DATA BASED MANAGEMENT DECISIONS AND OPERATIONAL PERFORMANCE OF LARGE MANUFACTURING FIRMS IN NAIROBI

JAMES M. IKIAO
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DECLARATION

I confirm that this is my original work and has not been submitted for presentation at the University of Nairobi or any other institution of higher learning.

Signature ……. **Date ……**

James M. Ikiao

D61/83987/2016

Supervisor

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

Signature …… **Date ……**

Dr. GITHII WAINAINA

Lecturer, Department of Management Science, School of Business, University of Nairobi.

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DEDICATION

This research paper is whole heartedly dedicated to my family, who have been my source of inspiration and gave me strength to carry on, who continually provide their moral, spiritual, emotional, and financial support. To my supervisor, friends, and classmates (MBA 2016 class) who shared their words of advice and encouragement to finish this study. Lastly and not least is to my employer for allowing and giving me time to work for, defend both proposal and project.

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ABSTRACT

The objectives of the study were; to establish the extent of data based management decision making adoption on large manufacturing firms in Nairobi and to determine the impact of data based management decisions on performance of large manufacturing firms in Nairobi. It also aimed at reviewing the increasing body of theoretical and empirical studies that have endeavored to examine the data based management decisions and its effect on organisation performance. The study employed a hybrid of a descriptive and causal research design. The target population was the 455 large manufacturing firms in Nairobi County, Kenya. Stratified random sampling was applied and 46 manufacturing firms in Nairobi County were picked as the study sample. Primary sources of data were employed, and the study was a cross-sectional study done across the 46 manufacturing entities in Nairobi County. The study utilized descriptive statistics in order to establish the extent of data based management decision making adoption on large manufacturing firms in Nairobi. The study also applied correlation analysis and multiple linear regression equation with the technique of estimation being Ordinary Least Squares (OLS) so as to determine the impact of data based management decisions on performance of large manufacturing firms in Nairobi. Regression was done on the operational performance measures of cost and quality, and then on the overall operational performance. The independent factors considered for this study were quality, procurement and marketing management decisions. The study established that data based management decision making adoption by large manufacturing firms in Nairobi was agreed. The study also found out that data based management decisions only have a significant effect on cost performance and overall operational perfomance. Quality management decisions also positively influence cost performance and operational performance. The study concluded that data based management decision making adoption by business enterprises is agreed and that data based management decisions impact on operational performance and aspect of cost effectiveness. Policy recommendations are that the government through the ministry of industrialization and through other trade agencies and regulators can employ the study findings to spur the growth of the manufacturing industry. The study also recommends that stakeholders in the Kenyan manufacturing sector, which include managers, analysts, and industry experts, as well as the manufacturing sector at large to utilize the manufacturing strategies to drive competitiveness sustainably in order to ensure business continuity over the long term. Venture capitalists can equally be armed with the trends that define this industry and the expected direction in establishing/firming up their investment options, strategies and critical success factors within their intended manufacturing plants.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Stiff competition today has forced business managers to shift from judgmental to data based management decision making. Use of data in management practices have been viewed as a strategy for reducing errors and costly mistakes in executing important firm affairs and gaining competitive edge in the market place. Information is a very critical resource of an organization as it enables managers to justify their decisions with verifiable data (Gordon, 2007). Without information, the business cannot function. All significant choices made within a business establishment are anchored on information within the reach of managers. Information in an entity presents itself in various forms. This information is regularly used by all managers within the precinct of the business in monitoring the effectiveness and efficiency. All businesses of any imaginable size whatsoever require information for proper planning for their future undertaking and making of high-level, high value and strategic decisions (Gordon, 2007). Strategic decision and future planning of business organization relies on historical information of performance of the business, the anticipated future business performance, their customers, present needs of their customers and their future needs and competitor's performance. Information regarding the external and internal business environment especially economy is extremely important in decision making (Maxwell, Nan, Rotz and Garcia, 2015).

The expectations of Kenya's manufacturing sector as outlined in the projected Vision 2030 development plan, is to have a vigorous, diversified and aggressive manufacturing industry capable of sustaining Kenyan socio-economic development agenda. The Kenyan socio-economic development agenda is to be attained through

creation of employment opportunities for the productive youths, wealth generation, creation of appropriate environment to induce Foreign Direct Investment (FDI) and ultimately laying appropriate ground for attainment of Millennium Development Goals (MDGs) (GOK, 2013). Historical evidence indicates that manufacturing sector contribution to the Kenyan economic growth is approximately 10%, and the growth rate according to economists is set to go up by 10% per year as per the Medium Term Plan (MTP) of Kenya Vision 2030. To achieve the vision 2030, firms have shifted their decision making process from the traditional decision making where decisions were made based on experience and individual judgment to data based management decision making that relies on information for decision making (Mohamed, 2013). This development coupled by lack of literature on the outcome of data based management practices on economic value of large manufacturing firms motivated the need for this research study.

1.1.1 Data Based Management Decisions

Gordon (2007) asserts that data based management decision making refers to continuing process of gathering and analyzing different types of data and information that pertains to a given organization and its environment for instance demographic, student achievement test, contentment, method data in order to steer decisions making and enhance the attainment of the organizational objectives. Decision-making is a critical activity of all top management in any business organization and business managers require relevant, accurate, reliable and timely adequate information to help out in making fundamental decisions in organizations. The need for crucial data for decision making has propelled business organization to acquire and install information systems. The main aim of decision support systems in any business firm

is to avail to managers plus relevant stakeholders with crucial highlights for more specific planning, forecasting, evaluating and control of the firm. Additionally, using authoritative system supported decision making systems have to a large extent assisted business organizations to become highly flexible, eliminating obsolete management layers roles, separating tasks from geographical location and moreover easing job processes (Turban, 1995).

Lucey (2005) on the other hand posits that availability of right information enhances knowledge, thus cutting off uncertainty in decision-making and is needed in the right form for the proposed drive. However, there are problems in coming up with the right and appropriate data, using decision support systems, many firms all over the world especially the insurance firms gather raw data turn it and bring out valuable and easy to comprehend output which is utilized to steer the firm on the right path. Information is a business resource just like any other organizational assets, normally utilized literally in all ways: Information backs routine operations work, enables daily administrative and general steps taken by the firm; and finally backs long term moves to be taken. The data and information gathering usually provides an important input when deciding on decisions. The act of collecting data and information involves gathering data along the field of interest, analyzing the same to come up with more understandable information and providing interpretations in order to guide the decision making process (Peppard and Ward, 2004).

1.1.2 Operational Performance

Voss and Robinson (2010) defined operational performance as measurable aspects of firm's processes such as cycle time, reliability and stock turnover. Schonberger and

Knod (2001) have defined performance in operations as the ability to create effective environment in an organization to convert inputs into outputs. Ketchen and Hult (2010) contend that the short term objectives of operations is to increase profitability and reduce stock and process duration, while-long run target is to enlarge market potion and returns for all operation points of focus. Taggart (2009) explains the three categories of groups of people interested with firm's performance; internal investors (management and employees), external investors and clients. Clients are mainly those with vested interest to invest or buy products at lower prices, good quality and or excellent delivery time. He further states that external investors are keen to understand firm's profitability, rate of capital return and margins of return on stock while internal stakeholders dwell on time to deliver, direct labor used, efficiency, lead time, injuries at work and time lost, quality and cost of products. Oakland (2000) opined that performance in operations is a critical determinant of the organization success. Performance measurement practices are the integrated, systematic processes used to improve the organizations efficiency and effectiveness in undertaking its operations (Voss, 1995).

Hamon (2003) asserted that measurement of performance is key or rather critical variable for business effectiveness in management hence identifying and measuring performance in an organizations remains key for checking success of the firm. A robust procurement success is crucial in ensuring the firm's competitive strong edge through pricing, market share, flexibility, cost, speed, quality, dependability on delivering products, duration before they reach market, innovation on new products, customer lead time and inventory optimal levels (Beamon, 1999). Venkatraman and Ramanujam (1986) investigated on the key indicators of the firm's success should be

checked based on financial metrics like sales growth, profit, and return on investment (ROI), how well, effective the firm his. However measuring the success of the firm and comparing it with internal and external industry key goals, the focal point should be towards: reliability, fulfillment of customer demand on-time, and complete and with no damages, responsiveness, the time it takes to react to and fulfill customer demand, agility, the capability of the firm to vary demand within a given planning cycle, cost goal checks of all sections of the firm cost and audit of resources utilized to ensure an order is delivered, (Poister, 2003).

This project has focused on three key operations decisions, mainly marketing, and quality and procurement. These independent variables will be used to check the effect of performance with respect to cost (dependent variable). Various writers' have emphasized the importance of these decisions in relation to firm's operations success. Roth and Velde (1991) explained the linkage between marketing and manufacturing strategy which was termed as critical for competitiveness and performance. Calantone, Dröge and Vickery (2002) wrote another paper exploring the interface between manufacturing and marketing, the study found a positive relationship. In addition Deane, McDougall and Gargeya (1991) found out that marketing and operations predict success when they work together. On the other hand, Politis and John (2002) said that quality is one of the main operations decision to ensure things are done right the first time to provide goods that are fit for their purposes. They added that quality in operation is the most observable performance objective since it lies in the lines of major customer focus. The literature added that acceptable quality reduces cost since the firm does not spend on correcting previous errors neither does it incur cost on returns from the market.

Politis *et al*., (2002) said that by default every customer will be attracted to products and services with low price and therefore cost is the most central performance objective for operations managers. He added that achieving low prices through low cost of operations allows managers to return on investment and satisfy stakeholders while offering products at low price. Heizer and Render (1999) defined purchasing as the art of acquisition of goods and services, purchasing is strategically important in order to satisfy customers as operations management strategy - over 50% of sales money is ploughed in buying materials hence the importance of material supply decisions for any operation manager to achieve success. Kraljic (1983) says that future success of firms is based on long term potential and reliable suppliers.

