STATISTICAL QUALITY CONTROL AND OPERATIONAL PERFORMANCE OF MANUFACTURING COMPANIES IN KENYA

BY

NICODEMUS ANGWENYI NYANG'AU

A MANAGEMENT RESEARCH PROJECT PRESENTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF MASTER OF BUSINESS ADMINISTRATION, SCHOOL OF BUSINESS, UNIVERSITY OF NAIROBI

2018

DECLARATION

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

Signature..... Date…….....

Nicodemus Angwenyi Nyang'au

Reg. No.: D61/86228/2016

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

Signed..... Date.....

Dr. Ernest Akello

Lecturer,

School of Business,

University of Nairobi.

DEDICATION

I dedicate this research project to my parents, Mr. and Mrs. Nyangau brothers' sisters, uncles, aunts and cousins you have been my rock and motivation as I pursed this course. To my friends who have been my rock and motivation as I supported me all through .I would have not made it without your moral as well as financial support, understanding and perseverance.

ACKNOWLEDGEMENT

My special thanks go to The Almighty God for all he has done to me and giving me an opportunity to come this far. I also wish to acknowledge the efforts of my family members for their moral support and encouragement throughout the entire research period. I also take this opportunity to salute the guidance and directions accorded to me, also acknowledge the professional efforts of my supervisor, Mr. Ernest Akello for his guidance throughout my research for remarkably never failing to be available when I need his assistance which enabled me to compile this project research.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Quality management is key to the performance of any firm .There are several quality management practices that are used in the operations if various firms to facilitate cost reduction, improvement in quality of products, customer satisfaction and revised errors and defects. Statistical quality control practice is one the several quality management practices. The study was aimed at establishing the various statically quality control practices adopted in large scale manufacturing firms in Nairobi. The study used descriptive research design since it focused on the effects of statistical quality control practices on operational performance of the large scale manufacturing firms in Nairobi County. The study was guided by Theory of constraints and quality improvement theories. The study used a descriptive statistic in its methodology on statistical quality control practices adopted in large scale manufacturing firms in Nairobi. This study used primary data. Data collection was effected by use of structured questionnaires. Property owners in Nairobi County were the targeted population who were sampled out to be 45 out of the total number of 455 large scale manufacturing firms in Nairobi. These questionnaires were issued through drop and pick method, coded, keyed and analyzed using both descriptive and regression analysis. The regression model used had three variables. Statistical process control, descriptive statistics and acceptance sampling were the dependent variables while operational performance was the independent variable. The study findings indicated that statistical process control, acceptance sampling and descriptive statistics had a positive impact on operational performance. The findings also indicated that to a large extent all the statistical quality control practices had been implemented in large scale manufacturing firms in Nairobi. Other future academicians should research on statistical quality control practices in a different town rather than Nairobi county or carry out a cross sectional study in Kenya. Key words: Quality, statistical quality control, large scale manufacturing firms in Nairobi.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Quality is core in the production of both goods and services. Quality is very crucial as a criteria in the selection process involving competitive products. Improvement in quality is a key factor for the success and growth of any company. Quality control is therefore of great importance in any manufacturing company. Statistical quality control is used as a method among others in quality control and involves the use of statistical techniques to maintain quality products in a continuous flow of products (Gomes, 2011). Operational performance refers to a measure against standard or prescribed indicators of productivity, capacity utilization, effectiveness, efficiency, cycle time, waste reduction and regulatory compliance (Munyao, 2014). Operational performance is concerned with production of high quality products at the lowest possible cost and is measured using several indicators.

These indicators include labor utilization, rework, delivery in full on time and complaints. Proper utilization of labor and the ability of the company to deliver the full amount of products on time as expected show optimal operational performance. Rework, correcting products that do not meet standards after production, is expensive. Companies should aim at reducing rework and this can be done through statistical process control. Complaints deal with quality. Quality is a key operational performance indicator (Hwang, Han, Jun, & Park, 2014).

Statistical quality control practices are therefore aimed at enhancing operational performance through maintenance and continuous improvement in quality. In statistical quality control, processes of production are regulated so they fit expected standards. This ensures the standard process gives quality products and minimizes waste products by correcting any defects before the product is ready.

The manufacturing companies in Kenya today are faced with stiff competition from rival companies. Counterfeit and contra-band goods have also flooded the market thus unfairly reducing the market share for the locally manufactured products. The market also favors cheaper imported products. To stay afloat, the manufacturing companies have to ensure that they have a competitive advantage over competition. They can gain this competitive edge by providing high quality products through quality control. According to Master Plan for Kenya's Industrial Development (MAPSKID) (2007), the manufacturing industry experiences inadequate capacity to meet product quality standards and ISO certification. Application of statistical quality control practices will aid in the alleviation of this problem through maintenance and improvement of product quality. This will foster operational performance giving the market high quality products at cheaper prices. This study therefore seeks to determine the statistical quality control practices and operational performance in manufacturing companies in Kenya.

1.1.1 Quality Control

Quality control is a process or a set of processes which are aimed at ensuring that a manufactured product or performed service adheres to a defined set of quality criteria or

meets the requirement of the client or customer (Salimu, 2012). According to ISO 9000 quality control is a part of quality management that is aimed at satisfying quality requirements. Quality of a product or service is sustained by various operational techniques and activities which facilitate satisfaction of needs by making use of them (Mithwani, 2011).It entails inspection of product ,either by visual inspection of each product using a stereo microscope for finer details before being sold. The inspectors are provided with a list and description of unacceptable product defects and products with these are rejected for sale into the market.

Quality control emphasizes on three issues. First, it focuses on elements which include: controls, job management, defined and well managed processes, performance and integrity criteria, together with records identification. The other two aspects are competence and soft elements. Competence involves knowledge, skills, experience and qualifications while soft elements include personnel, integrity, confidence, organizational culture, motivation, team spirit and quality relationships. A deficiency in one of the three elements, risks quality of outputs. Quality control may be done through several approaches; Statistical Quality Control (SQC), Total Quality Control (TQC), Statistical Process Control (SPC), company-wide quality control (CWQC), Total Quality Management (TQM) and six sigma.

1.1.2 Statistical Quality Control Practices

Statistical quality control (SQC) is a technique which makes use of statistical methods in controlling quality of manufactured products (Salimu, 2012). In detection of variations in

quality of manufactured products and provision of information useful in product design and in determination of capability, stastical techniques are used. In SQC, statistical tools are applied in the manufacturing processes for controlling quality (Gomes, 2011).

In evaluating quality, all SQC tools are necessary. These tools are descriptive statistics, statistical process control and acceptance sampling. Descriptive statistics entails description of features and relationships of quality. Statistical process control involves use of statistical techniques in the finding out the proper functionality of a process as per the set standards. Acceptance sampling entails use of statistical techniques in the determination of acceptance or rejection of population of products based on results of the samples tested. The variations of SQC are allowable or cause variation and assignable or preventable variation. Defining a statistical method used in separating allowable variations from preventable variation is the major purpose of SQC. It serves to evaluate quality standards of incoming goods, services and process both raw and finished. SQC in addition is used in judging conformance of processes to facilitate establishment of standards to be followed in taking suitable actions in instances that there is deviation noticed in order to facilitate evaluation of optimum quality attainable in certain situations. This leads to improvement in quality and productivity by process control and experimentation.

1.1.3 Operational Performance

Operational performance refers to a measure against standard or prescribed indicators of productivity, capacity utilization, effectiveness, efficiency, cycle time, waste reduction

and regulatory compliance (Munyao, 2014). According to Samson (2007), operational performance is performance that relates to a firm's internal operations like productivity, product quality and customer satisfaction. The variables of operational performance are productivity and quality, and scheduling and delivery. Productivity together with quality are measured through productivity, efficiency, cost of quality and errors and defects. Lead time, timeliness of delivery and vendor relations are the measures of scheduling and delivery. According to Kamau (2016) operational performance is the capability of an organization to fulfill its mission through governance, excellence and dedication to meeting its goals and objectives.

A company's operational performance according to Mahmoud and Carlos (2010) can be accomplished by building a strong culture around operational excellence, training and equipping the workforce on techniques and tools of process improvement, deploying real-time feasibility process management technology, and putting in place appropriate measures as well as controls. The operations of a company should be efficient and effective. Effectiveness is reflected in the extent to which customers' needs are fulfilled whereas efficiency entails the measure of how economical the use of company resources is. Performance measurement networks should be developed in companies to monitor and maintain operational control. Operational control is the process that ensures a company is able to pursue action with the aim of achieving overall goals and objectives (Kamau, 2016).

1.1.4 Manufacturing Companies in Kenya

Manufacturing industry entails a branch of manufacture and trade which focuses on fabrication, processing or preparation of products from raw materials. These products and raw materials include foods, chemicals, textiles, machines and equipments. Besides refined metals and minerals derived from extracted ores, all lumber, wood and pulp products are also part of these materials. After the conversion of the raw materials into finished goods, these can either be sold to the final consumers or other manufacturers for the manufacturing of more complex products for the end consumer or user. Manufacturing is done in almost all firms. Goods are produced as per the demand by many small independent manufacturers in direct competition with each other in capital free markets. The legally protected publishing and manufacturing monopolies are the only ones involved in mass production of finished products in the capitalist captive markets. The state based on necessity direct manufacturing of goods in collective markets.

In the early days, single skilled artisan with assistants carried out manufacturing and training was by apprenticeship. Most manufacturing was done in rural areas where household-based manufacturing was a supplement for subsistence strategy to agriculture before industrial revolution. There were a few urban artisans whose privileges and secrets were protected by the guild system. A number of manufacturing households would be organized by entrepreneurs into a single enterprise the putting-out system or subcontracting work. Manufacturing systems have since changed to adopt factory settings with labor coming from skilled and semi-skilled workers. New technologies have also

been adopted in manufacturing to ensure optimization in order to remain profitable. Flexibility is also an important aspect in manufacturing today due to a rapidly evolving market.

In Kenya the manufacturing industry has experienced tremendous growth since year 1990 and into the new century. The consistent industrial activity over the years in Kenya has been transformation of agricultural raw materials especially tea and coffee . Canning of fruit and meat, processing of wheat as well as milling of cornmeal also forms a significant part of the agro-based manufacturing sector. There are many small manufacturing industries which are relatively diverse with more than 2000 units. These include the manufacture of chemicals, textiles, cement, cigarettes, beer, soft drinks, metal products, rubber and leather goods among others. Kenya remains a favorite destination for investments in manufacturing due to the availability of a good workforce, a productive agricultural sector, a good financial services sector, dependable telecommunications and nearness to port facilities. The manufacturing industry offers employment to about 254,000 people currently which represents 13 per cent of the total employment in Kenya. To top up, additional 1.4 million people are employed in the informal side of the industry.

