

**Source, Author (2014)**

The study findings from Table 4.7 on the ownership of the organization above shows that locally owned large scale manufacturing firms take the bulk of the respondents, 32.4% were from both local and foreign whereas 29.7% of the respondents were from foreign firms; this is an indication that the firms were well distributed in form of ownership.

#### 4.3.7 Turnover of the Organisation

**Table 4.8: Turnover of the Organisation**

<b>Response</b>	<b>Frequency</b>	<b>Percent</b>
0-39m Ksh	1	2.7
40-99m Ksh	11	29.7
Above 100m Ksh	25	67.6
<b>Total</b>	<b>37</b>	<b>100.0</b>

**Source, Author (2014)**

The study findings from Table 4.8 shows that most of the organizations had a turnover of above Ksh 100 million as shown by 67.6%, 29.7% had a turnover of between Ksh 40-99 million whereas 2.7% of the firms had Ksh 0-39 million, this is an indication that most of the firms had a good turnover. Haron and Chellakumar (2012) used the turnover of an organization as a way of classifying manufacturing companies.

#### **4.4 Extent of ERP Application in the Supply Chain**

One of the specific objectives of this study was to establish the extent of ERP applications in the supply chain of large scale manufacturing firms in Nairobi. The respondents were provided with a set of questions that were meant to establish the extent of ERP application in the supply chain. The researcher came up with areas in each ERP application that respondents could choose as being used in their firm. Table 4.9 shows the mean scores and the standard deviation of the variables used in the analysis of the extent of ERP applications in the supply chain of large scale manufacturing companies. The mean scores were structured in an order of highest to lowest scores. Means with the highest score indicated the variables which are best used to impact supply chain performance. For this case, the most used application is the sales and distribution management application and the least used is the plant and machine maintenance management application.

**Table 4.9 ERP Applications used by Manufacturing Firms**

<b>Response</b>	<b>Mean</b>	<b>Std. Deviation</b>
Procurement Management	3.28	1.083
Production Planning and Control Management	3.49	1.151
Sales and Distribution Management	3.71	1.193
Warehouse Management	3.49	2.711
Quality Management	3.46	1.619
Inventory and Control Management	3.48	1.136
Plant and Machine Maintenance Management	2.96	1.340
Customer Relationship Management	3.41	1.084

**Source, Author (2014)**

#### **4.4.1 Extent of Application of ERP on Procurement management**

When it comes to ERP application in the procurement module, majority of the respondents agreed that they used billing process with a mean of 3.73. This is evident from the findings tabulated in Table 4.10. This was followed by supplier quote evaluation that tied with award of purchase order to the supplier with a mean of 3.22, and finally identification of potential suppliers with a mean of 2.95.

**Table 4.10: Extent of Application of ERP on Procurement Management**

<b>Response</b>	<b>Mean</b>	<b>Std. Deviation</b>
Award of purchase order to the supplier	3.22	1.228
Identification of potential suppliers	2.95	1.153
Supplier quote evaluation	3.22	1.182
Billing process	3.73	.769

**Source, Author (2014)**

#### **4.4.2 Production, Planning and Control Management**

The findings of the analysis of the production, planning and control module are tabulated in Table 4.11. From the findings on the statements relating to application of ERP on production, planning and control management, majority of the respondents as shown by mean of 3.97 agreed that they applied production planning, 3.84 agreed that they used material requirement planning, 3.76 used capacity planning, 3.11 used machine allocation details while 2.78 used shift allotments details.

**Table 4.11: Production, Planning and Control Management**

<b>Response</b>	<b>Mean</b>	<b>Std. Deviation</b>
Material requirement planning	3.84	.928
Production planning	3.97	.928
Capacity planning	3.76	1.278
Machine allocation details	3.11	1.308
Shift allotment details	2.78	1.315

**Source, Author (2014)**

#### 4.4.3 Sales and Distribution Management

From the findings on the statements relating to application of ERP on sales and distribution management in Table 4.12, majority of the respondents as shown by a mean of 3.84 agreed that they used order confirmation, 3.78 agreed that they used order tracking, 3.65 used sales focus while 3.57 used purchase order confirmation.

**Table 4.12: Sales and Distribution Management**

<b>Response</b>	<b>Mean</b>	<b>Std. Deviation</b>
Sales focus	3.65	1.418
Order confirmation	3.84	1.014
Order tracking	3.78	1.272
Purchase order confirmation	3.57	1.068

#### 4.4.4 Warehouse Management

From the findings on the statements relating to application of ERP on warehouse management as illustrated in Table 4,13, majority of the respondents as shown by a mean of 4.24 agreed that they used shelf life management tracking expiration and automatically identifying non-conforming inventory, 3.35 agreed that they used scheduling of picking, putaways, order staging, dock and container management etc., 3.32 agreed that they used handling of shipment when it comes while 3.08 used slotting storage locations.

**Table 4.13: Warehouse Management**

<b>Response</b>	<b>Mean</b>	<b>Std. Deviation</b>
Scheduling of picking, putaways, order staging, dock and container management	3.35	1.252
Handling of shipment when it comes	3.32	1.313
Shelf life management tracking expiration and automatically identifying non-conforming inventory	4.24	6.784
Slotting storage locations	3.08	1.498

**Source, Author (2014)**

#### **4.4.5 Quality Management**

From the findings on the statements relating to application of ERP on quality management, majority of the respondents as shown by a mean of 3.76 agreed that they did inventory inspections, 3.70 agreed that they used raw material quality check, 3.57 agreed that they conducted audit of products and processes, 3.16 conducted Environmental compliance monitoring while 3.11 conducted calibration checks using the quality management application of the ERP. This is tabulated in Table 4.14.

**Table 4.14: Quality Management**

<b>Response</b>	<b>Mean</b>	<b>Std. Deviation</b>
Raw material quality check	3.70	1.392
Calibration checks	3.11	1.390
Environmental compliance monitoring	3.16	1.385
Audit of products and processes	3.57	1.168
Inventory inspections	3.76	1.140

**Source Author (2014)**

#### 4.4.6 Inventory and Material Management

From the findings on the statements relating to application of ERP on inventory and material management in Table 4.15, majority of the respondents as shown by a mean of 3.68 agreed that they used this ERP application to come up with warehouse transaction reports, 3.62 agreed that they conducted ageing analysis, 3.59 agreed that they conducted material requisition, 3.27 used the application to come up with goods received note (GRN) approval while 3.22 used the application to come up with the stock in hand reports.