1.1.3 Relationship between Data Based Decisions and Performance

Data based decision making enhances organizations performance by providing managers with crucial information for decision making. Mithas, Ramasubbu and Sambamurthy (2011), indicated that decision support enhances growth of critical firm capacity that drives upper organizational performamce on; client's management, operations management, and results checks. Sharma, Mithas and Kankanhalli (2014) opined that big data use and analytics engagement create real benefits by enhancing more rational directions to move. In his book, Black (2010) insist the importance of business statistics in support of sound decision making in the current dynamic business world, literally every decision made in business today has a bearing in determining its profitability and growth. He added that most of these decisions are improved by use of information from market place, employees, economic/financial world and competition – this information comes in form of raw data.

Lee and Kim (2006) asserts that data backed decisions have significant results on the performance of organization. For instance, review of the technology investment articles established that high information traffic firms like financial sector, insurance, retail, healthcare usually record high out put on invested money than their counterparts with less information traffic industry such as construction and converting industries. Data analytics and research based decisions have revolutionized business and firms are striving to bring together highly rich data and disimenate knowledge from their clients, suppliers, strategic partners and even rivals so as to be ahead in market battles. Davenport and Harris (2007) came up with firms that have gained lead through use of data and analytical tools for deciding directions to take. Use of information technology differentiates firms within their industry and are twice likely to lead others in the market.

1.1.4 Manufacturing Firms in Kenya

Manufacturing is the process of converting unprocessed materials to end product, mainly through gigantic industrial means (Awino, 2011). As at 2015, manufacturing sector recorded an increase in growth of 4.1 percent as opposed to 3.6 percent as at 2014. Due to drought experienced from the beginning of 2017 and adoption of uncertain attitude towards August general elections by firms, it has caused a slow growth in manufacturing industry, in the first and second quarter of the year (Wakiaga, 2016). This sector needs a keen attention to make sure there is significant influence to the Kenyan economy. Manufacturing plays a major role in developing the economic growth of a country's Gross Domestic Product (GDP), and creation of job opportunities. It is the third ranked sector in Contribution of Kenya GDP, where it

increased from 10 percent in 2014 to 10.3 percent in the year 2015. This sector also contributes an average of 11.7 percent of formal jobs in Kenya (Wakiaga, 2016).

Manufacturing firms are the main foundation of development, with a huge chance of overall progress and expansion. This sector has various industry divisions where some of the common sub-sectors including small-scale consumer goods (textiles, plastic, furniture, batteries, cigarettes) steel industry, cement industries, horticulture and agricultural products. Majority of these industries are located in Nairobi and its environs due to availability of its important market (Mongina, 2015).

Although the sector has developed over time both in terms of its contribution to the country's GDP and job creation, the sector is small and under developed in respect to established countries. The extent of the sector in middle part of Africa is approximately 8 percent. Kenya manufacturing industry is on a various transition journey mainly due to the structural change process, which the Kenya government has been implementing with an objective to enhancing the economic and social environment of the country (Malama, 2012). Awino (2011) states that converson is an essential segment in Kenya which makes significant participation in commercial expansion. Conversion industry can bring in significant foreign exchange in the country through export.

1.2 Research Problem

The role of using decision support systems when taking a move on directions to proceed on is key to success. Rationalility when taking directions depends on accurate, timely and right data. Ghaffarzadeh (2015) states that management

information system architecture provides up to date and accurate information necessary to facilitate the decision-making and facilitate the organization ability to execute other managerial functions such as planning, staffing, control, and other operational functions for effective management of the business. Over the years traditionally managers have been allowed to make decisions based on their experience and other role qualifications which exposed managerial decisions to many costly errors and mistakes. However, with the integration of the world and its view as a global village, competition has increased exposing firms to risks of losing their tradition markets to other global firms which brings products to previously 'inaccessible' markets. This development has forced managers to rethink on ways of making decisions as there exist no room for trials and guess work. Big data analysis is key in the current world, either for making day to day decisions or strategic planning for the firm. This applies to government, non-profit firms, individual decisions, or private sector (Bacchetta and Ernst, 2009).

Despite its importance, many business people and business organization in Kenya do not recognise that supply of information is a critical firms inputs. In regard to information technology, firms view it as that section of the firm that is handled by specialist – while putting more emphasis in general technology, (Turbit, 2005). Information management is viewed as for specialist and therefore hard for layman to crack. Consequently, majority of business organization are constantly placing more emphasis on the information systems with little emphasis on research and information management. Determining the cost of running data support system may not be direct, neither knowing the actual benefits of the same, despite its use across the board in operations, client operations and general running of the firm. This development

coupled by the lack of literature in explaining the relationship between data based management decisions on the performance of large manufacturing firm's motivated the need for this study.

Several researches have been done in many parts of the world and locally on the area of data backed management decisions. Globally, Ghaffarzadeh (2015) carried out a research on decision making by use data decision surpport system and documented that result orieneted moves require precise, timely and right data. He further argued that management information system architecture usually offers precise information, which comes when required and right to supports moves that will sustain clients over long term.

Gacheru (2017) carried out a studied on the results of the quality of information in financial accounting on the decision making and concluded that quality information has a good effects on the process of making decision. Despite the attempts by many researchers to establish the impact of data based management decisions on performance, no empirical researches found investigating the impact of data based management decisions on performance on large manufacturing firms in Nairobi. This fact therefore translate to a gap in literature that this study seeks to fill by addressing the following question: What is the impact of data based management decisions on performance on large manufacturing firms in Nairobi?

1.3 Research Objectives

The objectives of this study were;

i. To establish the extent of data based management decision making adoption on large manufacturing firms in Nairobi.

ii. To determine the impact of data based management decisions on performance of large manufacturing firms in Nairobi.

1.4 Value of the Study

The research study will be beneficial to the management of large manufacturing firms by providing them with insight on the importance of data based management decisions. Findings from the study will form a foundation for implementing effective data based decisions to enhance the performance of the manufacturing firms. The study will offer insight to the manufacturing firms in Kenya and world wide that have implemented process improvement practices but have not conducted post implementation review, those planning to implement and those who would like to get insight on how data based decisions works. The findings of this research will be valuable for future use by scholar's and learners willing to progress this study or related topic. This research will assist policy designers to figure out how data based decisions making influence the performance of manufacturing firms in Nairobi since they will develop mechanisms that can be adopted to improve the performance of manufacturers which will contribute to growth of the economy and advancement of the country in general.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This research chapter reviews the literature in connection with impact of data based management decisions on performance of large manufacturing firms in Nairobi. The chapter also reviews the theoretical and the empirical studies which relate to the data based management decisions.

2.2 Theoretical Review

This section discusses theories which attempt to explain the impact of data based management decisions on performance of large manufacturing firms in Nairobi. These theories include; the transaction cost analysis theory and the strategic choice theory.

2.2.1 Transaction Cost Theory

Transactional cost theory (TCT) suggests that firms should try to minimize the cost of engaging in various transactions in order to enhance the performance (Williamson, 1981). The use of Information on making crucial decision has largely been embraced by business organization today. Information assists in lowering the cost of errors and mistakes. Williamson (1981) in his paper discussed that firms can reduce the total costs of their business operations via vertical integration and also enhances the degree of trust concurrently. The integration was seen as a way of decreasing expenses which relates with management of inventory while simultaneously increasing the service quality on delivery for all the business customers.

Evidence points out that performance of firms which take into consideration transaction costs are better performers, this theory depends on basic human behaviors and environmental tendancy (Williamson, 1985). These assumptions elucidate reasons for firms finding higher cost for exchanges done in the market and why relatively more well-organized than markets at organizing transactions. The way to run the firm is from choices made by the same firm, which it believes will reduce running cost. Transaction costs theory mainly checks on how firms uses or rather organizes specific assets for better. Generally if asset organization is not specific then the market will be more efficient. This aspect enables assets to be reused without major loss to its potential (Williamson, 1989). The Six various kinds of specifying on assets: specifying on site, specifying on physical assets, specifying on human assets, specialized assets, name branding capital and temporal specificity (Williamson, 1989).

The diminution of costs across the business supply chain has been identified as one of the key objectives of a business organization. Traditionally, decrease in the costs of business transactions enhances the performance of the firm. Similarly as outlined, inventory management approaches plays a significant role in improving efficiency of the supply chain management operations (Li, 2014). Given that profitability of the business establishment is one of the key indicators of the business performance, this research study is focused on providing an insight on how data based decision making enhances the profitability of large manufacturing companies in Kenya.

2.2.2 Strategic Choice Theory

This theory explains the link between management decisions and firm performance notwithstanding the business internal and external environment. The theory places key considerations on the value of managerial decisions on the firm performance (Child, 1972). Strategic choice analysis indicates the interconnections that exist between firms and its environment which has significant actions on overall performance of firm. The firm analytical model concentrates on achieving very good performance in order to enhance efficiency for instance when faced with limited resources (Campling and Michelson, 1998).

Data provides a critical infrastructure for making strategic choices. For instance Inventory organization methods are withtin the options that the managers contemplates for during decisions making as regards how to advance the results of the firm. These techniques rely heavily on quality information in order to enhance the competitive edge of firms (Porter and John, 1982). This research will help in understanding the choices of data based decisions taken by managers to advance firms decisions in manufacturing firms in relation to cost, quality, efficient use of resources, optimal production, production plans and delivery according to when required.

Leaders play a vital role determine firms direction by picking options in a turbulance political process. This theory provide an options that emphasize the speed of employees and groups in the firm to choices options, occassionaly satisfying themselfs, that influences growth of those firms. Part these strategic choices creats learning atmosphere culture that may be adapted to both the outside and internal

political environment (Child and Loveridge, 1990). For this study, Strategic Choice theory will be investigated in respect to individual's fedback in an usuall, routine arguments in an effort to resolve the dispute, which is the impact of data based management decisions on performance.

2.3 Data Based Management Decisions

Data based management decisions refer to the managerial decision system and business governance structure which values decisions that are supported by reliable and verifiable information (Tillman and Goddard, 2008). The success of data based management decisions depends on the quality of the collected information and the effectiveness of its subsequent analysis and human interpretation. Broadly, data based management decisions creates value to an entity from the rich data which starts with proper identification, gathering, and maitaining the same, move via technical capacity to process and display that data in a simple way; only firms that can compliment data analysis with human capability and trust on a cross-functional actitities with responsive structure to applly useful insights (Walther and Skousen, 2009). Data helps managers in making decisions like in logistics, corporate social responsibilities, environment, health and safety, finance, quality management decisions, procurement management decisions, marketing management decisions, human resource, research and development among others (Hürtgen, 2018).