1.2 Research Problem

According to Franks (2009) quality control brings about enhanced operational performance in a company. Over the past three decades companies have aggressively pursued quality control due to the fact that there is a notion that high quality goods and services result to better operational performance. Statistical quality control practices aim

at production of high quality products and improving the efficiency and effectiveness of the production process. Operational performance is an important aspect in overall company performance (Kamau, 2016). Companies therefore aim at improving their operational performance and this can be done through adoption of statistical quality control practices.

The manufacturing industry in Kenya is considered as one of the key pillars of Kenya Vision 2030. The industry faces great challenges with the flooding of markets with counterfeit goods and cheaper imported goods. Statistical quality control practices are therefore of great importance to control the quality of products that the manufacturing companies release into the market. Statistical quality control practices will also result in improved operational performance and streamlined operations will help the companies to provide higher quality products at lower prices.

Several studies have been conducted in relation to the subject of quality control practices and operational performance in manufacturing firms both globally and locally. Globally, Kaynak (2003) sought to determine the relationship between total quality management practices and their effects on firm performance. The study found that employment of total quality management practices positively affected three dimensions of performance: operating, market and financial. Truong, Sampaio, Carvalho, Fernandes and An (2014) in a conference to discuss the role of quality management practices in operational performance concluded that operational performance is affected by quality management practices under two categories: support practices and core practices. The results indicated

that reporting and analysis of quality data, product/service design and process management were identified as to affect operational performance under core practices.

Locally, Monirei (2016) studied quality management and operational performance in manufacturing firms in Nairobi County. The study acknowledged that there exists a positive relationship between quality management and operational performance. Results indicate that the adoption of quality management practices is taking place to a great extent and positively influences performance in operations and profitability. Kiarie (2013) evaluated statistical quality control in confectionary industry and its application. The study concluded that statistical quality control practices were being applied in the confectionary industry and were positively related to operational performance. Salimu (2012) evaluated the impact of statistical quality control on customer loyalty in maize and wheat flour manufacturing firms in Kenya. The study concluded that customer loyalty is highly dependent on quality and pricing which are consequences of efficient and effective operations. Statistical quality control practices are therefore positively related to operational performance. According to a study by Mithwani (2011) on quality control systems used by manufacturing firms in Kenya, manufacturing firms employed various quality control systems in order to improve the quality of products thus foster performance. Based on the studies discussed above, no study has been conducted on statistical quality control practices and operational performance in manufacturing companies in Kenya. This leaves a research gap that this study seeks to fill through answering the research question: what are the effects of statistical quality control practices on operational performance of manufacturing companies in Kenya?

1.3 Research Objectives

To determine the statistical quality control tools in manufacturing companies in Kenya.

To determine the relationship between statistical quality control and operational performance in manufacturing firms in Nairobi.

1.4 Value of the Study

To the management and employees of manufacturing companies in Kenya, the findings of this study may be used to determine the statistical quality control practices that can be applied to foster operational performance. A discussion on the techniques of statistical quality control and their application will offer manufacturing companies knowledge on a means to control the quality of their products thus improve their operational performance.

Policy makers use research findings that are available in their areas of concern to make policies. The findings of this research are then useful to policy makers as they may be used to formulate policies and mechanisms that guide manufacturing companies on the area of statistical quality control practices in order to optimize operational performance.

In the field of academia the findings of this study may be used by scholars and academicians to understand statistical quality control practices employed in manufacturing companies and the relation with operational performance. This research helps add to the literature available on the subject for reference in future studies and also offers a basis from which areas of further research may be identified.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the review of the literature for the purpose of the study in ensuring relevance to the research problem. The concept of statistical quality management practices and operational performance will be re reviewed from various sources. It represents the theoretical review, the SQC practices, the impact of these practices on performance, the empirical literature and conceptual framework.

2.2 Theoretical Review

2.2.1 Quality Improvement Theory

It asserts that components of quality management are those that assigns tasks regarding fabricating associations decisively at the entryway of top administration (Deming, 1986). It holds a hypothesis which states that the administration is in charge of the frameworks which produces 80 percent of the issues in organization (Hill, 1995). Deming (1986) found out that, lack of implementation of top administration duties like : making of a corporate culture, selection of providers and development of connections leads to unsuccessful quality administration. This theory enables firms to eradicate low quality control issues through successful administrative systems. The manner in which the management of a firm conducts its corporate activities determines what is character Management's conduct shapes the corporate mentality and characterizes what is essential for the achievement and survival of the firm. Hubert (2000) researched on quality administration framework in relation to quality management , where it looks at

production of a hierarchical framework which encourages participation and figuring out how to encourage the execution of process administration rehearses. This, thus, prompts the persistent change of the procedures, items, and administrations and imparts worker fulfillment. These are basic to advancing client center, and, eventually, helping in the survival of any association. These theory is related to this topic of research in that it asserts what quality management practices should be implemented by top administration being the policy makers through setting of quality administration systems. This facilitates eradication of low quality issues in the firm hence competitive advantage of the firm.

2.2.2 Theory of Constraints

Theory of Constraints (TOC) was initially displayed in 1984 by Eliyahu M. Goldratt and Cox. It gives out strategies which states issues to be changed and how to effect the change to facilitate implementation of a whole .It refers change to being a continuous process, other than focusing on restricted enhancements in all zones. TOC can be made use of as a system to facilitate implementation of quality management. It should be used in helping the firm in discovering issues in its execution and center the quality management endeavors toward the firm's objective. It is a very crucial approach to continuous change in a firm. It is an arrangement of ideas, standards and apparatuses which can be utilized to facilitate frameworks and expand execution by distinguishing the most prohibitive restricting component that requires the execution of the framework and overseeing it. It focuses on enhancing execution and not decrease of expenses. By and large, TOC is a mix of logic, ideas, standards, and apparatuses imagined to augment the execution of any framework by recognizing, overseeing and breaking the most

prohibitive restricting variable that limitations framework execution. Many quality change endeavors are centered around accomplishing the most elevated cost decreases (Anderson et al., 1994). Oakland (2004). To these topic of study in that one implementation of statistical quality control practices facilitates reduction of costs by a firm through ensuring production and processing of quality goods and services. Besides through continuous improvement and change as a practice, the firm is able to achieve competitive advantage.

2.2.3 Resource-Based View

The Resource Based View (RBV) looks at a firms' resources and the important determinants of competitive advantage and implementation. (Barney, 2001) asserts that RBV looks at firms inside a firm as being heterogeneous based on assets that they control. Heterogeneity (or uniqueness) is viewed as an important condition for an asset package to add to competitive advantage. A resource- based view theory justifies a firm's ability to gain competitive advantage when a firm's final product is not easily duplicated by competitors enabling the firm to create a competitive barrier, (Mahoney and Pandian, 1992). The Resource based view looks at resources as the major drivers to better firm's performance. A firm's ability to meet customer needs and its efficiency is well explained in terms of performance viewed from its productivity, its ability to work with other firms through collaborations in order to gain access to other firm's competencies rather than working in house. Through implementation of statistical quality management practices, firms are able to control their resources adequately through minimization of errors to gain competitive advantage over its competitors.

2.3 Statistical Quality Control Practices

Statistical quality control involves the use of statistical methods in the Various statistical methods in the control and improvement of quality in industrial productions. Methods of statistical quality control are becoming of great use and importance in the manufacturing sector due to a number of reasons: heightening of competition, increasing need to avoid loss of material and to save on time, intense profit squeeze, rapid increases in legal liability cases which emphasizes on greater need for reliability of the product, the need to know one's process, new and stricter quality related laws.

Statistical methods of quality control involve the random sampling of manufactured products and the plotting of their performance on a graph. The use of statistical methods of production monitoring and parts inspection became known as Statistical Quality Control (SQC), wherein statistics are collected, analyzed and interpreter to solve quality problems (Summers, 2000). Once the data has been plotted on the graph, it should be seen to be performing at the expected levels within the limits of standard deviation. If this is not the case, it is assumed that the samples used represent the entire batch of products and that all of them do not meet the required levels of quality. This is one of the reasons as to why statistical quality control is very important in the production process (Costin, 1999). These practices are as discussed below:

2.3.1 Acceptance sampling

It is one of the statistical quality control practices originally developed by Dodge and Romig (1966). It involves various inspection carried out on lots or batches of items which can be done before or after a process, to facilitate judgment on whether it conforms

to set standards . It involves inspection and related grouping of a sample of units which are chosen randomly from a batch or lot. Besides a final decision based on the lot at hand, normally occurs at two major areas: incoming raw materials also referred to as final production. This is a middle road approach which occurs between situations when there is zero inspection and when there is 100% inspection. Its aim is to facilitate decision making on issues to do with whether or not it is likely to be acceptable not to estimate the quality of the lot (Reyan, 2000).

This is closely interconnected to inspecting and testing of product .Outgoing inspection is one which occurs immediately after production before the product is shipped to the customer. Incoming inspection is one which normally occurs when sampling is done to lots of batches of a product whenever they are received from various sources. Under this there is no feedback on not only production process but also engineering design or development too. Besides there is much emphasis on conformance to specification view of quality (2007). It is applied when: testing is destructive, the inspection cost at 100% is extremely high and technologically infeasible and when the supplier explicates good quality history, and there is reduction in inspection from 100% as per the requirement, Deming (1996) . A combination of consideration of control implications with elements of acceptance sampling is done by acceptance control chart. It is an appropriate tool in decision making with respect to process acceptance .It is used to judge whether quality level.

2.3.2 Statistical Process Control

It is the implementation of statistical methods in the monitoring and controlling of processes to facilitate its full potential operation ability in order to manufacture a product which conforms to the requirements. Variations exists in all process Walter (1999). Decisions on whether variations require correction and whether they are natural is very crucial in quality control. In addition despite the fact that many process displays variations, some show controlled variations which occur in the form of common causes of variation and special causes of variation . In observing performance of the production process which facilitates prediction of significant deviations which may later result in products being rejected, acceptance sampling uses tools The statistical process control is broadly divided into understanding the process, cause of variation together with elimination of cause variation which are special. It involves use of maps and controlling of the process using control charts. In understanding causes of variation, control charts are used. In identifying variations tools like ishakawa diagram, pareto charts and designed experiments are used .Finally in the last aspect of eradication of sources of special cause variation, there use of both statistical methods and use of practical methods .Besides, in order to reduce the variations or align the process with the desired target especially if there is a problem with process capability additional process changes may be required (Woodall, 1997).