**Table 4.15: Inventory and Material Management**

<b>Response</b>	<b>Mean</b>	<b>Std. Deviation</b>
Ageing analysis	3.62	1.299
Warehouse transaction reports	3.68	1.180
Material requisition	3.59	0.927
Stock in hand reports	3.22	0.947
Goods received note (GRN) approval	3.27	1.326

**Source Author (2014)**

#### 4.3.7 Plant and Machine Maintenance

The findings on the statements relating to application of ERP on plant and machine maintenance in Table 4.16, illustrates that majority of the respondents as shown by a mean of 3.05 agreed that they used ERP application to record all maintenance performed on equipment, 3.00 agreed that they used ERP application to maintain labor tracking, 2.95 agreed that they conducted spare parts tracking, while 2.84 of the firms conducted preventive maintenance using the ERP applications.

**Table 4.16: Plant and Machine Maintenance**

<b>Response</b>	<b>Mean</b>	<b>Std. Deviation</b>
Maintenance labor tracking	3.00	1.374
Preventive maintenance	2.84	1.344
Spare parts tracking	2.95	1.353
Records of all maintenance performed on equipment	3.05	1.290

**Source, Author (2014)**

#### **4.3.8 Customer Relationship Management**

The findings on the statements relating to application of ERP on customer relationship management in Table 4.17, majority of the respondents as shown by a mean of 3.89 agreed that they use the application for the management of automated sales processes, 3.43 agreed they use the application to foster and prospect customer relationships. Other areas of ERP application that are significant in customer relationship management include: identification of trends, problems and opportunities with a mean of 3.35, access to centralized customer information with a mean of 3.32, delivery of consistent superior customer service 3.30, and the category with the least mean of 3.22 is the management of pre-sales activities.

**Table 4.17: Customer Relationship Management**

<b>Response</b>	<b>Mean</b>	<b>Std. Deviation</b>
Delivery of consistent superior customer service	3.30	1.102
Identification of trends, problems and opportunities	3.35	1.086
Fostering of customer and prospect relationships	3.43	1.094
Management of automated sales processes	3.89	0.936
Access to centralized customer information	3.32	1.132
Management of pre-sales activities	3.22	1.158

**Source, Author (2014)**

## **4.5 Supply Chain Performance**

To measure how ERP impacts on the supply chain performance of a manufacturing firm, the researcher came up with the key performance indicators that can be used in assessing the supply chain performance. Frazelle (2001) came up with a model for measuring supply chain performance that is more holistic and consists of four types of indicators which are: quality, time, financial and productivity indicators.

### **4.5.1 Quality Indicators on Supply Chain Performance**

Quality indicators are used to show how a firm is performing a specific activity. Under quality indicators, five areas were used to measure supply chain performance which are: supplier rejection rate, quality of delivery documentation, level of suppliers defect free deliveries, delivery performance and supplier performance. From the findings on Table 4.18, on the statements relating to application of ERP on supply chain performance, majority of the respondents used supplier and delivery performance as a quality indicator for the supply chain performance which had means of 4.68 and 3.95 respectively. Supplier rejection rate was the least used indicator to affect supply chain performance with a mean of 2.97.

**Table 4.18: Quality Indicators on Supply Chain Performance**

<b>Supplier</b>	<b>Mean</b>	<b>Std. Deviation</b>
Supplier rejection rate	2.97	0.957
Quality of delivery documentation	3.03	1.093
Level of suppliers defect free deliveries	3.43	1.191
Delivery performance	3.95	1.026
Supplier performance	4.68	4.905

**Source, Author (2014)**

#### **4.5.2 Time Indicators on Supply Chain Performance**

Time indicators are an important aspect when it comes to assessing the supply chain performance of manufacturing firms since they focus on the time it takes to complete specific activities. They show where saving time during specific activities can improve the overall supply chain performance.

Different characteristics of time indicators are used such as: total supply chain cycle time, total cash flow time, order lead time, delivery lead time, product development cycle time, purchase order cycle time, planned process cycle time and responsiveness to urgent times. From the findings as illustrated in Table 4.19, the top three indicators used by firms were total supply chain cycle with a mean of 3.97, delivery lead time with a mean of 3.97 and total cash flow time with a mean of 3.95.

**Table 4.19: Time Indicators on Supply Chain Performance**

<b>Response</b>	<b>Mean</b>	<b>Std. Deviation</b>
Total supply chain cycle time	3.97	1.166
Total cash flow time	3.95	0.998
Order lead time	3.92	1.187
Delivery lead time	3.97	1.093
Product development cycle time	3.89	1.022
Purchase order cycle time	3.81	1.126
Planned process cycle time	3.76	1.211
Responsiveness to urgent deliveries	3.84	1.280

**Source, Author (2014)**

#### **4.5.3 Financial Indicators on Supply Chain Performance**

Financial indicators help managers identify the supply chain cost drivers and help move toward a more efficiently managed supply chain. From the findings on the statements relating to financial indicators on supply chain performance as illustrated in Table 4.20, majority of the respondents used cost per hour operation as a financial indicator. Other frequent indicators include supplier performance with a mean of 3.84, information carrying cost 3.77, and supplier cost savings initiatives with a mean of 3.59.

**Table 4.20: Financial Indicators on Supply Chain Performance**

<b>Response</b>	<b>Mean</b>	<b>Std. Deviation</b>
Variations against budget	3.57	1.324
Accuracy of forecasting techniques	3.19	0.995
Supplier cost savings initiatives	3.59	0.896
Cost per hour operation	3.98	1.067
Supplier performance	3.84	1.107
Information carrying cost	3.77	1.226

**Source, Author (2014)**

#### 4.5.4 Productivity Indicators on Supply Chain Performance

These indicators examine how well resources are used. The most used indicator in this category is the capacity utilization which had a mean of 3.46 as illustrated in Table 4.21. The means of the other indicators include flexibility of service system to meet particular customer needs with a mean of 3.43, effectiveness of master production schedule 3.32 and range of products with a mean of 3.24.