Essentially Logistics management to and fro activites that aims to maximise the movement of information, materials and supplies accross the firm and its activities to the clients. Basically it involves planning steps and heavily relying on information. Market needs are translated into conversion requirements and eventually into raw materials needs after planning process. Recogition of global logistics is currently real

due to its benefits if wel conceptualized. It's imperative to broaden logistics concept upstream to suppliers' and downstream to clients. This defines supply chain concept of management (Waters, 2010). Hughes (2007) states that health at work place means protection peoples' physical body and mental from illness due to materials, procedures applied at the firm; protection of employees from physical injury is referred to as safety. However safety and health concerns physical and mental well-being of the employee at the place of work if used together.

Firm's finance is focused with the providing funds and investment decisions coined by the management of firms in pursuit of corporate objectives. Manager's aim is to secure the highest possible return in substitute for taking most little amount of risk, (Watson and Head, 2007). Human resource management deals with the design of formal organization systems to ensure the efficient and effective use of human skills/talent to attain organizational goals, (Mathis *et al*., 2005). Currently competitiveness is taking a direction of adopting multiple technology due to demand foces, specially, research and growth plans or activities experience challenges in these trends (Roos, 2008) Product development is becoming a vital organizational process that assist to reinforce and retain a strong competitive edge (Wheelwright and Clark, 1992).

Our society is primarily in transition as a result; new and unexpected demands on corporate social responsibilities (CSR) are arising upon businesses. Governments' are backing off slowly on some previously held duties, while environmental degradation issues are taking centre stage with clients questioning activities of various firms. These are some of the factors driving CSR today (Heidelberg, 2006). For the purpose

of this research, the aim is on the quality management decisions, procurement management decisions and marketing management decisions. A manufacturing system is a collection of men, machine tools, and material, moving machines, assembled together to achieve specific manufacturing/fabrication sequence, consequential in components or final products which are lastly taken to the consumer (Ramos-Rodriguez & Ruiz-Navarro, 2004).

According to Van Weele (2005) looking at various studies on procurement it is time for management to engage in coming up with strategies for proactivity rather than reactivity in either routine or strategic decisions. On the same wavelength to address change, transformational growth or inovation, there is still a long way to go. This study will thus seek to establish how procurement management decions impact manufacturing firms.

2.3.1 Quality Management Decisions

Quality management system refers to coordination of business activities in order to control a firm and fulfill the needs of the clients. Quality management is necessary to improve on resource usage and effectiveness of its success. Quality management system can be termed as key ingredient on quality in a well functioning of the firm that actually shows the concept of developing the rule for actual relationship surrounding the needs of clients and employees of the firm. The main effect on functioning of the firm is that it has implemented the quality management system refers to exactly define processes steps, prepares standard operating procedures (SOPS), which in the end ensures the transformation of acceptable quality goods.

Complete and implement quality management system will ensure that two critical requirements are achieved (Petkovska, 2008).

Data insights derived at the organizational and or section levels can identify ways to avoidance cost and cases of unnecessary spending. Analyzing customer engagement, firms can better appreciate the concerns and shifting desires of clients, and innovate products as a result. Manufacturers can also embed their fabrication lines with several of digital sensors to directly track and rectify problems connected with out-of-range tolerances, production inventory, quality of packaging materials and other quality-control issues, Using artificial intelligence decision-makers can learn more factors and key behavior traits of potential customers – this knowledge is used in future product design (Forbes *et al.,* 2018).

On various settings like batch, continuous, and discrete-production manufacturing systems can use a combination of big data, advanced analytics, and the Internet of Things to change asset output for better. Firms can now make better decisions that can optimize the entire production systems, thereby growing operational resilience and adopting lasting value (McKinsey et al., 2017).

Bommel, Edelman and Ungerman (2014) state that, manager's needs to embrace technology which allows them to understand consumer behavior by focusing all stakeholders at a go. This understanding will highlight keys decisions to make in regard to cost of marketing, product mix, price and promotion decisions; location of your products is to be determined by customer trend. Advanced analytics approaches such as marketing-mix modeling which uses big data to understand the effectiveness

of costing per channel.This method statistically joins marketing investments to various drivers of sales and frequently includes external variables like seasonality, competitor and promotional activities to unravel both changes in individuals and segments in the long run, this has a direct relation with firm performance on cost, quality of products to be produced and flexibility required (Bhandari, Singer and Scheer, 2014).

The primary focus is to engage data-based insights to improve processes internally. Prediction of maintenance activities, service design, accidents in the firm, waste analysis, customer care service, supply chain optimization, quality and reduction of fraud are just some processes that can be enhanced by making better decisions by use of data. Usage increase currently is propelled by growing number of internet of things applications and the collection of gigantic amounts of data that can be used to enhance organizations processes (Hürtgen, 2018). This study will focus on inventory checks, system maintenance routine, packaging decisions, product design and cost control – as stated earlier manufacturing key ingredients include, machines, materials of which cost reduction is the ultimate goal.

Chandra (2001) stated that inventory checks refers to the process of quality control whereby, managers allows only parts within tolerance to go to the next stage of processing, this assures customer satisfaction. Quality control was made easier after development of a statistical quality control technique in 1924 necessary to assure the integrity of products. Conforming quality focuses on ensuring specifications set down at design stage. It is focused with small diffrences from what is specified or expected, quality of design has to do with correctness to use; the choice and specification of

features that consist what a good or service is supposed to be like and is supposed to do (Vardeman *et al.,* 2007).

Product design is normally a process that develops an item that can be sold to clients in mind of making profit. Product development effort is measured by assessing key factors that determine pricing, like product quality of which determines the price a customer will be willing to pay for that commodity, cost is mainly due to tooling and capital machinery to produce it. Development time is key for returning benefits from team's effort, speed at which the firm is able to respond to technological changes and competitiveness in the market, finally development capability is crucial competitive edge as this determines future success with new goodss that are potentially demanded in the market (Ulrich *et al.,* 2012).

Every organization must ask a question regarding cost, to understand if it's operating at an acceptable cost levels. Modern techniques are focusing in analyzing cost at every level and comparing with market trends. This allows a business to know the origin of cost and how they can be reduced for it to survive, by understanding individual product and activity cost. Each section of the firm must have an aggregate of all cost associated, for example, supplier cost, production, warehouse, transport and carrying cost. Once all cost are defined, monitoring mode should be engaged to control the same – one common method used is management accounting (Edward, 2000).

Over the years packaging has transformed from a mere container to critical product design component. Packaging technology can be of strategic importance to a firm,

since it can be a key competitive advantage in the industry, and package used is partially determined by the needs of the end user and advantages it brings to the firm. Military has been the major source of various developments in packaging driven by its dynamic needs. For a firm to reduce cost in logistics, one of the vital aspects to monitor is packaging used. The concept in reducing cost through packaging come in different ways, healthy and safety issues and risks can be addressed through use of appropriate packs. Aesthetically pleasing features can be derived hence higher attraction to various markets targets, functional elements can easily be enhanced too; environmentally conscious attributes are added at the initial stage which gives a firm an added advantage. Environmentally friendly packaging is encouraged globally right now and with some countries having set legislation to guide the same (Blackwell, 2003).

Firms should provide fit for use products and services that ensure its existence and a sucessful quality management systems is a result of engagement with vaious stakeholders and investment bodies in the firm. Firms that have put in place quality system are more likely to achieve their goals in terms producing items that are fit for use (Sofija & Biljana, 2014). This study will thus seek to establish how quality management decions impact manufacturing firms.

2.3.2 Procurement Management Decisions

Hughes (2005) study states that, procurement management is the overall steps to acquire goods and services. Stiff competition today has compelled businesses to embrace the use of technologies in the procurement process. Technology helps to move knowledge and information and help to operationalize procurement effectively

for competitiveness. Firms are using various e-procurement like e-auctions, e-sourcing, and electronic data interchange to transact with their suppliers.

By engaging robust data analytics, managers in procurement can unravel new insights from data to use in existing or new negotiations, vendor segmentation and performance management, and annual purchase strategies. Advanced analytics methodologies use algorithms to identify patterns in complex mass of data set, permitting procurement analysts to interrogate all their data, determine the statistically significant drivers of price, and arrange the data depending on those drivers. Clusters of purchases without significant variations in cost drivers are revealed hence bringing out the actual difference in vendor performance, (McKinsey, 2017).

Data analytics works like a social network for companies and its supplier base partners, this enables a firm to have information like supplier availability, flexibility, and risk associated like quality, lead time among others, and hence greater level of strategic collaboration. Analytics can be used to check supplier performance with expected cost, quality, or delivery-time challenges plus claim gains against bleaches. Procurement receives parts specifications supplied by their engineering teams, supervise adhering to contract, invoicing tendency, and performance by the supplier hence assisting in scoring the supplier for future purchase decisions making (McKinsey, 2016)

Key operational purchasing decisions today are determined by various factors; however key revolutionising path include globalization, industry consolidation, Technology developments, and supply chain harmonization. Globalization is the word when it comes to better competitiveness through wider scope when it comes to procurement. Industry consolidation refers to the tendency of firms coming together

through various modalities like mergers, acquisitions among others (Julio, Raffaella and Gianluca, 2008). Through expanded size of these firms, purchasing decisions are more efficient and lower cost since larger firms are able to influence suppliers more; in return supplier's are also keen to consolidate on their own such that to counter their customers move. Procurement are looking for suppliers who can assist them move to the next level of technology, this direction of thinking is to help them reduce overall cost, higher productivity through quick processing and easy planning as new purchasing application are developed each day. Supply chain synchronization goes beyond organization boundaries to create end-to-end loop, which helps in bringing in new products in the market more quickly than competitors hence increased revenue. Synchronization reduces operational cost by improving source point, distributing manufactured items and retailing to the final customer (Dyer, Dong and Wujin, 1998).