2.3.3 Descriptive statics

It is used to summarizes data both statically and graphically. It is a static measure which describes data .It is used to analyze and represent data that has been previously

collected Lindsay (2002). It avails a large volume of data about a single variable. It focus on measures of central tendency like mean ,mode, median. It includes variables like , standard deviation, variance, e.t.c It majorly focuses on variables which are categorized into three as: nominal which is used for categorizing data into groups, Ordinal variables which is used in situating data into a higher or lower group and interval variable which tells the real distance between different data. The line formed by connecting data points called a frequency distribution is what is termed as distribution (Gomes, 2011).

2.4 Impact of implementation of Statistical Quality Control Practices

Due to the rising increase in competition in the world, firms have to keep up with the competition and ensure that they satisfy customer needs. In order to facilitate this, firm have to look at Statistical Quality Control practices because the objective of any business is to get profits and remain in business. Eldridge et al. (2006) asserted that in general, quality management practices facilitates competitiveness of a firm through implementation of SQC practices results in substantial reduction of costs and increase in revenue. Quality management practices facilitates minimization of wastes in a firm and eradication of errors or misstates by all departments. Bricknell (2006).

Palmberg and Garvare (2006) concluded that SQC practices have a positive effect to productivity and profitability of firms. These practices act as a motivator to employees in the enhancement of their skills through total commitment and productivity. Goetsch and Davis (2007). Good implementation of statistical quality management practices has

positive impact on financial performance resulting to high profits and productivity. It helps kin reduction of variability in product quality.

2.5 Empirical Literature Review

Locally, a number of researches have been carried out related to these topic :Ali (2015) explored on the quality management practices and supply chain performance of manufacturing firms in Kenya .He selected a sample of 46 large scale manufacturing firms out of the 455 companies using stratified sampling method. He used both primary and secondary data which was collected by use of structured questionnaires. Collected data was analyzed by use of descriptive and regression analysis. From his study, he concluded that, of all quality management practices, continuous quality improvement, six sigma practices, international organization for standardization, lean operations/production, benchmarking and supplier partnering have been adopted by these firms to a great extent. In addition the quality management practices are related to a firm's performance.

Mithwani (2011) carried out a study on the quality control systems used by manufacturing companies in Kenya. His population was a total of 651 medium sized and large scale manufacturing companies in Kenya. He selected a sample of 31 firms by use of stratified probability sampling. Data used was both from secondary and primary data and was collected by use of questionnaires .Data collected was analyzed using descriptive analysis. As per the findings: many of the large scale manufacturing firms in Kenya have greatly adopted quality control systems, quality management systems and use quality

control tools in their operations. In addition all the ,manufacturing firms have internal control systems in their firms.

Salimu (2012) explored on the impact of statistical quality control on customer loyalty in the maize and wheat flour manufacturing firms in Kenya. The study population was composed of ten maize and wheat flour manufacturing firms. Questionnaires were used in collecting data which were collected from primary sources. Descriptive statistics was used in data analysis. The research found out that firms that were studied had procedures for regulating variations as quality management systems which ensured that quality management systems. In addition they concluded wheat and flour firms largely apply these statical quality control procedures to a great extent. Besides most firms and customers give much attention to good quality maize and wheat.

Muli (2014) carried out study on the quality improvement practices and business performance among commercial state corporations in the ministry of health, Kenya. The study used both secondary and primary data sources. Data was collected by use of questionnaires and analyzed using stratified sampling method .A sample of 84 firms was used in data collection. From the study, findings indicate that total quality improvement implementation by parastatals has a positive relationship to operational performance. In addition he concluded that lean production quality improvement practices create agility and efficiency in the Organization.

Internationally, a number of studies were carried out .Motwani, Mahmoud and Rice(2000) explored on the quality practices of Indian organizations. The population used was of 73 companies. It had over 500 employees. They found out that for effective quality management to be implemented, there are nine critical factors to be looked at: top management, quality policies, role of quality department, training, product design, vendor quality management, process design, feedback and employees relations. In conclusion for effective quality management, all the factors need not to be present.

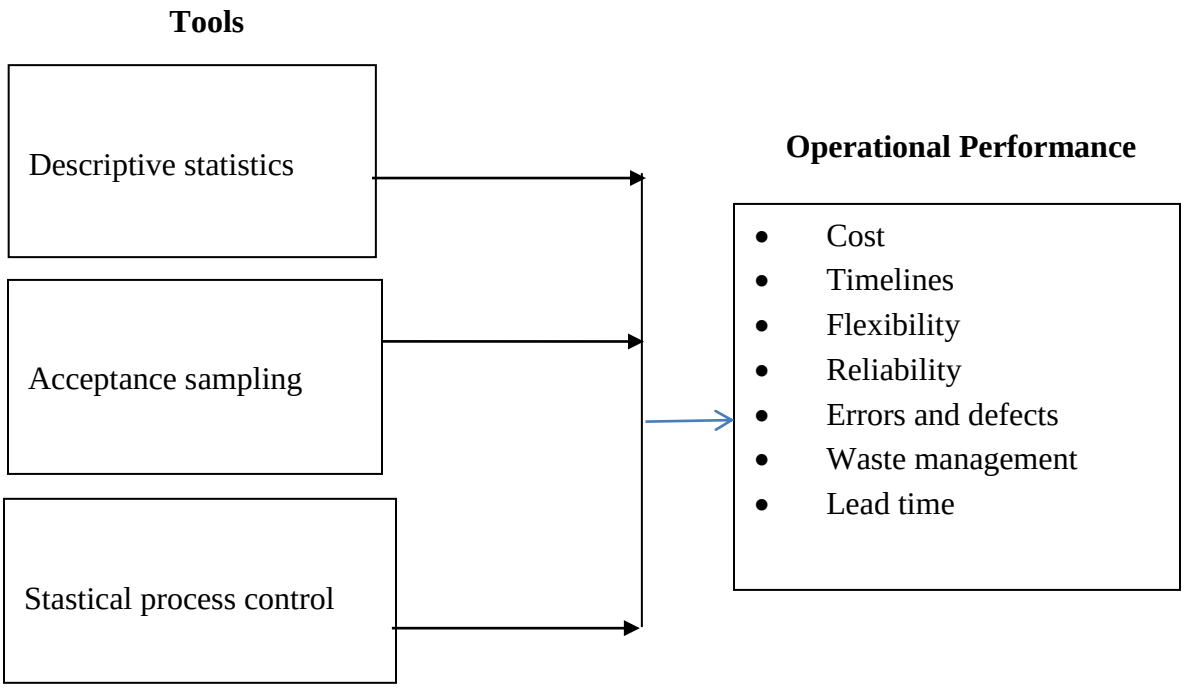
Alidi and Faraj (2005) carried out a research on Quality control techniques as a practice in the Saudi Arabian Manufacturing sectors. Where the findings indicate that most of the manufacturing firms in the manufacturing sector practice quality control techniques . Kwoko and Tummala (2006) carried out a research on a quality control and improvement system based on the total control methodology .The findings indicate that for effective quality control and improvement system, there is need for integration of isolated quality tools.

Lakhal, Pasin and Limam (2006) explored on the relationship between quality management practices and their impact on performance. The study used a sample size of 133 Tunisian companies from the plastics and operational performance transforming sector. Data was collected using questionnaires which were administered to the respondents. The findings indicate a strong relationship between quality management practices operational performance. In addition the results indicate a direct effect of infrastructure practices on product quality. Cristobal Sanchez-Rodriguez, Angel and

Lorente (2004) carried out research quality management practices in the purchasing function. Data collection was effected using questionnaires from the respondents .A sample of 306 purchasing managers within the Spanish manufacturing industry. Results of these research indicate that an increase in quality management practices result in increased business performance.

2.6 Conceptual framework

It clearly states the dependent and independent variables. From the study, the independent variables are : acceptance sampling, descriptive statistics and statistical process control. The independent variable is operational performance.



Source: Author (2017)

Figure 2.1: Conceptual Framework

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides an in-depth analysis on how the study went about in identifying the research design and locale of the study, identify the target population and sampling, identifying data collection instruments and data collection analysis.

3.2 Research Design

It is defined as ways in which data is to be collected and analyzed is structured by the researcher ahead of carrying out research with aims of meeting objectives sought in the research (Cooper & Schindler, 2006). This study used descriptive statistics in the collection of data. This method was preferred due to the fact that it provided in depth information on the statistical quality control practices and how it impacts on operational performance of large scale manufacturing firms in Nairobi.

3.3 Population of the Study

The target population was large scale manufacturing firms within Nairobi, Kenya. According to the Kenya Association of Manufacturers, there are a total of 455 large scale manufacturing firms operating in Nairobi as can been seen from the appendix attached at the end of this study. There are various sectors under which these companies operate. The 455 companies represents the study population. Stratified random sampling method as described in Cooper and Schindler (2006) was applied to come up with the sample size,

since the population in different large manufacturing firms was considered to be heterogeneous, implying that a simple random sample would be unrepresented. Through stratified sampling it ensured that all population was represented. Cooper and Schindler (2006) advocates for 10% of the total population hence the sample size was; 10% of 455 manufacturing companies give a sample size of 45 respondents.

3.4 Data Collection

Due to the fact that the nature of data that was collected is both qualitative and quantitative, the study used primary and secondary sources using structured and semi structured questionnaires. The respondents involved in the study were operation managers based on the fact that they had a detailed understanding of statistical quality management practices and performance of the firm. The questionnaires had three sections: The first contained bio data of the respondents. The second section entailed the statistical quality control practices and finally the third contained information on relationship of statistical quality control and operational performance of large scale manufacturing firms in Nairobi. The questionnaires were administered personally to the respondents to facilitate timely collection of information as per the agreement with the respondents.