**Table 4.21: Productivity Indicators on Supply Chain Performance**

<b>Response</b>	<b>Mean</b>	<b>Std. Deviation</b>
Range of products and services	3.24	1.164
Flexibility of service system to meet particular customer needs	3.43	1.094
Effectiveness of master production schedule	3.32	1.056
Capacity utilization	3.46	1.043

**Source, Author (2014)**

#### 4.6 Challenges of Implementing ERP Systems

This section of the questionnaire was used to identify and rank the challenges of implementing ERP applications in large scale manufacturing firms in Nairobi. In answering the research question, 20 factors (explanatory variables) were identified as possible challenges of implementing ERP applications. Each of the respondents reviewed each challenge captured on the questionnaire and responded on a 5 point Likert scale from five (very great extent) to one (no extent at all). Descriptive statistics was used with the aid of statistical packages for social science (SPSS) to derive further analysis of this section. Descriptive statistics captured in Table 4.4 indicated the mean scores and standard deviation for the various explanatory variables considered in establishing the

challenges of implementing ERP applications among large scale manufacturing firms in Nairobi.

From the findings in Table 4.22, the large scale manufacturing firms in Nairobi were to a small extent (mean  $\leq 2.99$ , with a significant standard deviation) faced with the following challenges in implementing ERP applications: vendors unreliability, system incompatibility and over customization of software. The findings are in agreement with Otieno (2010) who asserts on the issue of incompatibility, that managers and staff feel that the features incorporated in the ERP sometimes undermine the management control.

The results also indicate that to moderate extent ( $3.0 \geq \text{mean} \leq 3.4$ ) the firms face the challenge of lack of top management support, high system costs, resistance to the new system, lack of proper fit between technology and organization strategy, lack of training for employees, data inaccuracy, lack of infrastructure, sharing and control of information, local legislation, loss of flexibility, bureaucracy, inherent complexity of ERP, trust and security issues and corporate culture. It is also clear that to a very large extent (mean  $3.5 \geq \text{mean} \leq 4.0$ ), there is the problem of managing consultants, long customization period, unrealistic expectations and ineffective communication. Organizations should therefore manage their consultants to ensure there is smooth implementation of ERP system and also communicate to their employees effectively such that they are aware of what is happening at every phase.

**Table 4.22: Challenges of Implementing ERP Applications**

Response	Mean	Std. Deviation
Lack of top management support	3.46	1.070
Managing consultants	3.51	1.070
High systems cost	3.35	1.252
Resistance to the new system	3.22	0.886
Long customization period	3.59	0.985
Lack of proper fit between technology and organization strategy	3.32	1.011
Lack of training by employees	3.16	1.068
Data inaccuracy	3.11	1.308
Lack of infrastructure	3.14	1.206
Sharing and control of information	3.19	0.967
Local legislation	3.00	1.027
Loss of flexibility	3.49	0.961
Bureaucracy	3.11	1.242
Vendors unreliability	2.78	1.109
System incompatibility	2.86	0.822
Over customization of software	2.84	0.866
Inherent complexity of ERP implementation	3.38	0.953
Trust and security issues	3.16	1.068
Unrealistic expectations and effective communication	3.57	1.068
Corporate culture	3.30	1.127

**Source, Author (2014)**

#### **4.7 Regression Analysis**

A regression analysis was conducted to establish the form of relationship between supply chain performance and Enterprise Resource Planning applications as presented by procurement management, production planning and control management, sales and distribution management, warehouse management, quality management, inventory and

material management, plant and machine maintenance, customer relationship management. The results are presented below.

**Table 4.23 Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.753(a)	0.567	0.444	0.765

**Source, Author (2014)**

Where:

a - is the Predictors (Constant): Procurement Management, Production planning and control management, Sales and distribution management, Warehouse management, Quality management, Inventory and material management, Plant and machine maintenance, Customer relationship management

R - is the co-efficient value used to show the linear relationship between the dependent and the independent variables in the regression analysis.

R-Squared is the coefficient of determination which tells us how supply chain performance varied with Enterprise Resource Planning applications (procurement management, production planning and control management, sales and distribution management, warehouse management, quality management, inventory and material management, plant and machine maintenance, customer relationship management).

The results in Table 4.23 above show that the value of the Adjusted R-squared is 0.444.

This implies that Enterprise Resource Planning applications explained 44.4% of supply

chain performance at a 95% confidence level. The remaining 55.6% would be explained by other variables not included in the specific variables of the study.

**Table 4.24 ANOVA**

<b>Model</b>		<b>Sum of Squares</b>	<b>Df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
1	Regression	21.502	8	2.688	4.591	0.001(a)
	Residual	16.390	28	.585		
	Total	37.892	36			

**Source, Author (2014)**

Where:

a - is the Predictors (Constant): Procurement Management, Production planning and control management, Sales and distribution management, Warehouse management, Quality management, Inventory and material management, Plant and machine maintenance, Customer relationship management and quality management.

b - is the dependent variable which is Supply Chain Performance

The study used ANOVA to establish the significance of the regression model from which an f-significance value of  $p=0.001$  was established. This shows that the regression model has 0.001 (0.1%) likelihood or probability of giving a wrong prediction. This therefore means that the regression model has a confidence level of over 95% hence high reliability of the results.

**Table 4.25 Coefficients Results**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.851	0.757		2.443	0.021
	Procurement Management	0.061	0.161	0.068	3.377	0.009
	Production, planning and control management	0.070	0.233	0.063	4.301	0.006
	Sales and distribution management	0.131	0.140	0.180	0.932	0.035
	Warehouse management	0.010	0.133	0.013	0.079	0.938
	Quality management	0.174	0.116	0.236	3.497	0.046
	Inventory and material management	0.170	0.176	0.154	2.965	0.043
	Plant and machine maintenance	0.015	0.141	0.019	0.104	0.918
	Customer relationship management	0.617	0.142	0.662	4.346	0.000

**Source, Author (2014)**

Where:

a - is the dependent variable: Supply Chain performance

The study shows that there was a positive association between supply chain performance and all the Enterprise Resource Planning applications variables as shown; procurement management (0.061), production, planning and control management (0.070), sales and distribution management (0.131), warehouse management (0.010), quality management (0.174), plant and machine maintenance (0.015), customer relationship management (0.617). This implies that a unit increase in Enterprise Resource Planning applications will lead to an increase in supply chain performance by a unit of 0.061, 0.070, 0.131,

0.010, 0.174, 0.170, 0.015 and 0.617 respectively. From the regression model, the following regression equation was established:

$$Y = 1.851 + 0.061X_1 + 0.070X_2 + 0.170X_3 + 0.010X_4 + 0.131X_5 + 0.174X_6 + 0.617X_7 + 0.015X_8$$

The study further established that there is a significant relationship between supply chain performance and six of the variables as shown by the B values: Procurement Management ( $p=0.009<0.05$ ), Production, planning and control management ( $p=0.006<0.05$ ), Sales and distribution management ( $p=0.035<0.05$ ), Quality management ( $p=0.046<0.05$ ), Inventory and material management ( $0.043<0.05$ ), Customer relationship management ( $0.000<0.05$ ).