Reduction in inventory levels is one of the operations strategies used by firms to gain competitive advantage. Lean management insist on just in time principle which ensures that inventories are delivered when required, in quality that is acceptable thus less quality inspection and in quantities needed (Jonathan, 2008). Process improvement is related to planning and space utilization, ordering techniques, stock control and replenishment of the same. In operations, accuracy of inventory levels, capacity to measure and identify on-shelf availability is crucial focus area. Radio frequency identification can enhance stock correctness in the future (Fernie *et al.,* 2009).

Supplier analysis starts once you have laid down the foundation that will be later used to determine what is referred to as acceptable and unacceptable. The first step is to understand what the firm want; example could be to gain just in time skills or gain technological expertise among other needs. Secondly come up with evaluation criteria such that the supplier is in the same page when it comes to what is acceptable or not. Eventually come up with an appropriate reward system for suppliers, who achieve their objectives, this motivates them to continue improving (Thomas, 1998).

Over time firms have not taken advantage of relationships, however recent past has shown the way executives are using this strategy to not only reduce cost of doing business but more importantly creating value through a world class procurement practices. Relationships with vital suppliers should be strategic in nature and flexibility emphasized. Partnership can results to enhanced raw materials hence improved final products; this is achieved by mutually discussing areas of improvement during regular reviews of performance and visits on both sides. In addition manufacturing yield, capacity, and fill rate can be improved. Eventually revenue is increasing through better performance (Sanderson, Lonsdale and Mannion, 2015).

2.3.3 Marketing Management Decisions

Kotler and Keller (2000), authored that establishing the needs and wants of the customers is all about marketing and designing items and services to cover the gap better than other competitors in the market place. American Marketing Association (AMA) defines marketing as activity, business processes which are meant purposely for creating value to customers, passing crucial information to customers and

delivering, value that is in tandem with the expectations of business stakeholders such as customers, partners, business establishment and society at large. Traditionally, a market was seen as a physical place for bringing together buyers and sellers to exchange goods and services. Economists describe a market as a comprising of buyers and sellers who come together to exchange goods and services.

Kotler (2000) further argues that the main drivers of marketing are derived from its center of marketing concepts which are needs, wants and consumer demands. The needs consists of the basic human requirements like food; wants are extras people require though they can leave without. However needs and wants differ from society to the next depending on culture, social status among others reasons. Consumer demands signifies on the wants of customers on a specific product or a service which are supported by an ability to pay. Numerous people want a jet for instance but only a handful of them can afford to buy the jet. Consequently, firms must establish the needs, willingness to buy, ability to pay for their products and wants of people in determining the actual demand for their offerings.

An impact will be felt in marketing by use of big data, if marketing can benefit from acting a more engaging role in building associations with groups like clients service, sales, and human resources. Today's firm is like a big system with most items connected, in addition marketing will not find it valuable to try and build associations with clients in a seclusion/silo but should join other departments across internal community. The use of information in marketing helps firms in attracting new customers, improving sales and satisfying new and old better than their competitors in the same industry. Many firms have embraced the use of big data and information

by, using the need-to-have data, providing truly personalized clients experience ensuring marketing invaluable to the entire target market (Morgan, 2018).

In the modern world marketing has started evolving and therefore perceived with a more detailed 'focus'. Grönroos and Helsinki (1954), states that in the emerging relationship marketing is tailored on building and managing sustainable relationship with all customers' and business stakeholders. For the sake of this research, the four marketing mix will be the main area of focus due it strong influence on key marketing decision which helps to move produced items to the hands of the potential customers. Kotler and Armstrong (2014) state that the 4Ps are essential tactical tools used by marketing managers to get the desired feedback from the market segment of focus.

Singh (2012) added that marketing 4Ps are a set of variables that can be manipulated to sway customers to respond in a certain way for the better of the firm. Products include both physical and intangible products, customers can own tangible product and transfer them from one location to the next while intangible cannot be transferred neither can it be owned. Its remains the central focus in the 4Ps mix since it's the offering managers are holding of value to them (Kotler and Armstrong, 2014). Product or service quality is a key characteristic that enables customers to feel satisfied by the value offered by the same. Quality level and consistency needs to match the rivals or better without forgetting acceptable performance level (Kotler and Armstrong, 2014). The products are branded for easier identification and association; packaging is also done for easier handling and helps in advertising/display (Perreault and McCarthy, 2002).

Price is the amount placed against a product or service that customers pay to enjoy the same; or rather this is the purchase price which generates revenue to the firm (Kotler & Armstrong, 2014). Perreault and McCarthy (2002) added that pricing has three main objectives depending with the level of operation of the product in the market. The first objective is earning profit, where manager will focus their energy to ensuring profit is maximized. The second objective is to increase sales – this is where manager's focus is to set low prices so that to increase market share. The last but not the least is the focus to stabilize the product in the market – this is in situations where managers have achieved their desired market share and with relatively good price and they would like to retain the status quo.

Once goods are produced there is a process of moving them to where they are needed by the customers. Marc (2014) asserts that it's a process of moving products from the maker location t the location where they can finally be used. There are direct and indirect market channels of which managers use to send goods to the market place (Kotler and Armstrong, 2014). Direct method allows the producer to have a total control of the distribution circle. On the other hand indirect distribution allows third parties to assist in distribution of the products – this is necessary where the producer cannot handle a complex distribution channels due to various factors like high number of product mix.

Promotion refers to the activities initiated by the marketing managers to create awareness to the public or rather the intended group of the value proposition the products have. Managers expect these activities to leads to increased sales and or brand royalty (Kotler and Armstrong, 2014). Building an effective market

communication requires a concerted effort since its affected by various nature of the market, product nature, price of the product/service, life cycle stage, nature of the product, purchase price tagged and at times resources available for the exercise (Vargas, 2005).

Gerrit and Berend (2009) marketing activities are complicated, the activity engage with several variables touching various stakeholders. In addition, high number of interrelation is evident on these variables hence large extent of uncertainties in marketing. This study will thus seek to establish how marketing management decions impact manufacturing firms in Kenya.

2.3.4 Operational Performance

Operations performance means to the capability of the firm to satisfy their customers and the concept of the operational performance is operationalized in terms of time, cost, quality and flexibility (Brown, Blackmon, Cousins and Maylor, 2001). Production of products and services is main role played by operations managers; this is done in an ethical and environmentally caring way at the same time focusing to the market. Operations management is a systematic way of designing products and services, directing, controlling for the transformation of raw materials to finished products for either internal or external use or both (James, Freeman and Dawel, 2000). Therefore a firm will be termed to be performing well if flexibility, cost, time, and quality are managed within the allowed parameters, in case of gaps to the desired level of performance improvements activities as to be engaged (Brown *et al.,* 2001). Sound operations management practices create reasonable number competitive

priorities, such as cost, quality, flexibility and reliability - which enable its products to be demanded more than those of the competitors (Maingi, 2008).

Cost management remains critical in today's business since numbers are at the heart of every growing firm, cost and revenue numbers remains at the bottom line. Therefore firms maintain cost management system which acts as an overall business control system. Cost is always a key component to gauge business performance, the expectation if for this important aspect to develop as the firm develops in other aspects otherwise the entire firm will fail. A reliable cost management system should be able to assist managers make sound decisions by ensuring it mirrors the operational day to day activities which literally generates finances.

Flexibility refers to the ability by the firm to alter products design for various customer needs hence satisfying them. Customization of processes is a strategy geared to achieving flexibility by ensuring ability to reconfigure to meet diverse customer needs (Maingi, 2008). Flexibility is becoming an important aspect in manufacturing decision making, especially in accommodating changes happening in the world of manufacturing (Gupta and Goyal, 1989). Currently manufacturers world over are driven by significant changes in prices not forgetting abrupt demand changes. These changes require firms to be at the top by adjusting their production processes to avoid over or under capacity through well calculated flexibility. Over capacity may not be eliminated completely but can be used for advantage (Holtewerta and Bauernhansl, 2016).

For a firm to produce quality products, processes must be designed in such a manner to minimize errors, defects and have the capability to reproduce/repeat over different quality state. Quality is one of the vital competitive strategies used by most firms; high quality improves efficiency and firm performance (Magd, 2008). Yong and Wilkinson (2002) added that for a firm to succeed it has to recognize and practice quality management as a strategic tool for future success.

Reliability refers to the chance that equipment or a process will perform in its required function when achieving a reasonable level of predictability in manufacturing firms, is all what managers' desire since it's a natural competitive advantage. A firm is able to promise a delivery based on its previous history of capacity reliability. Reliability is basically in all areas of production, this can be in operation processes, equipment or operations issues. Operations managers strive to ensure reasonable reliability so as to achieve predictable processes which are capable of meeting customer specifications when needed (Noria, 2019).

2.4 Empirical Review

Ndegwa (2015) carried out a study assessing the effects of information quality and use in a community health database: a case study of karurumo community health unit-embu county, Kenya. The research used description design in collecting data for investigation. Purposive sampling was used; data was collected through observation by manual counting and recording results of previously collected data, using a data quality assessment form. The study indicated that Counties have seen an improvement in data use skills and in positive attitudes towards data, as well as an increased expectation that all decisions should be made by use of data.

Wanyoike (2016) carried out a research on management practices regarding quality and performance of companies among manufacturing companies in Kenya. The study employed a combination of descriptive research designs and explanatory to state the connection between ISO certification and value of manufacturing firms in Kenya. The study picked a target population of 60 ISO certified firms. The research study relied on Primary data which was collected by use of self-administered questionnaire sheet. The data collected was analyzed by use of descriptive and inferential statistics through the use of Statistical Package for Social Sciences. The researcher concluded that Continuous improvement shown a statistical significant in influencing the firm's performance. Top management commitment was also found to influence significantly on firm performance.