3.5 Data Analysis

In data analysis, descriptive statistics for example percentages, mean and median was used to facilitate levels of dispersion on the quantitative data determination of statistical quality control tools used by large scale manufacturing firms in Nairobi. A regression

model was implemented in finding out the relationship of SQC and operational performance of large scale manufacturing firms in Nairobi. The model had three variables. The independent variables were statistical quality control practices while the dependent variable was operational performance of large scale manufacturing firms in Nairobi

$$\mathbf{Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + €}$$

Y=operational performance

$\mathbf{X_1}$**=**Acceptance sampling

$\mathbf{X_2}$**=**Descriptive statistics

$\mathbf{X_3}$**=** statistical process control

β =Regression Constants

€= Error term

This research will use a linear regression model in order to show impact of SQC on operational performance of large scale manufacturing companies in Nairobi.

CHAPTER FOUR

DATA ANALYSIS FINDINGS AND DISCUSSION

4.1 Introduction

The main components of this chapter are data analysis, study findings, and the interpretation of findings in relation to the study objectives. The findings on how the practices involved in statistical quality control impact operational performance on large scale manufacturers based in Nairobi are presented in this section. The purpose of the research was to establish the statistical quality control practices adopted in large scale manufacturing companies based in Nairobi, to determine the influence of practices in statistical quality control management on the operation of large scale manufacturing companies based in Nairobi.

4.2 Response Rate

The study used descriptive statics where data collection was through questionnaires whose structure was as per the research objectives. The study target population was the operations managers and the equivalent in all the large scale manufacturing firms in Nairobi. The researcher administered the questionnaires personally and made follow-ups through phone calls. The respondents involved were described for any aspects in the study that they did not understand and the purpose and the importance the study was to the researcher. The study sample included 45 large scale manufacturing companies in Nairobi.

According to (Mugenda & Mugenda, 2003) a fifty percent response rate is deemed adequate, sixty percent good and one that is above seventy percent is deemed excellent. The study had a response rate of 73.3 where out of 45 questionnaires that were distributed, the response rate was 33firms. Hence this was considered efficient and will give out substantial information that can be used in generalization of the various aspects of the study being sought. For that reason, the researcher proceeded to analyze the data.

4.3 Biographic Data

The respondents were asked about information to do with their gender, experience and education background. The study was structured to gather on information from the respondents on the various aspects about their biographic information which would be linked toward the success of this study. The respondent was asked about their gender and from that a conclusion could be made in general on the distribution of staff in the operation department of various manufacturing firms in Nairobi. Their experience would indicate their knowhow on the various aspects being looked at in this study and their education level too will attribute to their knowledge on the SQC in large scale manufacturing companies based in Nairobi. The findings are as indicated below:

4.3.1 Gender

The researcher asked the participants to specify their gender.

The respondents were asked to indicate their gender. The table below represents the findings.

Table 4.1 Gender Distribution of the Respondents

Gender	Frequency	Percent
Male	25	75.8
Female	8	24.2
Total	**33**	**100**

The respondents were required to specify their gender and from the findings, the percentage of male respondents was 75.8% and that of female respondents was 24.2%. This showed that majority of large scale manufacturing firms based in Nairobi hire male counterparts to work in the operations department. The findings are consistent with Nyamai (2014)'s study which indicated that most of the respondents in operations departments of large scale manufacturing firms in Nairobi were male

Table 4.2 Education Distribution of the Respondents

The table below represents responses on the level of education of the respondents**:**

Education level	Frequency	Percent
College	13	39.4
Undergraduate	14	42.4
Masters	5	15.2
PhD	1	3.0
Total	**33**	**100.0**

Source: Researcher, 2017

Those who participated in the study were required to highlight their level of education and it was found that 39.4% of the respondents had college level education, 42.4 % of

the respondents had undergraduate education,15.2% of the respondents had up to masters education while only 3% of the respondents had PhD level.

The findings perfectly indicated that the knowledge of participants was adequate enough in relation to the data sought, based on the fact that they had acquired relevant education. This is an indication that operation managers in all the manufacturing firms in Nairobi had adequate education that facilitates their work. It was also required that the respondents indicate their years of experience working in the respective firms. The table below represents the findings.

Table 4.3 Experience

Experience	**Frequency**	**Percentage**
Below 2 years	5	15.2
3-5 years	6	18.2
6-10 years	13	39.4
Over 10 years	9	27.3
Total	**33**	**100**

The findings indicated that 15.2% of the respondents had an experience of below 2 years, 18.2% of the respondents had 3-5 years' experience, 39.4% had an experience of 6-10 years and 27.3% had an experience of more than 10 years. The findings showed that majority of the respondents were sufficiently knowledgeable about statically quality control management practices and how they affect operational in their respective firms given the number of years they had worked there. This is also an indication that

employees in most manufacturing firms have adequate experience in the specific duties that they carry out.

The table below represents the responses on whether the respondents had knowledge on SQC practices .

Table 4.4 Knowledge on SQC practices

Knowledge on SQC practices	Frequency	Percent
Yes	32	97
No	1	3
Total	**33**	**100.0**

Source: Researcher, 2017

The respondents were asked if they had knowledge on the statistical quality control practices .The results indicated that of all the respondents, 97% of the respondents indicated that they have knowledge on the SQC practices while only 3% of the respondents indicated that did not have knowledge on the SQC practices. From these findings the researcher was certain that the responses on the objectives on the study were right based on the fact that substantial number of the respondents knew the SQC practices.

4.4 Implementation of Statically Quality Control practices

The first objective was to establish whether the SQC practices had been implemented in manufacturing firms in Nairobi. The table below represents the findings. The respondents were expected to indicate to what extent various responses on descriptive statistics were adopted in the manufacturing firms in Nairobi.

Table 4.5. Descriptive Statistics

Descriptive Statistics	Mean	Std. Deviation
Measures of cental tenderncy like mean, mode, median are used in grouping of data	3.7576	.96922
Standard deviations, regreration analysis is used in explaining the variablews between various aspcts of data.	3.8788	.59987

Source: Researcher, 2017

The respondents were required to ascertain to what extent descriptive statistics had been implemented in large scale manufacturing companies based in Nairobi. The findings indicated that the companies under study had implemented descriptive statistics to a moderate extent. This was designated by the mean value of 3.7576 where the respondents ascertained that Measures of cental tenderncy like mean, mode, median are used in grouping of data and a mean value of 3.8788 was established for Standard deviations, regreration analysis is used in explaining the variablews between various aspcts of data.These findings indicated that large scale manufacturing companies based in Nairobi employ mean, mode, standard deviations in the management of quality of products produced by the firms to a great extent.

The table below presents the responses on the extent to which descriptive statistics had been adopted in large scale manufacturing firms in Nairobi.

Table 4.6 Descriptive statistics

Extent of Implementation	Frequency	Percent
Small extent	6	18.2
Moderate extent	15	45.5
Large extent	12	36.4
Total	**33**	**100.0**

From the findings, 18.2% of the participants considered descriptive statics to have been implemented to a small extent, 45.5% to moderate extent, and 36.4% to a large extent. It is therefore fair to state that most large scale manufacturing companies found in Nairobi have adopted use of descriptive statistics in the process of ensuring that quality of goods produced is as per the requirements and specifications of end users.

The table below represents responses on the implementation of acceptance sampling as SQC practice had been adopted.

Table 4.7 Acceptance sampling

Descriptive statistics	Mean	Std. Deviation
Inspection of lots or batches is done before production begins	4.5758	.506759…
Inspection of lots or batches is done after the process of production	3.6364	.65279
Control charts are used in determing acceptance of products	4.0606	.55562
Inspection is done on all raw materials from the suppliers	4.5152	.50752
Inspection is done on finished products befrore being send to customers	3.7879	.69631

From the despondences indicated above it was ascertained that Acceptance sampling as a statistical quality management practice had been carried out to a great extent in the firms under study. This is shown by the positive mean values that were more than 3.0. The respondents indicated that to a large extent, inspection of batches usually takes place befrore production begins, inndicated by a high mean value of 4.5758 and to a large extent too, the manaufacturing firms usually inspect raw materials from suppliers.Besides to a moderate extend the respondents ascertained that control charts are used in determinig acceptance of products and to a moderate extend they indicated that inspection of batches is deone after the proces of productionn is complete. The table below represents responses on the extent to which acceptance sampling as SQC practice had been adopted.

Table 4.8 Frequency table: Acceptance sampling

Implementation extent	Frequency	Percent
moderate extent	3	9.1
large extent	23	69.7
very large extent	7	21.2
Total	**33**	**100.0**

Source: researcher, 2017

The findings demonstrated that 9.1% of the total participants agreed to the fact that acceptance sampling is used to a moderate extent, 58.8% to a large extent an indication that acceptance sampling is highly implemented in large scale manufacturing companies based in Nairobi

The table below indicates the responses on the extent to which statistical process control had been implemented in large scale manufacturing firms in Kenya.

Table 4.9 Stastical Process Control

Stastical process control	Mean
Variations sometimes exists in the production process	4.1212
Common causes of variations can be controlled while special causes can not be easily controlled	4.3636
Control charts, in identifying causes of variations	3.1818
Pareto charts, ishakawa diagram are used in pointing out the variations	4.6667

Source: researcher, 2017

The findings indicated that statistical process control had been applied in the large scale manufacturing companies based in Nairobi. This was supported by the positive mean values which were above 3.0. To a large extent the respondents indicated that Pareto charts, ishakawa diagram are used in pointing out the variations indicated by a mean value of 4.6667.To a large extent indicated by a mean value of 4.36, most of the respondents indicated that Common causes of variations can be controlled while special causes can not be easily controlled.In a addition, a mean of 4.1 was indicated for the response which ascertaind that sometimess variations occur in production, to a moderate extent, supported by a mean value of 3.1 indicated that the participants agreed that control charts are used to indentify causes of variations.

The table below represents responses on the extent to which statically process control as SQC practice had been adopted.

Table 4.10 : Statistical process control

Extent of Implementation	Frequency	Percent
Small extent	4	12.1
Moderate extent	8	24.2
Large extent	13	39.4
Very large extent	8	24.2
Total	33	100.0

Source: Researcher, 2017

From the findings it was ascertained that 12.1% of the respondents agreed that statistical process control as statistical quality control practice is used in the manufacturing firms to a small extent, 36.4% indicate that it is used moderately and 75.8% of them indicated that it had been applied to a great extent. Descriptive statistics of all the three SQC practices was carried out and the summary of the findings are as indicated in the table below:

Table 4.11 Summary of statistical quality control practices

SQC practices	Mean	Std. Deviation	Variance
Acceptance sampling	4.1212	.54530	.297
Descriptive statistics	3.7576	.96922	.939
Statistical process control	3.1818	.72692	.528

From the summary indicated above, Acceptance sampling had been implemented to great extent, indicated by the highest mean value of 4.1212, the second in order of the level of use in large scale manufacturing firms was statistical process control and the least in use was descriptive statics shown by a mean value of 3.1818.