#### **4.8 Implication on Policy, Theory and Practice**

This study is expected to make impacts on existing organizational policy, theory and practice. Organizations implementing ERP projects will draw from the nine challenging areas encountered in the implementation of ERP strategy on firms and accordingly adjust their policy frameworks to mitigate against the risks that accompany ERP implementation; thereby ensuring a smoother ERP implementation process and timely cost effective attainment of anticipated benefits. According to Abiero (2010), the study can be used to put in place policies that ensure synergy in project implementation. The study will as well enrich the existing literature on implementation of ERP as a strategy and its challenges and advance scholarly research on this subject. This study will enable firms to increasingly view ERP as a potential business strategy to enhance their efficiency and competitiveness of their supply chain performance.

In practice, the results of this study provide a confirmation that once manufacturing companies adopt ERP applications; their supply chain performance is likely to improve which is important with all the global competition that is going around threatening the existence of manufacturing firms. Firms' management should also identify emerging challenges not cited in this study and set up mechanisms of dealing with those challenges.

## **CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 Introduction**

This chapter presents a summary of the key findings of the study, conclusions, limitations faced, and recommendations of the study. The goal of conclusions and recommendations drawn are meant to address the research objectives which were: to determine the extent of ERP application usage in the supply chain of large scale manufacturing firms; to establish the barriers in the impact of ERP on supply chain performance for large scale manufacturing firms in Nairobi and to determine the challenges that are faced in Nairobi.

### **5.2 Summary**

The study reveals that majority of the large scale manufacturing firms in Nairobi are using the ERP applications in their day to day operations. For instance it can be seen from the findings that most of the manufacturing firms are using at least some of the eight applications that had been identified. Results after analysis reveal that the most common applications adopted in the manufacturing firms according to their mean include: sales and distribution, production planning and control, warehouse management, inventory and control, quality management, and customer relationship management. The application that had average popularity was procurement. The application that was least used by the manufacturing firms was the plant and machine maintenance. The most popular applications being used by the manufacturing firms could be as a result of the important role they play in order for a manufacturing firm to run smoothly and that is why most of the firms from the various manufacturing firms had implemented them.

The findings of this research also indicated there is a positive and significant relationship between ERP applications and supply chain performance as evident from the regression analysis. The study concludes that six out of the eight variables play a significant role. These applications are Procurement (0.061), Production, Planning and Control (0.070), Sales and Distribution (0.131), Quality Management (0.174), Inventory and Control Management (0.170) and Customer Relationship Management (0.617). Out of all these applications it is apparent that Customer Relationship Management ranks highly and this could be attributed to the paradigm shift of organizations towards customer oriented business philosophy. From the study Enterprise Resource Planning applications explained 44.4% of supply chain performance at a 95% confidence level. The remaining 55.6% would be explained by other variables not included in the specific variables of the study.

The research also established how ERP impacts on the supply chain performance of a manufacturing firm. This is through the key performance indicators that were identified by Frazelle (2001) that are used in assessing the supply chain performance. The four types of indicators are identified were quality, time, financial and productivity indicators. Under quality indicators, five areas were used to measure supply chain performance. Of all the five indicators, the ERP applications had a great impact on supplier performance and delivery performance. For time indicators, ERP applications had a major impact on the delivery lead time, total supply chain cycle time, total cash flow time, order lead time, and product development cycle time. The results of the financial indicators show that ERP applications had an impact on the cost per hour operation, supplier performance, information carrying cost and supplier costs savings initiatives. On the last indicator

productivity, ERP applications had a major impact on capacity utilization, and flexibility of service system to meet particular customer needs.

The major findings when it comes to the challenges of implementing ERP, it is evident that most of the firms talked of the long customization period being a challenge. Other challenges raised included unrealistic expectations, loss of flexibility, and management of consultants and lack of top management support. To overcome the problem of long customization period, firms should roll out the ERP modules in stages and try not to attempt to implement other applications simultaneously. Another important factor to consider is not speeding up the timeline (Barton, 2001).

From the study, it is recommended that to avoid issues with the consultants the project lead should interview the staff proposed for the project, and ensure that the contract stipulates that those same people will work on the project, and in some cases remuneration may be based upon the successful completion of the project. To avoid the problem of mismanaging user expectations, the firm must be able to explain what can and cannot be achieved, understand the user expectations and prioritize the user expectations and communicate the priorities to the user community (Hill, 2000).

### **5.3 Conclusions**

The study found out that the following were important quality indicator in the following order; supplier performance, delivery performance, suppliers defect free deliveries and delivery documentation. On the other hand, Majority of the firms conducted warehouse transaction reports, had records of all maintenance performed on equipment and they managed automated sales processes.

From the analysis aspects such as total supply chain cycle and delivery lead time, total cash flow time, order lead time, product development cycle time, responsiveness to urgent deliveries, purchase order cycle time and planned process cycle time were important time indicators. The study also identified as important financial indicators such as; cost per hour operation, supplier performance, information carrying cost, supplier cost savings initiatives, variations against budget, accuracy of forecasting techniques, cost per hour operation, supplier performance, information carrying cost, supplier cost savings initiatives, variations against budget and accuracy of forecasting techniques.

The study finally concludes that some of the challenges of implementing ERP Systems are long customization period, unrealistic expectations and effective communication, managing consultants, loss of flexibility, lack of top management support, inherent complexity of ERP implementation, high systems cost, lack of proper fit between technology and organization strategy, corporate culture, resistance to the new system is a challenge, sharing and control of information, trust and security issues and lack of employee training, lack of infrastructure is a challenge, bureaucracy and data inaccuracy, local legislation, system incompatibility, over customization of software and vendors unreliability.

#### **5.4 Limitations of the Study**

The findings of this study should be interpreted within the limitations of the study. At the outset, there are limitations of measurement, which are common to social researches. Interviewees' perceptions may change over time and vary with personal inclinations based on individual experience with ERP. Also interviewees may express prejudiced views or offer insincere reply.

Secondly, the study was constrained with time on the part of the interviewees and the researcher. The interviews were not as exhaustive as was envisaged considering that interviews were conducted amid interviewees' pressing work schedules; this robbed the interviews of valuable time to give well thought out responses. The study was thus deprived of ample opportunity for snooping on the questions of interview.