Brodsky, Ekirapa, Cannon and Nutley (2016) investigated a topic on understanding data demand and use in Kenya successes and challenges in Kakamega, Kilifi, and Kisumu counties. Data collection approaches was through interviews, focus group discussions and observations. The study concluded that people must understand the value of data use and believe in the importance of using data in the decision making process. Simultaneously, county leadership must continuously advocate for the use of data in decision making and develop organizational policies and procedures that not only encourage data use, but require it.

Mphatswe, Mate, Bennete and Rollins (2011) also conducted a study that assessed the accuracy of data gathered between 2007 and March 2009 to the DHIS for all 222 hospitals giving PMTCT services in districts of study. Accuracy was checked by

defining if a number for a given data from a cetain hospital was present or not in the database. It was analyzed by data element and facility, as well as over time. The study findings indicated that the extent of database accuracy moved from 26% ealier to 64% later after the engagement. Similarly, the perentage of data element in the database considered complete rose from 37% to 65% as observed.

Kafetzopoulos (2015) investigated the quality management systems on the performanceof manufacturing companies. The research design adoptedincludes an initial exploratory factor analysis (EFA), followed by confirmatory factor analysis (CFA) and structural equation modeling (SEM). The study used a sample of 287 ISO 9001 certified Greek manufacturing companies was used for this reason. The study documented that ISO 9001 effectiveness unswervingly contributes to product quality and firms performance. However, it has no direct implication on performance of converting companies; it has an indirect ramification through the mediation of business performance.

Kour, Tretten and Karim (2014) they researched on e-maintenance results through online analytics for decision-making on railway maintenance, the study used secondary data extracted from measurement stations to the e-maintenance cloud centre, where they are checked for accuracy/errors before analyzed to help on decisions regarding maintenance. Discussions with with stakeholders allowed the analysis of railway data. The research findings brought to the lime light the important of data based decision making which makes the process more economically sound and efficient. Train wheels reaching their maintenance and safety limits are visualized

using various tables, graphs and other data tools for easier understanding by stake holders.

Kunz, Aksoy, Bart, Heinonen, Kabadayi, Ordenes, Sigala, Diaz and Theodoulidis (2017) carried out an investigation regarding Customer commitment in a Big Data world, and they finally concluded that data-driven customer commitment needs a vibrant and iterative value creation business process which entails customers recognizing the value of business activities and company capability of capturing and delivering of value to clients.

Valentine, Hollingworth and Schultz (2018) carried out a research on data-based ethical decision making, organizational commitment tangential relations: structuring positive workplace relations through ethical business operations, data from various united states of America financial firms were collected and analyzed using structural equation modeling. The research concluded that employees' opinions on data-based decision making were directly related to perceived tangential relations, and that perceived tangential relations had a positive relation to the organizational commitment.

Brous *et al.,* (2018) carried out a research titled; the adoption of Internet of Things for reconfiguring decision-making processes in management of assets. The research results indicated that decision making in management of asset has been transformed to cope with up to date nature of the data, provenance, governance and the necessity for standardization. Internet of Things therefore promises to have a transformative effect on business decision making if fully adopted.

Strange *et al.,* (2017) investigated issues regarding Industry 4.0, the world value chains and the world business. The paper relied on exploring various sources of information about the likely use and impact of the latest digital technologies which are mostly referred to as Industry 4.0 as compared with existing technologies. The study concluded that latest digital technologies have substantial probable effects in disrupting how and where business activities are situated and organized within global village, and who captures the value-added business activities within those chains. They also accounted that Industry 4.0 is still in its early stages; however, its sound effects are already having impacts in shaping competition and business strategies in numerous industries across the world.

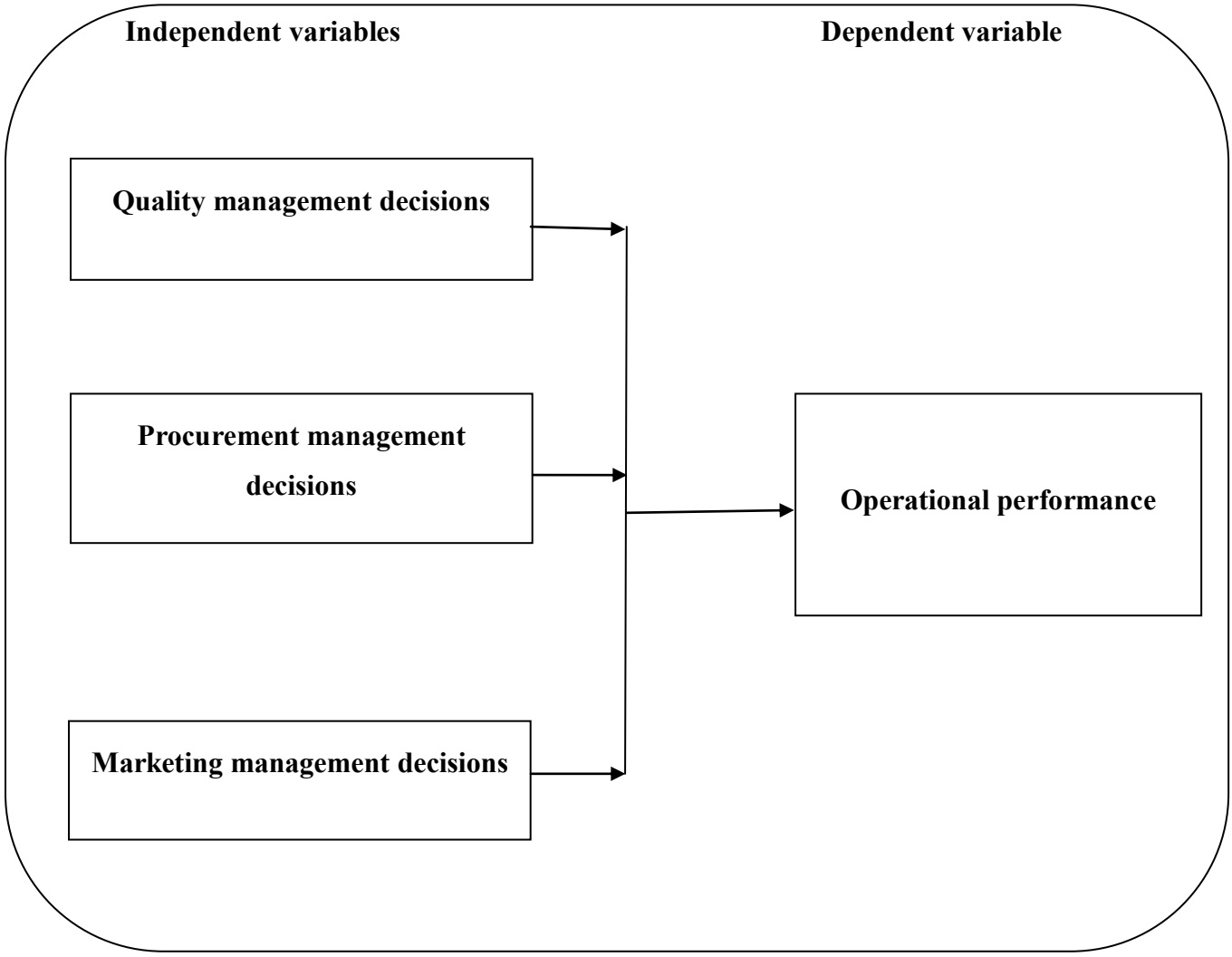
Streufert (1973) carried out a study investigating the impacts of information relevance and making decisions in a complex environments. The research picked randomly twenty-four male undergraduate students at a mid-western university, the study established that relevance information had no effects on respondent decision making and information search decisions, combined with the absence of any consistent trends in the curves.

Muteti (2015) did a study on strategic decision making at Kenyatta University in Kenya. The study used a case study research design, data was collected through an interview guide regarding strategic decisions at the institution and established that information is very crucial in supporting Management board decisions.

2.5 Conceptual Framework

The conceptual framework depicts the relationship between the independent variables (quality management, Marketing Management Decisions and procurement management decision and the dependent variables (Performance) of the research study. The Figure below shows how independent and dependent variables interact with each other. The major objective of the study is to establish the impact of data based management decisions on performance on large manufacturing firms in Nairobi, Kenya.

Figure 2.1: Conceptual Model



Source: Researcher (2018)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research approach that has been utilized in completing the research study. It is organized into the following research structure; research design discussions, target population, data collection, and data analysis.

3.2 Research Design

Ghauri and Gronhaug (2005) indicated that research design entails coming up with a specified plan or a specified data collection framework and the successive statistical analysis, which contains the research approach and the objectives which are of much concern to the researcher. The research study used hybrid descriptive and causal research design in trying to seek comprehensive answers to the research issues. The design is preferred for the reason that it enables the researcher to describe the context area of research, institute the relationship and explain the collected data with aim of establishing the differences and similarities within a given time frame. Therefore, this design is deemed appropriate for this specific study, since it provides the researcher with detailed information through descriptions and is vital for identifying variables and the underlying relationship which is the main concern of this study. The blueprint is very appropriate since the fundamental interest of concern is to explore the viable

relationship and describe impact of data based management decisions on performance on large manufacturing firms in Nairobi.

3.3 Target Population

Kombo and Tromp (2003) avers that population refers to collection of the whole category of elements, individuals, objects or an item with similar characteristic from which data is collected for analysis. The population of this research will consist of 455 manufacturing entities in Nairobi, as per Kenya associstion of manufacturers (KAM) 2017.

3.4 Sampling Method

Bartlett, Kotrlik and Higgins (2001) indicated that a general goal of the research survey is to gather data from a population representative. Researcher utilizes information gotten from the survey to generalize findings population based on a sample, within random error limits. According to Mugenda (2003), a sample of 10% of the total population was appropriate for this descriptive study, thus the sample size utilized is 45 manufacturing firms that operate within Nairobi where they wewe picked using stratified method, as shown on Table 3.1 below.