From these findings it was concluded that all the three SQC practices had been adopted as statistical quality management practices with acceptance sampling having been adopted to a great extent an indication that most large scale manufacturing firms in Nairobi an indication that they usually carry out inspection of raw materials before carrying out production and also inspection of finished products after production.

Descriptive statistics was least implemented an indication that very few firms make use of measures of central tendency in explaining variations.

4.5 Correlation analysis between SQC practices and operational performance

Correlation between statistical quality control practices: acceptance sampling, statically process control and descriptive statics and operational of large scale manufacturers found in Nairobi was carried out . The results of the analysis are as indicated in the table below:

The table below represents correlations between SQC performance and practice in large scale manufacturing companies based in Nairobi.

Table 4.12 Correlation matrix

		Operational Performance	Acceptance sampling	Statically process control	Descriptive statics
Operational performance	Pearson Correlation	1			
	Sig. (2-tailed)				
Acceptance sampling	Pearson Correlation	.730	1		
	Sig. (2-tailed)	.000			
Statistical process control	Pearson Correlation	.465	.230	1	
	Sig. (2-tailed)	.004	.198		
Descriptive statics	Pearson Correlation	.235	.132	.224	1
	Sig. (2-tailed)	.084	.465	.210	

Source: Researcher, 2017

From the findings it was ascertained that there exists a positive relationship between acceptance sampling and operational performance. This was indicated by correlation values of (r=0.730, p- 0.000) an indication that acceptance sampling is a great determinant of operational performance in large scale manufacturing companies found in Nairobi. A 0.000 p-value indicated that acceptance sampling is statically substantial since 0.000 was lower than 0.05 at 95% confidence level. Statistical process control as a statistical quality control practice affects operational since it indicated a correlation value of (r=0.465,p=0.004) an indication that statistical quality control practice affects operational performance positively. Besides, it had a p-value of 0.004 an indication that statistical process control as a statistical quality control practice, is statistically significant since 0.004 is less than 0.05 critical value at 95% confidence level. A correlation value of (r=0.235, p=0.084) was found descriptive statics as practices, an indication that it affects operational performance of large scale manufacturing companies found in Nairobi. Moreover, its p-value was 0.084 showing descriptive statics as a statistical quality control practice, is not statically significant given that it is more than 0.05 at 95% confidence level.

A positive correlation value is an indication that an increase in the levels of any of the SQC practices results in an increase in the levels of operational performance in large scale manufacturing firms in Nairobi. From these findings it was ascertained that statistical process control, descriptive statistics and acceptance planning influences performance positively and therefore management of the various large scale

manufacturing companies found in Nairobi needs to make sure that they are well implemented and are operational to experience these effect on performance.

4.6 Regression Analysis between SQC practices and Operational performance

It was used to indicate the relationship between independent variable: statically quality control practices and dependent variables: operational performance of large scale manufacturing firm in Nairobi as follows:

4.6.1 Model Summary

It is used in the determination of the correlation between statically quality control practices and operational performance of companies involved in large scale manufacturing in Nairobi. The table below shows the appropriateness of the regression model in explaining the phenomena of the study.

Table 4.13 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.648[a]	.419	.359	.45287	.419	6.980	3	29	.001

a. Dependent Variable: Operational performance
b. Predictors: (Constant), Acceptance sampling, Stastical process control, Descriptive stastistics

Acceptance sampling, Stastical process control and Descriptive stastistics were found to be satisfactory variables in explaining operational performance in companies involved in large scale manufacturing in Nairobi. This is supported by a coefficient of determination

of 41.9% .From this we can conclude that statistical quality control practices are a representative of 41.9% of variations in operational performance in companies involved in large scale manufacturing in Nairobi, which show this is a fairly good model. Besides the significance level is at 0.00 which is less that the critical value of 0.05 hence this model was statically significant at 95% confidence level.

4.6.2 Analysis of Variance

Analysis of Variance was adopted to ascertain the impact of the practices of statistical quality control on operational performance of firms in Nairobi that carry out manufacturing on a large scale.

Table 4.14 :ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.295	3	1.432	6.980	.001[b]
	Residual	5.948	29	.205		
	Total	10.242	32			

a. Dependent Variable: Operational
b. Predictors: (Constant), Acceptance sampling, Stastical process control, Descriptive stastistics .

From the findings in the above table the results indicate a significance level of 0.001 which is an indication theat. Statistical quality control practices which include: statistical process control, descriptive statistics and acceptance sampling are significant contributors to operational since 0.001 p-value lies below a 0.05 critical value at 95% confidence level. These was an indication that all the SQC practices had effect on performance in large scale manufacturing firms in Nairobi.

4.6.3 Significance of regression Coefficients

Test for coefficients test was carried out to establish whether there exists a relationship between statically quality control practices and performance of companies involved in large scale manufacturing in Nairobi as tabulated below:

Table 4.15 Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.550	.777		4.570	.000
Acceptance sampling	.352	.112	.400	2.912	.007
Statistical process control	.311	.121	.420	2.767	.010
Descriptive statics	.275	.148	.272	1.853	.074

a. **Dependent Variable: operational Performance**

The findings above indicate that the various statistical practices have a positive impact on operational performance. Acceptance sampling had the highest impact indicated by (β_1=0.352 p-value=0.007) which indicates that an increase in the level of implementation of acceptance sampling by one unit, results in increase in the operational of companies involved in large scale manufacturing in Nairobi by 0.352..Besides the p-value of acceptance sampling was 0.007 which shows that acceptance sampling is of statistical significance, because the p-value is below 0.05.

Statistical process control besides has a coefficient value of 0.331 which is an indication that an increase in the Statistical process control by one unit, results in a related increase

in operational performance by 0.331.Besides the P- value attained was 0.00 which is lower than 0.05 and hence Statistical process control is statically significant indicant at 95% confidence level.

Descriptive statistics had a positive impact on operational performance (β_1=0.275,p-value=0.074). An indication that a unit increase in the levels of descriptive performance in companies involved in large scale manufacturing in Nairobi, results in an increase in the level of operational performance by 0.275.In addition to that a p-value of 0.074 was an indication that descriptive statics is not statically significant since the p-value is more than 0.05 as the critical value at 95% confidence level .These findings indicated that all the three statistical quality control practices adopted in the companies involved in large scale manufacturing in Nairobi have a positive impact on performance and hence there is need for close monitoring of them by top management to achieve this. According to the results of these study, $Y = \beta_0 + \beta 1X_1 + \beta_2X_2 + \beta_3X_3$ becomes;

$Y = 3.550 + 0.352X_1 + 0.311X_2 + 0.275X_3$

$X_{1=}$Acceptance Sampling

X_2 =Statistical Process Control

X_3=Descriptive Statistics

4.7 Discussion

The major objective of the study was to determine the statically quality control practices implemented in large scale manufacturing companies in Nairobi. The second aim was to ascertain the impact of the statistical quality control practices on operational of large

scale manufacturers in Nairobi. The outcomes of the study as indicated above ascertained that, large scale manufacturing companies in Nairobi make use of acceptance sampling, statistical process control and descriptive statistics as their quality management practices. This was indicated by the positive mean values for the three statistical quality control practices, an indication that to great extent, they had been adopted by the large scale manufacturing companies in Nairobi. To specify the statistical quality control practice that had been adopted by large scale manufacturing companies in Nairobi, the research employed descriptive statistics where the mean, mode and standard deviations of the level of responses on the use of the three statistical quality control practices .From these findings it was ascertained that all the three statistical quality control practices: acceptance sampling, descriptive statistics and statistical process control used in this study had been adopted by Nairobi's large scale manufacturers.

Acceptance sampling indicated the highest mean of 4.1,statsical process control indicated a mean value of 3.7 and descriptive statistics indicated the lowest mean value of 3.1 .This indicated that in the large scale manufacturing companies found in Nairobi, Acceptance sampling had been espoused largely as compared to other statistical quality control practices. The large scale manufacturing companies found in Nairobi least implemented descriptive statistics judging from the mean value of 3.1. There was a moderate-level implementation of statistical process control shown by the mean value of 3.7. In conclusion given a given likert scale where "1 = No Extent; 2 = Small extent; 3 = Moderate Extent; 4 = Large Extent; 5 = Very Large Extent", (Monirei, 2016) it is possible to state that statsical quality control practices had been adopted in the large scale

manufactruring firms in Nairobi to a moderate to large extent, given that their mean values were between 3.1 and 4.1.In addition to that from the responses indicated by the respondents in this study, it was assceratinde that more than 50% of the respondents indicated that all the three statstsical quality management practices: descriptive statsics, acceptance sampling and statsical process control had been implemeneted in large scale manufacturing companies in Nairobi.

The second objective of the study was to establish the impact of statistical quality control practices on operational performance of companies involved in large scale manufacturing in Nairobi. The study used correlation to indicate the effect of the statistical quality control practices on operational of companies involved in large scale manufacturing in Nairobi. From the results of correlation analysis carried out on the statistical quality control practices and operational performance of companies that carry out large scale manufacturing operations in Nairobi, the results indicated a positive relationship between the statistical quality control practices and operational performance of companies that carry out large scale manufacturing operations in Nairobi. The correlation between acceptance sampling and Operational performance in this study was measured by use of profitability, quality and customer satisfaction. From the findings it was ascertained that statistical quality control practices have a positive impact on operational performance whereby: acceptance sampling had a strong positive correlation of 0.730, descriptive statistics had a correlation of 0.235 and statistical process control had a correlation of 0.465 hence all the statistical quality control practices in this study affect operational

management in the companies that carry out large scale manufacturing operations in Nairobi.