### **5.5 Recommendations**

This study provides manufacturing organizations with key recommendations on how ERP applications impact the supply chain performance which is a strategic tool for competitive advantage, since competition today is based on supply chain versus supply chain and not business versus business. The study findings imply that the successful implementation and the effective usage of ERP applications can contribute toward enhancing supply chain performance in many ways such as timely deliveries across the supply chain and reduced costs, enhanced collaboration among the suppliers, sharing of large amounts of information along the supply chain, real time collaboration supply chain partners, providing organizations with forward visibility thus improving inventory management and distribution among others.

This study recommends the need for manufacturing organizations to apply all the ERP modules if they are to improve their supply chain performance. From the study, it is evident that some organizations were not using some of the modules they had implemented. Case and point is the plant and machine maintenance module which had the least usage.

The government also has a role to play in enhancing the implementation and use of ERP applications by coming up with policies that are not complex and are easy to understand,

since one of the challenges that manufacturing organizations are facing is complex local legislation especially on the taxation policies.

ERP vendors or developers should come with a way to work on the flexibility of these applications. Although much has been improved on the lack of flexibility which was a major challenge in the earlier years of ERP systems, a lot has still to be done. Manufacturing firms are losing out on one of their competitive advantages which were fast response to customer demand changes. The inability of ERP applications not to allow firms to make these kinds of changes impacts negatively on the supply chain performance.

The need to institute cost-effective hands-on-training facilitated by super-users to deepen and broaden ERP user abilities is crucial and needs to be effected at earliest opportunity. Training ought to be structured to assess and evaluate trainees as a means of estimating training effectiveness and ensuring an earlier realization of envisioned benefits of ERP by the firms.

### **5.6 Suggestions for Further Research**

The mandate of the study was to analyze enterprise resource planning applications and supply chain performance of large scale manufacturing firms in Nairobi. This study was only able to analyze ERP applications and supply chain performance of large scale manufacturing firms in Nairobi. It will be necessary to carry out a study featuring other areas outside Nairobi in order to find out if there are any similarities and differences in the findings of this study. Much focus has been given on ERP applications in

manufacturing or distribution sectors, it is important to conduct a study on other sectors such as the service sector which is an important part of the economy.

It will also be important to do a comparative study with another country both in the sub-region, the developed and developing world to ascertain the similarities and differences when it comes to the ERP applications they are implementing and how it is impacting the performance of their supply chains.

The study was able to come up with the most used ERP applications, and the least used. A study could be done on the reason why some of the applications which have been implemented are not being used.

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## APPENDICES

### Appendix I: Introduction Letter

Edna .K. Makori  
MBA Student  
University of Nairobi  
School Of Business  
P.O Box 56219 – 00200  
Nairobi  
28<sup>th</sup> August, 2014  
To whom it may concern,

#### **RE: Permission to carry out research in your firm**

I am a post graduate student at the University of Nairobi and in partial fulfillment of a Master in Business Administration degree. I intend to carry out a research on large scale manufacturing firms in Nairobi. The topic of the research is “Enterprise Resource Planning Applications and Supply Chain Performance in Large Scale Manufacturing Firms in Nairobi, Kenya”.

Your firm has been chosen for the study based on the strategic importance it plays in the achievement of the objective of the study. I kindly request your approval in collecting data in the organization through the attached questionnaire.

The research information will be confidential and will only be used for academic purposes.

Thank you in advance.  
Edna K. Makori D61/60721/2011  
MBA Student  
University of Nairobi

## Appendix II: Questionnaire

### SECTION A: Demographics Information

#### INDIVIDUAL

1. Job title.....

2. Level of Education (Please tick the highest level attained)

Postgraduate [ ]    Degree [ ]    Diploma [ ]    others (Please specify) [ ]

3. What is your age range? (Tick range as applicable)

18-25 years [ ]    26-30 years [ ]    31-35 years [ ]    36-40 years [ ]

41-45 years [ ]    46-50 years [ ]    above 50 years [ ]

4. How long have you worked for this organization? (Tick range applicable)

0-3 years [ ]    4-7 years [ ]    8-11 years [ ]    12-15 years [ ]

16-19 years [ ]    20-23 years [ ]    24-27 years [ ]    28-30 years [ ]

Above 31 years [ ]

5. How many employees does this firm have? (Tick range applicable)

0-11 people [ ]    11-49 people [ ]    50-99 people [ ]    above 100 people [ ]

6. How many years has your organization been in operation? (Tick range applicable)

0-5 years [ ]    6-10 years [ ]    11-15 years [ ]    More than 15 years [ ]

7. Ownership of the organization

Foreign [ ]    Local [ ]    Both [ ]

8. Turnover of the organization in Kshs

0-39 Kshs.39M [ ]      Kshs. 40M - Kshs.99M [ ]      Above Kshs. 100M [ ]

**SECTION B: Extent of ERP application in the supply chain.**

Kindly indicate the extent to which the following ERP modules have been applied into the supply chain activities of your organization.

Use the scale of:

1. No Extent    2. Little    3. Moderate    4. Great    5. Very Great

No	Extent of ERP application in the Supply Chain Processes of Manufacturing firms	No Extent (1)	Little (2)	Moderate (3)	Great (4)	Very Great (5)
<b>1</b>	<b>Procurement Management</b>					
	Award of purchase order to the supplier					
	Identification of potential suppliers					
	Supplier quote evaluation					
	Billing process					
	Others:					
<b>2</b>	<b>Production, Planning and Control Management</b>					
	Material requirement planning					
	Production planning					

	Capacity planning					
	Machine allocation details					
	Shift allotment details					
	Others:					
<b>3</b>	<b>Sales and Distribution Management</b>					
	Sales forecast					
	Order confirmation					
	Order tracking					
	Purchase order confirmation					
	Others:					
<b>4</b>	<b>Warehouse Management</b>					
	Scheduling of picking, putaways, order staging, dock and container management etc					
	Handling of shipment when it comes					
	Shelf life management-tracking expirations and automatically identifying non-conforming inventory.					
	Slotting storage locations					
<b>5</b>	<b>Quality Management</b>					

	Raw material quality check					
	Calibration checks					
	Environmental compliance monitoring					
	Audit of products and processes					
	Inventory inspections					
	Others:					
<b>6</b>	<b>Inventory and Material Management</b>					
	Ageing analysis					
	Warehouse transaction reports					
	Material requisition					
	Stock in hand reports					
	Goods Received Note (GRN) Approval					
	Others:					
<b>7</b>	<b>Plant and Machine Maintenance</b>					
	Maintenance labor tracking					
	Preventive maintenance					
	Spare parts tracking					
	Records of all maintenance performed on equipment					
	Others:					

<b>8</b>	<b>Customer Relationship Management</b>					
	Delivery of consistent superior customer service					
	Identification of trends, problems & opportunities					
	Fostering of customer & prospect relationships					
	Management of automated sales processes					
	Access to centralized customer information					
	Management of pre-sales activities					
	Others:					
	<b>Other ERP Systems being used (please specify)</b>					
9						
10						
11						

**SECTION C: Impact of ERP on the supply chain performance**

Indicate to what extent ERP systems have had an impact on the supply chain performance using the following key performance indicators.