Table 3.1: Sampling Method

Category	Population	% of industry	10 % -sample
Building	16	3.51	1
Chemical	59	12.96	6
Energy	34	7.47	4
Food and berages	108	23.73	10
Leather	6	1.31	1
Metal and allied	55	12.08	4
Motor vehicle	14	3.07	2
Paper products	44	9.67	5
Phamaceuticals	18	3.95	2

Plastic and rubber	48	10.54	5
Textile and appled	36	7.91	4
Wood and furniture	17	3.73	2
	455	100	46

3.5 Data Collection

The study employed primary data in seeking answers to the research question. The data was collected using a semi- structured questionnaire. Nigel, Nick and Amanda (2013) stated that a questionnaire method is the most suitable tool for collecting relevant comprehensive information. According to Kothari (2004) a self-administered questionnaire is a systematic approach of eliciting opinion, attitudes, beliefs and values of the people. The questionnaire has sections representing the various issues of great concern to the researcher. The questionnaire contain both open ended and closed ended questions in order to gather views, opinions and attitude from the respondent. The open ended questions was used because they give unrestricted freedom of answer to respondents. The data collection instrument was administered through drop and pick method to the key managers or equivalent of large manufacturing firms in Nairobi.

3.6 Diagnostic Tests

Diagnostic tests on normality, linearity, and homogeneity and sample adequacy were carried on the collected data to establish its suitability in the formulation of linear regression model. Normality was tested by Shapiro wilk which though common, fails to work well where large amount of data is involved and as was also supplemented by Kolmogorov-Smirnov test which is suitable for testing distributions of Gaussian

nature which have specific mean and variance. Linearity indicates a direct proportionate relationship between the dependent and independent variable such that a change in independent variable is followed by a correspondent change in the dependent variable (Gall et al. 2006). Linearity was tested by the means of considering the normality and the homoscedacity of the individual variables.

Tests on Multicolinearity of data was carried out using variance inflation factors (VIF) to determine whether the independent variables considered in this study are significantly correlated with each other. According to Grewal *et al*., (2004) the main sources of multicolliearity are small sample sizes, low explained variable and low measure reliability in the independent variables. Homoscedacity tests were carried out by means of scatter plot diagrams.

3.7 Data Analysis

The collected data was checked for completeness, consistency and any errors in preparation for analysis. The data collected was then be analyzed using descriptive statistics and inferential statistics. Descriptive statistics was captured by use of measures of central tendency like the mean, frequencies, percentages and standard deviation. Inferential statistics such as correlation was used to give conclusions. Multiple regression analysis was used in this case in order to establish the impact of data based management decisions and performance on large manufacturing firms in Nairobi. To measure performance, this study measured variables of cost and quality. For the independent variable quality management decisions was measured based on the variables of inventory stock, product design, and cost control. Procurement management decisions was measured based on the inventory decisions, supplier analysis decisions and purchasing decisions. In addition, marketing management

decisions was measured based on Product decisions, Price decisions, Place decisions and Promotion decisions.

The following research model was used for analysis:

$$\mathbf{Y_1 = a + B_1X_1 + B_2X_2 + B_3X_3 + \varepsilon}$$

$$\mathbf{Y_2 = a + B_1X_1 + B_2X_2 + B_3X_3 + \varepsilon}$$

Where Y_1 = Cost

Y_2=Quality

a= Constant

X_1 = Quality Management Decisions

X_2 = Procurement Management Decisions

X_3 = Marketing Management Decisions

ε = error term

B_1, B_2, B_3 represents regression coefficients. These help in the generalization of the findings on the impact of data based management decisions on performance on large manufacturing firms in Nairobi.

3.7.1 Tests of Significance

F- test was tested to ascertain the statistical significance of the predictor variables (quality management decisions, procurement management decisions and marketing management Decisions) against the response (performance). The statistical significance of variables was examined at a confidence level of 95% whereby 'p' value

of 0.05 and below was deemed significant and research variables with 'p' values above 0.05 are not significant to the study.

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSIONS

4.1 Introduction

In this section, data analysis, interpretation and discussion of the findings have been done. The chapter was divided into five sections. They included; response rate, background and demographics, descriptive statistics, inferential statistics, and discussion of findings. In summary, the chapter showcases data analysis, presentation, and interpretations of the study.

The presentation, interpretation and discussion of the findings was done based on the objectives of the reseach as; to establish the extent of data based management decision making adoption on large manufacturing firms in Nairobi, and to determine the impact of data based management decisions on performance of large manufacturing firms in Nairobi. The chapter therefore presents an analysis and presentation of the findings based on the objectives of the study. The findings are displayed in tables showing percentages, frequency distributions, mean and standard deviations.

4.2 Response Rate

Information on the response rate recorded for the current study is presented in Table 4.1.

Table 4.1: Response Rate

Response	Frequency	Percentage
Returned	38	82.61
Unreturned	08	17.39
Total	**46**	**100**

Out of the 46 questionnaires that were issued to the target respondents who constituted the sample employed in the study of the target population of manufacturing entities in, 38 were filled up and returned. The overall response rate for the study was as presented was 82.61%.

The results indicate an overall successful response rate of 82.61%. Therefore, the response rate documented for the analysis was found fit for analysis since it is supported by Mugenda and Mugenda (2010) that any response rate of 70% and above is considered excellent for analysis and making conclusions.

4.3 Background and Demographics

Fourty six manufacturing entities were picked for the study. Enumerated below is the summary of their characteristics derived from the Part A of this study's questionnaire. Information regarding demographic factored on this project included gender, age bracket of the respondents and firm, sales bracket per month, education level and bracket range of number of employees.

4.3.1 Respondents' Level of Education

From the questionnaire, the respondents were asked to indicate their education level. It was necessary to indicate the education level because it indicated their understanding of the manufacturing entities data based decisions and performance. It can also act as an indicator of the management level of the respondent. The results are displayed in Table 4.2.

Table 4.2: Education Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Secondary	5	13.2	13.2	13.2
	University	33	86.8	86.8	100.0
	Total	38	100.0	100.0	

Out of the four education categories asked, the 38 respondents indicated of having achieved only two qualifications. 86.8% them has university education while only 13.2 has secondary school level. Therefore majority had atleast university level of education. This implies that majority of the respondents have sufficient knowledge of the manufacturing firms data based decisions and performance. This because the findings indicate that the respondents work in the level where they encounter data based decisions.

4.3.2 Gender

From the questionnaire, the respondents were asked to indicate their gender. The expectation is to have more male than female employees in manufacturing. The findings are exhibited in Table 4.3.

Table 4.3: Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	20	52.6	52.6	52.6
	Male	18	47.4	47.4	100.0
	Total	38	100.0	100.0	

From the returned questionnaires, majority of respondents were female at 52.6% while the male proportion was 47.4%.

4.3.3 Age

From the questionnaire, the respondents were asked to tick their age bracket from the four categories ranging from 18 to 55 years of age. It was necessary to indicate the age because it may indicate the implementation of data based decisions and performance. This is because the older an employee is, the most likely the employee is in higher management hireachy and the greater the experience in data based decisions and performance. The results are showcased in Table 4.4.

Table 4.4: Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-25 years	3	7.9	7.9	7.9
	25-35 years	19	50.0	50.0	57.9
	35-45 years	12	31.6	31.6	89.5
	45-55 years	4	10.5	10.5	100.0
	Total	38	100.0	100.0	

The results indicated that majority are between 25-35 years of age at 50.0% followed by 35-45 years at 31.6%, 7.9% and 10.5% for 18-25 years and 45-55 years respectively.

4.3.4 Total Monthly Sales

From the questionnaire, the respondents were asked to indicate the level of monthly sales of the firm they work for. It was necessary to indicate the monthly sales because it may indicate the size of the firm. The results are displayed in Table 4.5.

Table 4.5: Total Monthly Sales

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 20,000,000	5	13.2	13.2	13.2
	Between 50,000,000-100,000,000	22	57.9	57.9	71.1
	Between 100,000,000-150,000,000	11	28.9	28.9	100.0
	Total	38	100.0	100.0	

Out of the three sales range asked, respondents indicated that 57.9% of firms have a monthly sales of between 50 million (Kshs) and 100 million (Kshs). Those between 100 to 150 million being 28.9% and 13.2% for those below 20 million.

4.3.5 Period of Operation

From the questionnaire, the respondents were asked to indicate the period of operation of the firm they work for. It was necessary to indicate the period of operation because it may indicate the level of experience of the manufacturing entity in the implementation of data based decisions. The results are displayed in Table 4.6.

Table 4.6: Period of Operation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 -2years	3	7.9	7.9	7.9
	3 -5 years	6	15.8	15.8	23.7
	6-10 years	5	13.2	13.2	36.8
	11 -15years	12	31.6	31.6	68.4
	Over 15 Years	12	31.6	31.6	100.0
	Total	38	100.0	100.0	

Firms with over 10 years accounted for 63.2%, 15.8% for those between 3-5 years, 6-1years and 0-2 years were 13.2% and 7.9% respectively.

4.3.6 Number of Employees

From the questionnaire, the respondents were asked to indicate the number of employees in the organization they work for. It was necessary to indicate the number of employees because it may indicate diversity size, and experience which may indicate the level of implementation of data based decisions. The results are displayed in Table 4.7.

Table 4.7: Number of Employees

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	50 -150	7	18.4	18.4	18.4
	150-250	11	28.9	28.9	47.4
	250-350	13	34.2	34.2	81.6
	Over 350	7	18.4	18.4	100.0
	Total	38	100.0	100.0	

34.2 % of the firms have between 250 - 350 employees, followed by 28.9% for those with between 150 to 250 employees. Firms with employees between 50 to 150 and those with over 350 account for 18.4% each.

4.4 Data Based Management Decisions

Descriptive statistics in this study were employed to establish the extent of data based management decision making adoption on large manufacturing firms in Nairobi.

4.4.1 Quality Management Decisions

Descriptive statistics were derived for quality management decisions. The results are presented in Table 4.8.