Knowledge on effect of the statistical quality control practices used in large scale manufacturing companies in Nairobi on operational performance was established through carrying out of regression analysis where the various statistical quality control practices were regressed against operational performance. The regression analysis established that 41% (fair) of the operational performance of large scale manufacturing firms in Nairobi is affected by acceptance sampling, descriptive statistics and statistical process control. This indicated that the statistical quality control practices had impact on the operational performance of large scale manufacturing firms in Nairobi. In addition to that the model coefficients indicated that all the SQC practices had impact on operational performance of large scale manufacturing firms in Nairobi as indicated, hence reject the null hypothesis that states that statistical quality control practices have no impact on performance of companies that carry out large scale manufacturing operations in Nairobi. This study is in line with a study carried out by Mithani (2012) whereby he ascertained that implementation of statistical quality control practices has positive impact on operational performance of manufacturing firms in Kenya. Meniere (2016) established that implementation of statistical quality control practices in maize floor companies have a positive impact on performance. Salimu (2012) ascertained that adoption of statistical quality control practices has positive impact on performance of wheat for manufacturing firms in Kenya.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the study, conclusions made, as well as the recommendations. It further discusses the study limitations. The objective of this study was to ascertain the degree to which statistical quality control practices had been implemented in large scale manufacturing companies in Nairobi and also to determine the relation between practices in statistical quality control and operational performance in the firms.

5.2 Summary

A total of 45 questionnaires were administered to respondents who were the operational managers and the equivalent in the large scale manufacturing companies in Nairobi in order to meet the set objectives of ascertain the implemented statistical quality control practices in companies that carry out large scale manufacturing operations in Nairobi to provide information on quality control practices Out of 45 questionnaires that were administered, 33 were completed indicating a response rate of 73%. The questions in the questionnaires were developed based on the objectives of the research. To ensure the consistency and comprehensiveness of the technique, a process of editing and cleaning of the questionnaires was performed. After coding the questionnaires, the responses were analyzed by keying the questionnaires into the SPSS (Statistical Package for Social Sciences). The analytical methods used for the data were regression analysis, correlation analysis, and descriptive analysis. These enabled the study to meet the three study

objectives outlined. According to the biographic information obtained, male respondents accounted for 75.8% of the total number of participants whereas female respondents accounted for 24.2%. This indicates that majority of operations department employees in Nairobi's large scale manufacturing companies are male. In addition, 39.4% of the 2 % of respondents had up to college education level, 42.4 % of the respondents had undergraduate education, and 15.3% of the respondents had up to master's education while only 3% of the respondents had PhD level. Hence more than 50% of the respondents were well versed with knowledge on the statistical quality control practices based that they were educated. Based on experience, 15.2% of the respondents had an experience below 2 years, 18.2% of the respondents had 3-5 years' experience, 39.4% of the respondents had a working experience spanning between 6-10 years and 27.3% had an experience of more than ten years. The findings ascertain that majority of the respondents were adequately experienced in matters to do with the operations of such firms and their acquaintance with statistical quality control management practices and how they affect operational was profound.

Besides, the study further established, 55.6% of the respondents were degree holder, 28.8 percent of the respondents had master's education level, and 15.9% of the respondents had college education. An indication that most of the respondents had adverse education that enabled them to effectively carry out their duties and they had knowledge on the data sought on statistical quality control practices in Nairobi. In relation to the experience of the respondents, the study indicated that 54% of the respondents had an experience of between 5 and 10 years, 31.7% of them had an experience of 0-5 years'

experience and 14.3% had more than 10 years' experience. These results indicated that the study could be well carried out based on the fact that most of the respondents had adequate experience and hence understood the various statistical quality control practices in large scale manufacturing companies in Nairobi. Based on the knowledge on statistical quality control practices, 75.8% of the respondents indicated that they have knowledge on the SQC practices while only 24.2% of the respondents indicated that did not have knowledge on the SQC practices. From these findings the researcher was certain that the responses on the objectives on the study were right based on the fact that substantial number of the respondents knew the SQC practices.

This study was set to identify the statistical quality control practices that had been implemented in large scale manufacturing companies in Nairobi. It was also meant to determine the effect of statistical quality control practices on operational performance of large scale manufacturing companies in Nairobi. The research results established that firms that manufacture on large scale in Nairobi practiced statistical quality control to a large extent which were acceptance sampling, statistical quality control and descriptive statistics. The statistical quality control practices generated a positive mean value proving the hypothesis. Further, the descriptive results demonstrated that to a large extent, statistical quality control practices had been implemented in companies that manufacture on a large scale in Nairobi indicated by positive mean value above three. The results on the extent of adoption results from showed that large-scale manufacturers in Nairobi had to a great extent implemented all statistical quality control practices and this was

confirmed by the response from more than half the number of participants who agreed that they had been implemented in their firms.

The study was also aimed at establishing how statistical quality control practices affect operational practices in large scale manufacturing companies in Nairobi. From the findings, it is possible to ascertain that statistical quality control practices impact operational practices positively. This finding was backed by the positive correlation found between statistical quality control practices and timeliness, reduction of errors, quality and profitability of the firms. Besides the results from the regression analysis showed that a 41% of the independent variable which was operational performance well explained by the practices implemented in the companies that manufacture on a large scale in Nairobi which were: statistical quality control process control, descriptive statistics and acceptance sampling practices.

5.3 Conclusion

In conclusion, the study was aimed at establishing the statistical quality control practices that had been implemented in the large scale manufacturing companies in Nairobi and its relation to operational performance. The findings indicated that to a large extent, all the statistical quality control practices had been implemented in the firms as per the indicated by positive mean values above three with acceptance sampling having been implemented to a large extent, whereas statistical process control have been implemented to a moderate extent, while descriptive statistics having been least adopted in large scale manufacturing companies, an indication that all the practices had been used in Nairobi's

large scale manufacturers. In addition the responses indicated that to a great extent, most of the respondents agreed that the various statistical quality control practices had been applied in the large scale manufacturing companies. This was demonstrated by half of the respondents.

The findings from the regression analysis indicated that statistical quality control practices to a moderate extent have effect on operational performance in the large scale manufacturing companies in Nairobi. The study results ascertained a positive correlation between the various statistical practices in quality control and operational performance of large scale manufacturing companies in Nairobi. The value of coefficient of Multiple Determination of forty one percentage implying that up to forty one percent of the changes in the level of operational performance of the large scale manufacturing companies in Nairobi is attributed to by the various statistical quality control practices and the other percentage of the performance in large scale manufacturing companies is caused by other factors not included in these study as the dependent variables. In addition to that the p-value indicated that the various statistical quality control practices implemented in large scale manufacturers Nairobi are statically significant based on the fact that the value is less than zero point zero five. From this findings it indicates that various statistical quality control practices which include: acceptance sampling, descriptive statics and statistical process control have all been adopted in the companies that manufacture on a large scale in Nairobi. In addition these statistical quality control practices affect operational performance of large scale manufacturing companies in Nairobi. Implementing statistical quality control practices reduces errors, improves

quality of products, improves productivity of the firms, reduces costs and facilitates adequate use of resources.

5.4 Recommendations to Policy and Practice

From these study findings, it was established that most of the companies that manufacture on a large scale in Nairobi had implemented statistical quality control practices .However of the three statistical quality control practices, descriptive statistics has been implemented to a least extent. This study recommends that the operational managers of the various companies that manufacture on a large scale and are based in Nairobi should have adopted descriptive statistics into their quality management in order to increase the level of accuracy and reduce instances of errors caused by poor and incorrect figures in the inventory management of these firms.

All statistical quality control practices had a near perfect positive influence on organizational operational performance in the large scale manufacturing industry in Nairobi. There is need for adoption of these practices in other firms too by increasing the investment in current statistical quality control and improvement to build their core competences. There is need for more research to be carried out on the challenges faced on the adoption of the statically quality control practices on performance of companies that manufacture on a large scale in Nairobi and ways in which they can be managed.

5.5 Limitations of the Study

The aim of this study was to establish the extent of implementation of statistical quality control practices in companies that manufacture on a large scale in Nairobi. Besides the study was aimed at establishing the relationship between statistical quality control practices and operational of large scale manufacturing firms in Nairobi. There was much resistance from the employees in the large scale manufacturing firms in giving out information which posed a major hindrance to the effectiveness of the study.

The study was narrowly focused on the large scale manufacturing firms in Nairobi and hence the results could not be generalized for a wider population area like for example, the whole Kenyan country. Besides some of the respondents did not accept the questionnaires thus making it a challenge to effectively carry out the study. Most respondents did not know the SQC practices in general but they used to make use of them each and every day and this had to force the researcher to have to explain to theme on what each and every practice entailed.

5.6 Suggestions for further Research

The aim of this study was to establish the extent to which statistical quality control practices had been implemented in large scale manufacturing firms in Nairobi. Despite the fact the objectives of the study were attained, the study recommends that this was a study of large scale manufacturing firms in Nairobi only. A further research needs to be done on other firms other than large scale manufacturing firms, a study to be done on large scale manufacturing firms in Kenya in general rather than in Nairobi alone.

Statistical quality management practices are one of the other several quality management practices which include six sigma, continuous improvement, and total quality management among others. Studies need to be done on the quality management practices as a whole and it affects performance of various sectors and firms.

REFERENCES

Cristobal Sanchez-Rodriguez, Angel and R. Martinez-Lorente (2004) "Quality management practices in the purchasing function: An empirical study *", International Journal of Operations & production management* , 24:(7).666-687

Costin, Harry, (1999). Strategies For Quality Improvement (Second Edition). *Fort Worth, Texas: The Dryden Press*

Cooper D.R. & Schindler, (2006).*Business Research Methods*, (5thEdition), Boston Irwin, McGaw Hill, Inc

Franks, O. S. (2009). A Theoretical Model for Implementing Quality Management in an Automated Environment. *International Journal of Control and Automation,.2(2)* , 1-8.

Gomes, M. I. (2011). *Statistical Quality Control.* University of Lisbon: ResearchGate.

Hwang, G., Han, S., Jun, S., & Park, J. (2014). Operational Performance Metrics in Manufacturing Process. *International Journal of Innovation Management and Technology,* 5,(1) , 50-55.

Jenn Riley, Kurt Whitsel ,(2005) "Practical quality control praocedures for digital imaging projects "OCLC systems & services: *International digital library prospectives*, 21 : 1, .40 -48.

Kamau, S. M. (2016). Performance measurement practices and operational performance of manufacturing firms in Kenya. University of Nairobi: *Unpublished MBA report.*

Kaynak, H. (2003). The relationship between total quality management practices and their effects on firm performance. *Journal of Operations Management 21* , 405-435.

Kiarie, J. W. (2013). Statistical Quality Control In Confectinary Industry and its Application. University of Nairobi: *Unpublished MBA Report.*

Mahmoud, M., & Carlos, F. (2010). Performance Management in Service Operational Settings: A selective literature examination, benchmarking. *An International Journal, 17 (2)* , 214-231.