Use the scale of:

1. No Extent    2. Little Extent    3. Moderate    4. Great Extent    5. Very Great

No	Impact of ERP integration on the Supply Chain Performance	No Extent (1)	Little Extent (2)	Moderate (3)	Great Extent (4)	Very Great (5)
<b>1</b>	<b>Quality indicators</b>					
	Supplier rejection rate					
	Quality of delivery documentation					
	Level of suppliers defect free deliveries					
	Delivery performance					
	Supplier performance					
	<b>Other quality indicators (please include)</b>					
<b>2</b>	<b>Time Indicators</b>					
	Total supply chain cycle time					
	Total cash flow time					
	Order lead time					

	Delivery lead time					
	Product development cycle time					
	Purchase order cycle time					
	Planned process cycle time					
	Responsiveness to urgent deliveries					
	<b>Other time indicators (please include)</b>					
<b>3</b>	<b>Financial Indicators</b>					
	Variations against budget					
	Accuracy of forecasting techniques					
	Supplier cost savings initiatives					
	Cost per hour operation					
	Supplier performance					
	Information carrying cost					
	<b>Other financial indicators (please include)</b>					
<b>4</b>	<b>Productivity Indicators</b>					
	Range of products and services					
	Flexibility of service system to meet particular customer needs					
	Effectiveness of master production schedule					

	Capacity utilization					
	<b>Other productivity indicators (please include)</b>					

**SECTION D: Challenges of implementing ERP applications**

Kindly indicate the extent to which firms face each of the following challenges during ERP integration in the supply chain.

Use the scale of:

1. No Extent    2. Little    3. Moderate    4. Great    5. Very Great

No	Challenges of implementing ERP system in the Supply Chain	No Extent (1)	Little (2)	Moderate (3)	Great (4)	Very Great (5)
1	Lack of top management support					
2	Managing consultants					
3	High systems cost					
4	Resistance to the new system					
5	Long customization period					
6	Lack of proper “fit: between technology and organization strategy					
7	Lack of training by employees					

8	Data inaccuracy					
9	Lack of infrastructure					
10	Sharing and control of information					
11	Local legislation					
12	Loss of flexibility					
13	Bureaucracy					
14	Vendors unreliability					
15	System incompatibility					
16	Over customization of software					
17	Inherent complexity of ERP implementation					
18	Trust and security issues					
19	Unrealistic expectations and ineffective communication					
20	Corporate culture					
	<b>Other Challenges (please include)</b>					

**THANK YOU**

### Appendix III: List of Large Scale Manufacturing Firms in Nairobi, Kenya

<b>Sector: Building, Construction and Mining (6)</b>	
Central Glass Industries Ltd	Kenya Builders & Concrete Ltd
Karsan Murji & Company Limited	Manson Hart Kenya Ltd
Kenbro Industries Ltd	Mombasa Cement Ltd
<b>Sector: Food, Beverages and Tobacco (100)</b>	
Africa Spirits Ltd	Highlands Mineral Water Co. Ltd
Agriner Agricultural Development Limited	Homeoil
Belfast Millers Ltd	Insta Products (EPZ) Ltd
Bidco Oil Refineries Ltd	Jambo Biscuits (K) Ltd
Bio Foods Products Limited	Jetlak Foods Ltd
Breakfast Cereal Company(K) Ltd	Karirana Estate Ltd
British American Tobacco Kenya Ltd	Kenafric Industries Limited
Broadway Bakery Ltd	Kenblest Limited
C. Czarnikow Sugar (EA) Ltd	Kenya Breweries Ltd
Cadbury Kenya Ltd	Kenya Nut Company Ltd
Centrofood Industries Ltd	Kenya Sweets Ltd
Coca cola East Africa Ltd	Nestle Kenya Ltd
Confec Industries (E.A) Ltd	Nicola Farms Ltd
Corn Products Kenya Ltd	Palmhouse Dairies Ltd
Crown Foods Ltd	Patco Industries Limited
Cut Tobacco (K) Ltd	Pearl Industries Ltd
Deepa Industries Ltd	Pembe Flour Mills Ltd
Del Monte Kenya Ltd	Premier Flour Mills Ltd
East African Breweries Ltd	Premier Food Industries Limited
East African Sea Food Ltd	Proctor & Allan (E.A.) Ltd
Eastern Produce Kenya Ltd	Promasidor (Kenya) Ltd
Farmers Choice Ltd	Trufoods Ltd
Frigoken Ltd	UDV Kenya Ltd
Giloil Company Limited	Unga Group Ltd
Glacier Products Ltd	Usafi Services Ltd
Global Allied Industries Ltd	Uzuri foods Ltd
Global Beverages Ltd	ValuePak Foods Ltd
Global Fresh Ltd	W.E. Tilley (Muthaiga) Ltd
Gonas Best Ltd	Kevian Kenya Ltd
Hail & Cotton Distillers Ltd	Koba Waters Ltd
Al-Mahra Industries Ltd	Kwality Candies & Sweets Ltd
Alliance One Tobacco Kenya Ltd	Lari Dairies Alliance Ltd
Alpha Fine Foods Ltd	London Distillers (K) Ltd
Alpine Coolers Ltd	Mafuko Industries Ltd
Annum Trading Company Limited	Manji Food Industries Ltd
Aquamist Ltd	Melvin Marsh International
Brookside Dairy Ltd	Kenya Tea Development Agency