Table 4.8: Quality Management Decisions Descriptive Statistics

	Mean	Std. Deviation
Policies are developed based on data analytics and insights generated.	3.7105	1.35383
The most relevant inventory checks are determined by use of data and analytics.	3.7632	1.28261
We utilize artificial intelligence to learn factors and key behavior traits of potential customers.	2.7105	1.20602
Most elements of quality management decisions are done through data analystics.	3.5526	1.00532
Quality cost centres are monitored through data capture and analysis	4.2895	1.18340
Quality conformance of product design is monitored through data analysis .and insights generated.	3.8158	1.18219
Valid N (listwise)		
Overall Mean and Standard Deviation	3.64035	1.20223

The results show that the attribute quality cost centres are monitored through data capture and analysis has the highest mean of 4.2895 and a standard deviation of 1.18340. The attribute utilization of artificial intelligence has the lowest mean of

2.7105 and a standard deviation of 1.20602. All the attributes had a mean of between 2 and 5 which implies that the respondents strongly agreed, agreed, or were neutral about the implementation of quality management decisions in their organizations. The overall mean is 3.64035 with an average standard deviation of 1.20223 which indicates that the the respondents agreed about the implementation of quality data based management decisions in their organizations.

4.4.2 Procurement Management Decisions

Descriptive statistics were derived for procurement management decisions.

See table 4.9.

Table 4.9: Procurement Management Decisions Descriptive Statistics

	Mean	Std. Deviation
We use data to decide among variety of e-procurement technologies such as e-sourcing, e-auctions, and electronic data interchange (EDI) to transact with suppliers.	4.0263	1.10250
Data based management decisions have been utilized to secure goods and services.	3.9737	1.21892
Data analytics is used to have information like supplier availability, flexibility, and risk associated like quality, lead time among others.	3.5000	1.24662
Procurement receives product specifications using data based management decisions.	3.5263	1.13273
We make most decisions based on data.	3.8158	1.00956
Data is used extensively when it comes to partnership and receiving raw materials.	3.8158	1.29145
Valid N (listwise)		
Overall Mean and Standard Deviation	3.7763	1.16696

The results show that the attribute using data to decide among variety of e-procurement technologies has the highest mean of 4.0263 and a standard deviation of 1.10250. The attribute use of data analytics to derive procurement information has the lowest mean of 3.5000 and a standard deviation of 1.24662. All the attributes had a mean of between 3 and 5 which implies that the respondents strongly agreed and agreed about the implementation of procurement management decisions in their organizations. The overall mean is 3.7763 with an average standard deviation of 1.16696 which indicates that the the respondents agreed about the implementation of procurement data based management decisions in their organizations.

4.4.3 Marketing Management Decisions

Descriptive statistics were derived for marketing management decisions. The results are presented in Table 4.10.

Table 4.10: Marketing Management Decisions Descriptive Statistics

	Mean	Std. Deviation
Key customers are determined through data based management decision.	3.6842	1.41622
Decisions regarding new, and customer satisfaction and sales is through data analysis.	3.8158	1.31221
We have embraced the use of big data and information across marketing decisions.	3.8947	1.22562
Our main competitors are determined through data nalytics and insights generated.	3.7895	1.23371
We combine use of market intelligence and data to decide packaging decisions.	3.8421	1.17465
Valid N (listwise)		
Overall Mean and Standard Deviation	3.8053	1.27248

The results show that the attribute embracing the use of big data and information across marketing decisions has the highest mean of 3.8947 and a standard deviation of 1.22562. The attribute key customers are determined through data based management decision has the lowest mean of 3.6842 and a standard deviation of 1.41622. All the attributes had a mean of between 3 and 4 which implies that the respondents agreed about the implementation of marketing data based management decisions in their organizations. The overall mean is 3.8053 with an average standard deviation of 1.27248 which indicates that the the respondents agreed about the implementation of data based marketing management decisions in their organizations.

4.5 Data Based Management Decisions and Performance

The section states the inferential statistics employed to state the impact of data based management decisions on performance of large manufacturing firms in Nairobi. They included correlation analysis and regression analysis. The attributes denoting the predictor variables and the response were summarized to create whole variables. This was achieved by estimating the mean and median values of all the attributes.

4.5.1 Cost Improvement

Correlation analysis was done for the predictor variables on the response variable, cost. Pearson correlation was employed to analyze the level of association between data based management decisions and cost. The study employed a Confidence Interval of 95%, as it is the most utilized in social sciences. A two tailed test was utilized. The results are displayed in the Table 4.11 below.

Table 4.11: Cost Correlation Analysis

		Cost	QMD	PMD	MMD
Cost	Pearson Correlation	1	.773**	.512**	.594**
	Sig. (2-tailed)		.000	.001	.000
	N	38	38	38	38
QMD	Pearson Correlation	.773**	1	.628**	.798**
	Sig. (2-tailed)	.000		.000	.000
	N	38	38	38	38
PMD	Pearson Correlation	.512**	.628**	1	.435**
	Sig. (2-tailed)	.001	.000		.006
	N	38	38	38	38
MMD	Pearson Correlation	.594**	.798**	.435**	1
	Sig. (2-tailed)	.000	.000	.006	
	N	38	38	38	38

**. Correlation is significant at the 0.01 level (2-tailed).

The study findings in Table 4.12 above indicate that cost is significantly correlated at the 1% significance level (hence, consequently at the 5% level) to all the predictor variables. Thus, the findings imply that there is a positive relationship between cost and all the predictor variables. Thus, data based management decisions exhibit a significant positive relationship with cost improvement.

The regression analysis was done by regressing the predictor variables against cost. The logarithm function was introduced on the predictor variables in order to linearize them because they did not exhibit a linear relationship with the depedent variable. The regression analysis was undertaken at 5% significance level. The critical value obtained from the F test and T test were compared with the values obtained in the analysis. The results are displayed from Table 4.12 to Table 4.14.

Table 4.12: Cost Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

1	.774[a]	.600	.564	.85259

a. Predictors: (Constant), MMD, PMD, QMD

R square, being the coefficient of determination indicates the differences in the response variable that is as a result of changes in the predictor variables. From the outcome in Table 4.12, the value of R square was 0.600, a discovery that 60% of the deviations in cost improvements are caused by the predictor variables included in the study. Other variables not included in the model justify for 40% of the variations in cost savings.

Table 4.13: Cost Analysis of Variance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	37.002	3	12.334	16.968	.000[b]
	Residual	24.715	34	.727		
	Total	61.717	37			

a. Dependent Variable: Cost

b. Predictors: (Constant), MMD, PMD, QMD

A critical value of 2.88260421 was obtained from the F-Test tables. The F statistic indicated in the study findings is more than the critical value, thus the whole model is significant to predict cost improvements.

Table 4.14: Cost Model Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.334	.747		-.447	.658	-1.851	1.184
	QMD	1.114	.296	.794	3.768	.001	.513	1.715
	PMD	.063	.236	.038	.268	.790	-.417	.544
	MMD	-.061	.199	-.056	-.308	.760	-.466	.343

a. Dependent Variable: Cost

The significance of the individual coefficients was established using the T-Test. The T-Test critical value of ± 2.0261921 was obtained from the T tables. It was a two tailed test at the 5% significance level. Only quality management decisions had a significant relationship with cost improvements. It had a positive significant effect on cost improvements at the 95% confidence interval as exhibited by its t-statistic value. The regression equation below was thus estimated:

$$\mathbf{Y_1 = -0.334 + 1.114X_1 + 0.063X_2 - 0.061X_3}$$

Where;

Y_1 = Cost

X_1 = Quality Management Decisions

X_2 = Procurement Management Decisions

X_3 = Marketing Management Decisions

4.5.2 Quality Improvement

Correlation analysis was then done for the predictor variables on the response variable, quality. Pearson correlation was employed to analyze the level of association between data based management decisions and quality. The study employed a Confidence Interval of 95%, as it is the most utilized in social sciences. A two tailed test was utilized. The results are displayed in the Table 4.15.

Table 4.15: Quality Correlation Analysis

		Quality	QMD	PMD	MMD
Quality	Pearson Correlation	1	.309	.285	.363*

	Sig. (2-tailed)		.059	.083	.025
	N	38	38	38	38
	Pearson Correlation	.309	1	.628**	.798**
QMD	Sig. (2-tailed)	.059		.000	.000
	N	38	38	38	38
	Pearson Correlation	.285	.628**	1	.435**
PMD	Sig. (2-tailed)	.083	.000		.006
	N	38	38	38	38
	Pearson Correlation	.363*	.798**	.435**	1
MMD	Sig. (2-tailed)	.025	.000	.006	
	N	38	38	38	38

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

The study findings in Table 4.15 indicate that all the predictor variables are not significantly correlated at the 5% significance level to quality.

Then regression analysis was done by regressing the predictor variables against quality. The logarithm function was introduced on the predictor variables in order to linearize them because they did not exhibit a linear relationship with the depedent variable. The regression analysis was undertaken at 5% significance level. The critical value obtained from the F test and T test were compared with the values obtained in the analysis. The results are displayed from Table 4.16 to Table 4.18.

Table 4.16: Quality Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.393[a]	.154	.080	.97621

a. Predictors: (Constant), MMD, PMD, QMD

From the outcome in Table 4.16, the value of R square was 0.154, a discovery that 15.4% of the deviations in quality improvements are caused by the predictor variables

included in the study. Other variables not included in the model justify for 84.6% of the variations in quality improvements.

Table 4.17: Quality Analysis of Variance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	5.914	3	1.971	2.069	.123[b]
	Residual	32.401	34	.953		
	Total	38.316	37			

a. Dependent Variable: Quality

b. Predictors: (Constant), MMD, PMD, QMD

A critical value of 2.88260421 was obtained from the F-Test tables. The F statistic indicated in the study findings is less than the critical value, thus the overall model is not significant to predict quality improvements.

Table 4.18: Quality Model Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	2.009	.855		2.350	.025	.272	3.746
	QMD	-.105	.338	-.095	-.309	.759	-.793	.583
	PMD	.250	.271	.189	.925	.362	-.300	.800
	MMD	.307	.228	.357	1.348	.187	-.156	.771

a. Dependent Variable: Quality

The T-Test critical value of ± 2.0261921 was obtained from the T tables. It was a two tailed test at the 5% significance level. No predictor variable was found to significantly affect quality improvements at the 95% confidence interval as exhibited by their t-statistic values.