Mithwani, R. E. (2011). A study of Quality Control Systems used by Manufacturing Firms in Kenya. University of Nairobi: *Unpublished MBA Report.*

Monirei, E. M. (2016). Quality management and operational performance of manufacturing firms in Nairobi County. University of Nairobi: *Unpublished MBA Report.*

Munyao, M. S. (2014). Effect of Service Quality Management Practices on Operational Performance of Petroleum Distributing Firms in Kenya. University of Nairobi: *Unpublished MBA Report.*

Lasaad Lakhal, Federico Pasin, Mohamed Limam (2006) "Quality management practices and their impact on performance," *International Journal of Quality & Reliability Management,* 23:(6).625-646

Salimu, B. H. (2012). Impact of Statistical Quality Control on Customer Loyalty in the Maize and Wheat Flour Manufacturing Firms in Kenya. University of Nairobi: *Unpublished MBA Report.*

Saunders, M., Lewis, P. & Thornhill, A., (2007). Research Methods For Business Students. Essex, England: Pearson Education Ltd.

Summers, Donna C. S., (2000). Quality (2nd Ed.). New Jersey, USA: Pearson Education Ltd.

Taqi N. Al-Faraj,Abdulaziz S.Alidi (2006) "The practice of Quality Control Techniques in the Saudi Arabian Manufacturing sectors ," *International Journal of Quality & Reliability management*,.9(7) 122-125

Truong, H., Sampaio, P., Carvalho, M. d., Fernandes, A. C., & An, D. T. (2014). The role of quality management practices in operational performance: An empirical study in a transitional economy. *International Conference on Quality Engineering and Management*, (. 717-733). Braga, Portugal.

APPENDICES

APPENDIX I: QUESTIONNAIRE

University of Nairobi

School of Business

Department of Management Science

Research Questionnaire

Dear respondents, this questionnaire is for data gathering on the Statistical quality management practices and operational performance in the large scale manufacturing firms in Nairobi Kenya. The research is purely for academic purpose and will only be used for that purpose. So, your genuine, frank and timely response is important for the success of this study. Therefore, I kindly request you to respond to each items of the question very carefully

General Instructions

You can write your name or choose not to.

The questionnaire has three sections, please try and complete all the sections

Please tick where appropriate and write your answer where there is no option as applicable.

Section I (General Information)

1. What is the name of your organization?

……

2. What is your position in the organization?

……

3. For how long have you worked in your organization?

Under 2 years ☐ 2–5 years ☐ 6–10 years ☐ over 10 years ☐

4. What is your level of education?

Primary ☐
Secondary ☐
College ☐
Undergraduate ☐
Master ☐
Doctorate ☐

5. Do you have knowledge about quality management ? Yes ☐ No ☐

6. Do your colleagues know about quality management? Yes ☐ No ☐

SECTION 2 Assessment of Statistical quality control practices Adoption

II. To what extent has your company adopted the following stastistical quality control practices?

Please indicate on a Scale of 1 – 5 where: 1 = No Extent; 2 = Small extent; 3 = Moderate Extent; 4 = Large Extent; 5 = Very Large Extent

No	**Stastistical quality control practices associated with performance**	**1**	**2**	**3**	**4**	**5**
1	**Acceptance sampling**					
	Inspection of lots or batches is done before production begins					
	Inspection of lots or batches is done after the process of production					
	Control charts are used in determing acceptance of products					
	Inspection is done on all raw materials from the suppliers					
	Inspection is done on finished products befrore being send to customers					

2	**Stastical process control**					
	Variations sometimes exists in the production process					
	Common causes of variations can be controlled while special causes can not be easily controlled					
	Control charts, in identifying causes of variations					
	Pareto charts, ishakawa diagram are used in pointing out the variations					
	Stastical methods and process controls are used in controlling variations					
3	**Descriptive stastistics**					
	Measures of cental tenderncy like mean, mode, median are used in grouping of data					
	Standard deviations, regreration analysis is used in explaining the variablews between various aspcts of data.					

PART C: STATISTICAL QUALITY CONTROL PRACTICES AND OPERATIONAL PERFORMANCE

To what extend does these statsical quality practices affect performance of the stated variables as indicated

Please indicate on a Scale of 1 – 5 where: 1 = No Extent; 2 = Small extent; 3 = Moderate Extent; 4 = Large Extent; 5 = Very Large Extent

STASTISCAL QUALITY CONTROL PRACTICE ASSOCIATED WITH PERFORMANCE	**Operational performance measures**	**1**	**2**	**3**	**4**	**5**
Acceptance sampling	Reduces errors and defects					
	Increases on quality of goods and services					
	Reduces operational costs (quality)					
	Faccilitates adequate facility utilization					
	Ensures timeliness and reduces cycle timesin production					
	Increases productiviuty of a firm					
Stastical process control	Reduces errors and defects					
	Increases on quality of goods and services					
	Reduces operational costs (quality)					
	Faccilitates adequate facility utilization					
	Ensures timeliness and					

	reduces cycle timesin production					
	Increases productiviuty of a firm					
Descriptive stastics	Reduces errors and defects					
	Increases on quality of goods and services					
	Reduces operational costs (quality)					
	Faccilitates adequate facility utilization					
	Ensures timeliness and reduces cycle timesin production					
	Increases productiviuty of a firm					
	Reduces errors and defects					

Appendix II: Large Scale Manufacturing Firms in Nairobi, Kenya

Energy sector
A.I Records (Kenya) Ltd
Modulec Engineering Systems Ltd
Kenwestfal Works Ltd
Amedo Centre Kenya Ltd
Mustek East Africa
Assa Abloy East Africa Ltd
Kenya Power & Lighting Co. Ltd
Nationwide Electrical Industries
Kenya Scale Co. Ltd Ltd/ Avery Kenya
Aucma Digital Technology Africa Ltd
Nationwide Electrical Industries Ltd
Kenya Shell Ltd
Avery (East Africa) Ltd
Optimum Lubricants Ltd
Libya Oil Kenya Limited
Baumann Engineering Limited
PCTL Automation Ltd
Power Technics Ltd
Centurion Systems Limited
Reliable Electricals Engineers Ltd
Pentagon Agencies
Digitech East Africa Limited
Power Engineering International Ltd
Sanyo Armo(Kenya) Ltd
Manufacturers & Suppliers (K) Ltd
Eveready East Africa Limited
Socabelec East Africa
Marshall Fowler(Engineers) Ltd
Frigorex East Africa Ltd
Sollatek Electronics (Kenya) Limited
Mecer East Africa Ltd
Holman Brothers (E.A.) Ltd
Specialised Power Systems Ltd
Metlex Industries Ltd
IberaAfrica Power(EA) Ltd
Synergy-Pro
Metsec Ltd
International Energy Technik Ltd
Tea Vac Machinery Limited

East African Cables Ltd
Kenwest Cables Ltd
Virtual City Ltd
Chemical Sector
Anffi Kenya Ltd
Maroo Polymers Ltd
Basco Product (K) Ltd
Imaging Solutions(K) Ltd
Match Masters Ltd
Interconsumer Products Ltd
Bayer East Africa Ltd
United Chemical Industries Ltd
Odex Chemicals Ltd
Continental Products Ltd
Oasis Ltd
Osho Chemicals Industries Ltd
Cooper K- Brands Rumorth EA Ltd
Cooper Kenya Africa Ltd
PolyChem East Africa Ltd
Rumorth East Africa Limited
Procter & Gamble East Africa Ltd
Beiersdorf East Africa
Sadolin Paints (E.A.) Ltd
PZ Cussons Ltd
Blue Ring Products Ltd
Sara Lee Kenya Limited
Rayal Trading Co. Ltd
Saroc Ltd
BOC Kenya Limited
Reckitt Benckiser(E.A) Ltd
Buyline Industries Limited
Super Foam Ltd
Revolution Stores Co. Ltd
Carbacid (CO2) Limited
Crown Berger Kenya Ltd
Soilex Chemical Ltd
Chemicals & Solvents E.A. Ltd
Strategic Industries Limited
Crown Gases Ltd
Chemicals and Solvents E.A. Ltd

Decase Chemical(Ltd)
Supa Brite Ltd
Coates Brothers (E.A.) Limited
Unilever Kenya Ltd
Deluxe Inks Ltd
Coil Products (K) Limited
Desbro Kenya Limited
Murphy Chemical E.A Ltd
Colgate Palmolive(E.A) Ltd
E. Africa Heavy Chemicals (1999) Ltd
Syngenta East Africa Ltd
Johnson Diversity East Africa Limited
Elex Products Ltd Synresins Ltd
Kel Chemicals Limited
European Perfumes& Cosmetics Ltd
Tri-Clover Industries(K) Ltd
Kemia International Ltd
Galaxy Paints & Coating Co. Ltd
Twiga Chemical Industries Limited
Ken Nat Ink & Chemical Ltd
Grand Paints Ltd Vitafoam Products Limited
Magadi Soda Company Ltd
Henkel Kenya Ltd
Food Sector
Africa Spirits Ltd
Annum Trading Company Limited
Premier Flour Mills Ltd
Agriner Agricultural Development Limited
Brookside Dairy Ltd
Aquamist Ltd
Premier Food Industries Limited
Belfast Millers Ltd
Proctor & Allan (E.A.) Ltd
Bidco Oil Refineries Ltd
Candy Kenya Ltd Promasidor (Kenya) Ltd
Bio Foods Products Limited
Capwelll Industries Ltd
Trufoods Ltd
Breakfast Cereal Company(K) Ltd
Carlton Products(EA) Ltd

UDV Kenya Ltd
British American Tobacco Kenya Ltd
Chirag Kenya Limited
Unga Group Ltd
Broadway Bakery Ltd
E & A Industries Ltd
Usafi Services Ltd
C. Czarnikow Sugar(EA) Ltd
Kakuzi Ltd Uzuri foods Ltd
Cadbury Kenya Ltd
Erdemann Co. (K) Ltd
ValuePak Foods Ltd
Centrofood Industries Ltd
W.E. Tilley(Muthaiga) Ltd
Excel Chemical Ltd
Coca cola East Africa Ltd
Kenya Wine Agency Limited
Kevian Kenya Ltd
Confec Industries(E.A) Ltd
Highlands Canner Ltd
Koba Waters Ltd
Corn Products Kenya Ltd
Sunny Processor Ltd
Super Bakery Ltd
Kwality Candies &Sweets Ltd
Crown Foods Ltd
Lari Dairies Alliance Ltd
Cut Tobacco (K) Ltd
Spin Knit Dairy Ltd
London Distillers (K) Ltd
Deepa Industries Ltd
Highlands Mineral Water Co. Ltd
Mafuko Industries Ltd
Del Monte Kenya Ltd
Homeoil
Manji Food Industries Ltd
East African Breweries Ltd
Insta Products(EPZ) Ltd