Candy Kenya Ltd	Mini Bakeries (Nbi) Ltd
Capwelll Industries Ltd	Miritini Kenya Ltd
Carlton Products (EA) Ltd	Mount Kenya Bottlers Ltd
Chirag Kenya Limited	Nairobi Bottlers Ltd
E & A Industries Ltd	Nairobi Flour Mills Ltd
Kakuzi Ltd	NAS Airport Services Ltd
Erdemann Co. (K) Ltd	Rafiki Millers Ltd
Excel Chemical Ltd	Razco Ltd
Kenya Wine Agency Limited	Re-Suns Spices Limited
Highlands Canner Ltd	Smash Industries Ltd
Super Bakery Ltd	Softa Bottling Co. Ltd
Sunny Processor Ltd	Spice World Ltd
Spin Knit Dairy Ltd	Wrigley Company (E.A.) Ltd
<b>Sector: Chemical and Allied (62)</b>	
Anffi Kenya Ltd	Crown Berger Kenya Ltd
Basco Product (K) Ltd	Crown Gases Ltd
Bayer East Africa Ltd	Decase Chemical (Ltd)
Continental Products Ltd	Deluxe Inks Ltd
Cooper K- Brands Ltd	Desbro Kenya Limited
Cooper Kenya Limited	E. Africa Heavy Chemicals (1999) Ltd
Beiersdorf East Africa td	Elex Products Ltd
Blue Ring Products Ltd	European Perfumes & Cosmetics Ltd
BOC Kenya Limited	Galaxy Paints & Coating Co. Ltd
Buyline Industries Limited	Grand Paints Ltd
Carbacid (CO2) Limited	Henkel Kenya Ltd
Chemicals & Solvents E.A. Ltd	Imaging Solutions (K) Ltd
Chemicals and Solvents E.A. Ltd	Interconsumer Products Ltd
Coates Brothers (E.A.) Limited	Odex Chemicals Ltd
Coil Products (K) Limited	Osho Chemicals Industries Ltd
Colgate Palmolive (E.A) Ltd	PolyChem East Africa Ltd
Johnson Diversity East Africa Limited	Procter & Gamble East Africa Ltd
Kel Chemicals Limited	PZ Cussons Ltd
Kemia International Ltd	Royal Trading Co. Ltd
Ken Nat Ink & Chemical Ltd	Reckitt Benckiser (E.A) Ltd
Magadi Soda Company Ltd	Revolution Stores Co. Ltd
Maroo Polymers Ltd	Soilex Chemical Ltd
Match Masters Ltd	Strategic Industries Limited
United Chemical Industries Ltd	Supa Brite Ltd
Oasis Ltd	Unilever Kenya Ltd
Rumorth EA Ltd	Murphy Chemical E.A Ltd
Rumorth East Africa Ltd	Syngenta East Africa Ltd

Sadolin Paints (E.A.) Ltd	Synresins Ltd
Sara Lee Kenya Limited	Tri-Clover Industries (K) Ltd
Saroc Ltd	Twiga Chemical Industries Limited
Super Foam Ltd	Vitafoam Products Limited
<b>Sector: Energy, Electrical and Electronics (42)</b>	
A.I Records (Kenya) Ltd	East African Cables Ltd
Amedo Centre Kenya Ltd	Eveready East Africa Limited
Assa Abloy East Africa Ltd	Frigorex East Africa Ltd
Aucma Digital Technology Africa Ltd	Holman Brothers (E.A.) Ltd
Avery (East Africa) Ltd	IberaAfrica Power (EA) Ltd
Baumann Engineering Limited	International Energy Technik Ltd
Centurion Systems Limited	Kenwest Cables Ltd
Digitech East Africa Limited	Kenwestfal Works Ltd
Manufacturers & Suppliers (K) Ltd	Kenya Power & Lighting Co. Ltd
Marshall Fowler (Engineers) Ltd	Kenya Scale Co. Ltd/ Avery Kenya Ltd
Mecer East Africa Ltd	Kenya Shell Ltd
Metlex Industries Ltd	Libya Oil Kenya Limited
Metsec Ltd	Power Technics Ltd
Modulec Engineering Systems Ltd	Reliable Electricals Engineers Ltd
Mustek East Africa	Sanyo Armo (Kenya) Ltd
Nationwide Electrical Industries	Socabelec East Africa
Nationwide Electrical Industries Ltd	Sollatek Electronics (Kenya) Limited
Optimum Lubricants Ltd	Specialised Power Systems Ltd
PCTL Automation Ltd	Synergy-Pro
Pentagon Agencies	Tea Vac Machinery Limited
Power Engineering International Ltd	Virtual City Ltd
<b>Sector: Plastics and Rubber (54)</b>	
Betatrad (K) Ltd	ACME Containers Ltd
Blowplast Ltd	Afro Plastics (K) Ltd
Bobmil Industries Ltd	Alankar Industries Ltd
Complast Industries Limited	Dune Packaging Ltd
Kenpoly Manufacturers Ltd	Elgitread (Kenya) Ltd
Kentainers Ltd	Elgon Kenya Ltd
King Plastic Industries Ltd	Eslon Plastics of Kenya Ltd
Kingway Tyres & Automart Ltd	Five Star Industries Ltd
L.G. Harris & Co. Ltd	General Plastics Limited
Laneeb Plastics Industries Ltd	Haco Industries Kenya Ltd
Metro Plastics Kenya Limited	Hi-Plast Ltd
Ombi Rubber Rollers Ltd	Jamlam Industries Ltd
Packaging Industries Ltd	Kamba Manufacturing (1986) Ltd
Plastics & Rubber Industries Ltd	Keci Rubber Industries
Polyblend Limited	Nairobi Plastics Indus

Polyflex Industries Ltd	Nav Plastics Limited
Polythene Industries Ltd	Ombi Rubber
Premier Industries Ltd	Packaging Masters Limited
Prestige Packaging Ltd	Plastic Electricons
Prosel Ltd	Raffia Bags (K) Ltd
Qplast Industries	Rubber Products Ltd
Sumaria Industries Ltd	Safepak Limited
Super Manufacturers Ltd	Sameer Africa Ltd
Techpak Industries Ltd	Sanpac Africa Ltd
Treadsetters Tyres Ltd	Silpack Industries Limited
Uni-Plastcis Ltd	Solvochem East Africa Ltd
Wonderpac Industries Ltd	Springbox Kenya Ltd
<b>Sector: Textile and Apparels (38)</b>	
Africa Apparels EPZ Ltd	MRC Nairobi (EPZ) Ltd
Fulchand Manek & Bros Ltd	Ngecha Industries Ltd
Image Apparels Ltd	Premier Knitwear Ltd
Alltex EPZ Ltd	Protex Kenya (EPZ) Ltd
Alpha Knits Limited	Riziki Manufacturers Ltd
Apex Appaels (EPZ) Ltd	Rolex Garments EPZ Ltd
Baraka Apparels (EPZ) Ltd	Silver Star Manufacturers Ltd
Bhupco Textile Mills Limited	Spinners & Spinners Ltd
Blue Plus Limited	Storm Apparel Manufacturers Co. Ltd
Bogani Industries Ltd	Straightline Enterprises Ltd
Brother Shirts Factory Ltd	Sunflag Textile & Knitwear Mills Ltd
Embalishments Ltd	Tarpo Industries Limited
J.A.R Kenya (EPZ) Ltd	Teita Estate Ltd
Kenya Trading EPZ Ltd	Thika Cloth Mills Ltd
Kikoy Co. Ltd	United Aryan (EPZ) Ltd
Le-Stud Limited	Upan Wasana (EPZ) Ltd
Metro Impex Ltd	Vaja Manufacturers Limited
Midco Textiles (EA) Ltd	Yoochan Kenya EPZ Company Ltd
Mirage Fashionwear EPZ Ltd	YU-UN Kenya EPZ Company Ltd
<b>Sector: Timber, Wood Products and Furniture (22)</b>	
Economic Housing Group Ltd	Rosewood Office Systems Ltd
Eldema (Kenya) Limited	Shah Timber Mart Ltd
Fine Wood Works Ltd	Shamco Industries Ltd
Furniture International Limited	Slumberland Kenya Limited
Hwan Sung Industries (K) Ltd	Timsales Ltd
Kenya Wood Ltd	Wood Makers Kenya Ltd
Newline Ltd	Woodtex Kenya Ltd
PG Bison Ltd	United Bags Manufacturers Lt

Uchumi Quick Suppliers Ltd	Tetra Pak Ltd
<b>Sector: Pharmaceutical and Medical Equipment (20)</b>	
Alpha Medical Manufacturers Ltd	Dawa Limited
Beta Healthcare International Limited	Elys Chemical Industries
Biodeal Laboratories Ltd	Gesto Pharmaceutical Ltd
Bulks Medical Ltd	Glaxo Smithkline Kenya Ltd
Cosmos Limited	KAM Industries Ltd
Laboratory & Allied Limited	KAM Pharmacy Limited
Manhar Brothers (K) Ltd	Pharmaceutical Manufacturing Co.
Madivet Products Ltd	Regals Pharmaceuticals
Novelty Manufacturing Ltd	Universal Corporation Limited
Oss. Chemie (K)	Pharm Access Africa Ltd
<b>Sector: Metal and Allied (38)</b>	
Allied Metal Services Ltd	Booth Extrusions Limited
Alloy Street Castings Ltd	City Engineering Works Ltd
Apex Street Ltd Rolling Mill Division	Crystal Industries Ltd
ASL Ltd	Davis & Shirliff Ltd
ASP Company Ltd	Devki Steel Mills Ltd
East Africa Foundry Works (K) Ltd	East Africa Spectre Limited
Elite Tools Ltd	Kens Metal Industries Ltd
Friendship Container Manufacturers	Khetshi Dharamshi & Co. Ltd
General Aluminum Fabricators Ltd	Nampak Kenya Ltd
Gopitech (Kenya) Ltd	Napro Industries Limited
Heavy Engineering Ltd	Specialized Engineer Co. (EA) Ltd
Insteel Limited	Steel Structures Limited
Metal Crown Limited	Steelmakers Ltd
Morris & Co. Limited	Steelwool (Africa) Ltd
Nails & Steel Products Ltd	Tononoka Steel Ltd
Orbit Engineering Ltd	Welding Alloys Ltd
Rolmil Kenya Ltd	Wire Products Limited
Sandvik Kenya Ltd	Viking Industries Ltd
Sheffield Steel Systems Ltd	Warren Enterprises Ltd
<b>Sector: Leather Products and Footwear (8)</b>	
Alpharama Ltd	CP Shoes
Bata Shoe Co. (K) Ltd	Dogbones Ltd
New Market Leather Factory Ltd	East Africa Tanners (K) Ltd
C & P Shoe Industries Ltd	Leather Industries of Kenya Limited
<b>Sector: Motor Vehicle Assembly and Accessories (17)</b>	
Auto Ancillaries Ltd	Kenya Vehicle Manufacturers Limited
Varsani Brakelining Ltd	Labh Singh Harnam Singh Ltd
Bhachu Industries Ltd	Mann Manufacturing Co. Ltd
Chui Auto Spring Industries Ltd	Megh Cushion industries Ltd
Toyota East Africa Ltd	Mutsimoto Motor Company Ltd

Unifilters Kenya Ltd	Pipe Manufacturers Ltd
General Motor East Africa Limited	Sohansons Ltd
Impala Glass Industries Ltd	Theevan Enterprises Ltd
Kenya Grange Vehicle Industries Ltd	
<b>Sector: Paper and Paperboard (48)</b>	
Ajit Clothing Factory Ltd	Conventual Franciscan Friars-Kolbe Press
Associated Papers & Stationery Ltd	Creative Print House
Autolitho Ltd	D.L. Patel Press (Kenya) Limited
Bag and Envelope Converters Ltd	Dodhia Packaging Limited
Bags & Balers Manufacturers (K) Ltd	East Africa Packaging Industries Ltd
Brand Printers	Elite Offset Ltd
Business Forms & Systems Ltd	Ellams Products Ltd
Carton Manufacturers Ltd	English Press Limited
Cempack Ltd	General Printers Limited
Chandaria Industries Limited	Graphics & Allied Ltd
Colour Labels Ltd	Guaca Stationers Ltd
Colour Packaging Ltd	Icons Printers Ltd
Colour Print Ltd	Interlabels Africa Ltd
Kenya Stationers Ltd	Jomo Kenyatta Foundation
Kim-Fay East Africa Ltd	Kartasi Industries Ltd
Paper Converters (Kenya) Ltd	Kenafric Diaries Manufacturers Ltd
Paper House of Kenya Ltd	Kitabu Industries Ltd
Paperbags Limited	Kul Graphics Ltd
Primex Printers Ltd	Label Converters
Print Exchange Ltd	Modern Lithographic (K) Ltd
Printpak Multi Packaging Ltd	Pan African Paper Mills (EA) Limited
Printwell Industries Ltd	Ramco Printing Works Ltd
Prudential Printers Ltd	Regal Press Kenya Ltd
Punchlines Ltd	SIG Combibloc Obeikan Kenya

**Source: Kenya Association of Manufacturers (KAM) Directory. August, 2014**