International
Melvin Marsh East African Sea Food Ltd
Jambo Biscuits (K) Ltd
Kenya Tea Development Agency
Miritini Kenya Ltd
Eastern Produce Kenya Ltd
Karirana Estate Ltd
Jetlak Foods Ltd
Mini Bakeries (Nbi)Ltd
Farmers Choice Ltd
Frigoken Ltd
Kenafric Industries Limited
Mount Kenya Bottlers Ltd
Nicola Farms Ltd
Giloil Company Limited
Nairobi Bottlers Ltd
Kenblest Limited
Glacier Products Ltd
Kenya Breweries Ltd
Nairobi Flour Mills Ltd
Razco Ltd
Global Allied Industries Ltd
Nestle Kenya Ltd
Kenya Nut Company Ltd
Rafiki Millers Ltd
NAS Airport Services Ltd
Kenya Sweets Ltd
Global Beverages
Global Fresh Ltd
Gonas Best Ltd
Re-Suns Spices Limited
Hail & Cotton Distillers Ltd
Palmhouse Dairies Ltd
Smash Industries Ltd
Al-Mahra Industries Ltd
Patco Industries Limited
Softa Bottling Co. Ltd
Alliance One Tobacco Kenya Ltd
Spice World Ltd
Pearl Industries Ltd
Alpha Fine Foods Ltd

Pembe Flour Mills Ltd
Wrigley Company(E.A.) Ltd
Alpine Coolers Ltd
Plastics and Rubber
Betatrad (K) Ltd
Prestige Packaging Ltd
Haco Industries Kenya Ltd
Prosel Ltd Hi-Plast Ltd
Blowplast Ltd
Bobmil Industries Ltd
Jamlam Industries Ltd
Qplast Industries
Complast Industries Limited
Sumaria Industries Ltd
Kamba Manufacturing (1986) Ltd
Kenpoly Manufacturers Ltd
Super Manufacturers Ltd
Keci Rubber Industries
Techpak Industries Ltd
Kentainers Ltd
Nairobi Plastics Industries
King Plastic Industries Ltd
Treadsetters Tyres Ltd
Nav Plastics Limited
Kingway Tyres & Automart Ltd
Ombi Rubber
Uni-Plastcis Ltd
L.G. Harris & Co. Ltd
Wonderpac Industries Ltd
Packaging Masters Limited
Laneeb Plastics Industries Ltd
ACME Containers Ltd
Plastic Electricons
Metro Plastics Kenya Limited
Afro Plastics (K) Ltd
Raffia Bags (K) Ltd
Ombi Rubber Rollers Ltd
Alankar Industries Ltd
Rubber Products Ltd

Packaging Industries Ltd
Safepak Limited
Dune Packaging Ltd
Plastics & Rubber Industries Ltd
Sanpac Africa Ltd
Elgitread (Kenya) Ltd
Elgon Kenya Ltd
Sameer Africa Ltd
Polyblend Limited
Polyflex Industries
Eslon Plastics of Ltd Kenya Ltd
Silpack Industries Limited
Polythene Industries Ltd
Five Star Industries Ltd
Solvochem East Africa Ltd
Premier Industries Ltd
General Plastics Limited
Springbox Kenya Ltd
Building sector
Central Glass Industries Ltd
Kenbro Industries Ltd
Manson Hart Kenya Ltd
Karsan Murji & Company Limited
Kenya Builders & Concrete Ltd
Mombasa Cement Ltd
Paper Sector
Ajit Clothing Factory Ltd
Paper House of Kenya Ltd
General Printers Limited
Associated Papers & Stationery Ltd
Guaca Stationers Ltd
Paperbags Limited Graphics & Allied Ltd
Primex Printers Ltd
Autolitho Ltd
Bag and Envelope Converters Ltd
Icons Printers Ltd
Print Exchange Ltd
Bags & Balers Manufacturers (K) Ltd

Printpak Multi Packaging Ltd
Interlabels Africa Ltd
Brand Printers Printwell Industries Ltd
Jomo Kenyatta Foundation
Business Forms & Systems Ltd
Prudential Printers Ltd
Kartasi Industries Ltd
Kenafric Diaries Manufacturers Ltd
Carton Manufacturers Ltd
Conventual Franciscan Friers- Kolbe Press
Punchlines Ltd
Cempack Ltd
Kitabu Industries Ltd
Chandaria Industries Limited
Creative Print House
D.L. Patel Press(Kenya) Limited
Kul Graphics Ltd
Colour Labels Ltd
Label Converters
Colour Packaging Ltd
Dodhia Packaging Limited
Modern Lithographic (K) Ltd
Colour Print Ltd
East Africa Packaging Industries Ltd
Pan African Paper Mills (EA) Limited
Kenya Stationers Ltd
Elite Offset Ltd
Ramco Printing Works Ltd
Kim-Fay East Africa Ltd
Ellams Products Ltd
Regal Press Kenya Ltd
Paper Converters(Kenya) Ltd
English Press Limited
SIG Combibloc Obeikan Kenya
Textile Sector
Africa Apparels EPZ Ltd
Kenya Trading EPZ Ltd
Spinners & Spinners Ltd

Kikoy Co. Ltd
Fulchand Manek & Bros Ltd
Sunflag Textile & Knitwear Mills Ltd
Storm Apparel Manufacturers Co. Ltd
Metro Impex Ltd
Le-Stud Limited
Image Apparels Ltd
Straightline Enterprises Ltd
Alltex EPZ Ltd
Alpha Knits Limited
Midco Textiles (EA)Ltd
Tarpo Industries Limited
Apex Appaels(EPZ) Ltd
Mirage Fashionwear EPZ Ltd
Teita Estate Ltd
Baraka Apparels(EPZ) Ltd
MRC Nairobi (EPZ) Ltd
Thika Cloth Mills Ltd
Bhupco Textile Mills Limited
Ngecha Industries Ltd
United Aryan (EPZ) Ltd
Premier Knitwear Ltd
Blue Plus Limited
Upan Wasana (EPZ) Ltd
Bogani Industries Ltd
Protex Kenya (EPZ) Ltd
Vaja Manufacturers Limited
Brother Shirts Factory Ltd
Riziki Manufacturers Ltd
Yoohan Kenya EPZ Company Ltd
Rolex Garments EPZ Ltd
Embalishments Ltd
YU-UN Kenya EPZ Company Ltd
J.A.R Kenya (EPZ) Ltd
Silver Star Manufacturers Ltd
Timber Sector

Economic Housing Group Ltd
Transpaper Kenya Ltd
Wood Makers Kenya Ltd
Eldema (Kenya) Limited
Twiga Stationers & Printers Ltd
Woodtex Kenya Ltd
Fine Wood Works Ltd
Uchumi Quick Suppliers Ltd
United Bags Manufacturers Ltd
Furniture International Limited
Rosewood Office Systems Ltd
Statpack Industries Ltd
Hwan Sung Industries (K) Ltd
Shah Timber Mart Ltd
Taws Limited
Kenya Wood Ltd
Shamco Industries Ltd
Tetra Pak Ltd
Newline Ltd Slumberland Kenya Limited
Timsales Ltd
PG Bison Ltd
Motor Vehicle Assembly and Accessories
Auto Ancillaries Ltd
General Motor East Africa Limited
Megh Cushion industries Ltd
Varsani Brakelining Ltd
Impala Glass Industries Ltd
Mutsimoto Motor Company Ltd
Bhachu Industries Ltd
Kenya Grange Vehicle Industries Ltd
Pipe Manufacturers Ltd
Chui Auto Spring Industries Ltd
Kenya Vehicle Manufacturers Limited
Sohansons Ltd
Toyota East Africa Ltd
Labh Singh Harnam Singh Ltd
Theevan Enterprises Ltd
Unifilters Kenya Ltd
Mann Manufacturing Co. Ltd
Metal and Allied

Allied Metal Services Ltd
Morris & Co. Limited
Khetshi Dharamshi& Co. Ltd
Alloy Street Castings Ltd
Nails & Steel Products Ltd
Nampak Kenya Ltd
Apex Street Ltd Rolling Mill Division
Orbit Engineering Ltd
Specialized Engineer Co. (EA) Ltd
Sandvik Kenya Ltd
Napro Industries Limited
Rolmil Kenya Ltd
ASL Ltd
ASP Company Ltd
Steel Structures Limited
East Africa Foundry Works (K) Ltd
Sheffield Steel Systems Ltd
Steelmakers Ltd
Elite Tools Ltd
Booth Extrusions Limited
Steelwool (Africa) Ltd
Friendship Container Manufacturers
City Engineering Works Ltd
Tononoka Steel Ltd
General Aluminum Fabricators Ltd
Crystal Industries Ltd
Welding Alloys Ltd
Gopitech (Kenya) Ltd
Davis & Shirtliff Ltd
Wire Products Limited
Heavy Engineering Ltd
Devki Steel Mills Ltd
Viking Industries Ltd
Insteel Limited
East Africa Spectre Limited
Warren Enterprises Ltd
Metal Crown Limited
Kens Metal Industries Ltd
Pharmaceutical and Medical Equipment
Alpha Medical Manufacturers LtdMadivet Products Ltd
KAM Industries Ltd
Beta Healthcare International Limited
Novelty Manufacturing Ltd
KAM Pharmacy Limited
Biodeal Laboratories Ltd
Dawa Limited
Oss. Chemie (K)
Pharmaceutical Manufacturing Co.
Bulks Medical Ltd
Regals Pharmaceuticals
Cosmos
Limited Elys Chemical Industries
Universal Corporation Limited
Laboratory & Allied Limited
Gesto Pharmaceutical Ltd
Pharm Access Africa Ltd
Manhar Brothers(K) Ltd
Glaxo Smithkline Kenya Ltd
Leather Products and Footwear
Alpharama Ltd
CP Shoes Industries L td
East Africa Tanners (K) Ltd
C & P Shoe
Bata Shoe Co. (K) Ltd
Leather Industries of Kenya Limited
New Market Leather Factory Ltd
Dogbones Ltd

Source: Kenya Association of Manufacturers (KAM) Directory. June, 2016