4.5.3 Operational Performance

Correlation analysis was done for the predictor variables on the response variable, operational performance. Pearson correlation was employed to analyze the level of association between data based management decisions and quality. The study employed a Confidence Interval of 95%, as it is the most utilized in social sciences. A two tailed test was utilized. The results are displayed in the Table 4.19.

Table 4.19: Operational Performance Correlation Analysis

		Oper_Perf	QMD	PMD	MMD
Oper_Perf	Pearson Correlation	1	.708**	.513**	.614**
	Sig. (2-tailed)		.000	.001	.000
	N	38	38	38	38
QMD	Pearson Correlation	.708**	1	.628**	.798**
	Sig. (2-tailed)	.000		.000	.000
	N	38	38	38	38
PMD	Pearson Correlation	.513**	.628**	1	.435**
	Sig. (2-tailed)	.001	.000		.006
	N	38	38	38	38
MMD	Pearson Correlation	.614**	.798**	.435**	1
	Sig. (2-tailed)	.000	.000	.006	
	N	38	38	38	38

**. Correlation is significant at the 0.01 level (2-tailed).

The study findings in Table 4.19 indicate that operational performance is significantly correlated at the 1% significance level (hence, consequently at the 5% level) to all the predictor variables. Thus, the findings imply a positive association between operational performance and all the predictor variables.

Regression analysis was done by regressing the predictor variables against operational performance. The logarithm function was introduced on the predictor variables in order to linearize them because they did not exhibit a linear relationship with the

depedent variable. The regression analysis was undertaken at 5% significance level. The critical value obtained from the F test and T test were compared with the values obtained in the analysis. The results are displayed from Table 4.20 to Table 4.22.

Table 4.20: Operational Performance Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.720[a]	.518	.475	.67134

a. Predictors: (Constant), MMD, PMD, QMD

R square, being the coefficient of determination indicates the deviations in the response variable that is as a result of changes in the predictor variables. From the outcome in Table 4.20, the value of R square was 0.518, a discovery that 51.8% of the deviations in operational performance are caused by the predictor variables included in the study. Other variables not included in the model justify for 48.2% of the variations in operational performance.

Table 4.21: Operational Performance Analysis of Variance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	16.461	3	5.487	12.174	.000[b]
	Residual	15.324	34	.451		
	Total	31.785	37			

a. Dependent Variable: Oper_Perf

b. Predictors: (Constant), MMD, PMD, QMD

A critical value of 2.88260421 was obtained from the F-Test tables. The F statistic indicated in the research findings exceed the critical value, thus the overall model is significant to operational performance.

Table 4.22: Operational Performance Model Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	.838	.588		1.425	.163	-.357	2.032
	QMD	.505	.233	.501	2.168	.037	.032	.978
	PMD	.157	.186	.130	.843	.405	-.221	.535
	MMD	.123	.157	.157	.785	.438	-.196	.442

a. Dependent Variable: Oper_Perf

The T-Test critical value of ± 2.0261921 was obtained from the T tables. It was a two tailed test at the 5% significance level. Only quality management decisions has significant relationship with cost improvements. It has a positive significant effect on cost improvements at the 95% confidence interval as exhibited by its t-statistic value. The regression equation below was thus estimated:

$$\mathbf{Y_3 = 0.838 + 0.505X_1 + 0.157X_2 - 0.123X_3}$$

Where;

Y_3 = Operational Performance

X_1 = Quality Management Decisions

X_2 = Procurement Management Decisions

X_3 = Marketing Management Decisions

4.6 Discussion of Findings

The discussion of findings was done in regard to the objectives of the reseach, the discussions are enumerated below. The first specific objective was to establish the

extent of data based management decision making adoption on large manufacturing firms in Nairobi. This was achieved through the use of descriptive statistics.

All the attributes denoting data based management decisions had means implying that the respondents strongly agreed, agreed, or were neutral about the implementation of data based management decisions in their organizations. The overall mean of quality management decisions, procurement management decisions, and marketing management decisions implied that the respondents agreed about the implementation of data based management decisions in their organizations. The average mean of data based management decisions also implied that the respondents agreed about the implementation of data based management decisions in their organizations. Thus, data based management decision making adoption by large manufacturing firms in Nairobi was to a large extent (agreed) as exhibited by the agreement by the respondents about its implementation in their respective organizations.

The findings resonate with those of the study conducted by Ndegwa (2015) assessing the effects of information quality and use in a community health database and found out that Counties have seen an improvement in data use skills and in positive attitudes towards data, as well as an increased expectation that all decisions should be made by use of data. The findings agree with those of the study conducted by Brous *et al.,* (2018) on the adoption of Internet of Things for reconfiguring decision-making processes in management of assets which established that decision making in management of asset has been transformed to cope with up to date nature of the data, provenance, governance and the necessity for standardization.

The second objective was to determine the impact of data based management decisions on performance of large manufacturing firms in Nairobi. This was achieved through the utilization of correlation and regression analysis.

The correlation analysis found out that quality management decisions, procurement management decisions, and marketing management decisions are all significantly correlated to cost improvement. They all had a positive significant correlation. This implies that data based management decisions positively impact on cost improvement. Correlation analysis done on quality improvement, quality management decisions, procurement management decisions, and marketing management decisions established that there was no significant correlation between the predictor variables and the response variable. This implies that data based management decisions have no impact on quality improvement. The final correlation analysis conducted revealed that quality management decisions, procurement management decisions, and marketing management decisions are all significantly correlated to operational performance. They all had a positive significant correlation. This implies that data based management decisions positively impact on operational performance.

The regression analysis conducted for cost improvement against quality management decisions, procurement management decisions, and marketing management decisions found out that the model developed in the study to predict cost improvement was significant. This was established by use of the F statistics. This implies that data based management decisions have an effect on cost improvement. When the significance of the individual predictor variables was conducted it was found that only quality management decisions had an effect on cost improvements and it had a positive

influence. The coefficient obtained for quality management decisions implies that its unit increase will lead to an increase of 1.114 in cost improvements.

The regression analysis conducted for quality improvement against quality management decisions, procurement management decisions, and marketing management decisions found out that the model developed in the study to predict quality improvement was not significant. This was established by use of the F statistics. This implies that data based management has no impact on quality improvement. When the significane of the individual predictor variables was conducted it was found that they all had no significant effect on quality improvements.

The regression analysis conducted for operational performance against quality management decisions, procurement management decisions, and marketing management decisions found out that the model developed in the study to predict operational performance was significant. This was established by use of the F statistics. This implies that data based management decisions positively impact on operational performance. When the significane of the individual predictor variables was conducted it was found that only quality management decisions had an effect on operational performance and it had a positive influence. The coefficient obtained for quality management decisions implies that its unit increase will lead to an increase of 0.505 in operational performance.

The study findings resonate with those of the study conducted by Wanyoike (2016) quality management practices and performance of companies among manufacturing

companies in Kenya which found out that continuous improvement shown a statistical significant in influencing the firm's performance. The findings are also in agreement with those of the study conducted by Kafetzopoulos (2015) investigating the quality management systems on the performance of manufacturing companies and found out that ISO 9001 effectiveness unswervingly contributes to product quality and firms performance.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This section discusses the summary of the research findings and offers conclusions and recommendations of the research. It offers a summary on the results of the two objectives of the study; to establish the extent of data based management decision making adoption on large manufacturing firms in Nairobi and to determine the impact of data based management decisions on performance of large manufacturing firms in Nairobi. It further goes on to state the challenges of the research and provide suggestions for further study.

5.2 Summary of the Study Findings

The data based management decisions that impact on operational performance hypothesized in the study included; quality management decisions, procurement management decisions, and marketing management decisions. Primary method of data collection was utilized where questionnaires were administered to 46 respondents in large manufacturing companies Nairobi, out of the total population of 455 firms. The study employed the use of descriptive statistics, correlation analysis, and regression analysis to establish the extent of data based management decision making adoption on large manufacturing firms in Nairobi and to determine the impact of data based management decisions on performance of large manufacturing firms in Nairobi.

The study established through descriptive statistics that data based management decision making adoption by large manufacturing firms in Nairobi was agreed. The study through correlation and regression analysis exhibited that the model developed

in the study to predict cost improvement was significant thus data based management decisions have an impact on cost improvement. It was also found that only quality management decisions had an effect on cost improvements and it had a positive influence.

Further findings indicated that the model developed in the study to predict quality improvement was not significant thus implying that data based management has no impact on quality improvement. The final findings revealed that the model developed in the study to predict operational performance was significant thus implying that data based management decisions positively impact on operational performance. It was also established that only quality management decisions had an effect on operational performance and it had a positive influence.

5.2 Conclusion

From the above findings, it can be concluded that certainly that data based management decision making adoption by business enterprises is generally agreed. This conclusion is similar to that Gordon (2007) who opined that information is a very critical resource of an organization as it enables managers to justify their decisions with verifiable data and that all businesses of any imaginable size whatsoever require information for proper planning for their future undertaking and making of high-level, high value and strategic decisions. The conclusion is also in agreement with that of Brodsky, Ekirapa, Cannon and Nutley (2016) who concluded that people must understand the value of data use and believe in the importance of using data in the decision making process and entity leadership must continuously advocate for the use

of data in decision making and develop organizational policies and procedures that not only encourage data use, but require it.

Further conclusions are that data based management decisions impact on cost improvements and operational performance. Quality management decisions have a positive impact on cost improvements and operational performance. The conclusions are in agreement with those of Petkovska (2008) who opined that the main effect on functioning of the firm is that it has implemented the quality management system refers to exactly define processes steps, prepares standard operating procedures (SOPS), which in the end ensures the production of acceptable quality products. Complete and implement quality management system ensure that two critical requirements are achieved.

The conclusions are also in agreement with Brown *et al.* (2001) that a firm will be termed to be performing well if flexibility, cost, time, and quality are managed within the allowed parameters, in case of gaps to the desired level of performance improvements activities as to be engaged. It also resonates with Maingi (2008) conclusions that sound operations management practices create reasonable number competitive priorities, such as cost, quality, flexibility and reliability that enable its products to be demanded more than those of the competitors.

The conclusions are in tandem with those of Magd (2008) who stated that for a firm to produce quality products, processes must be designed in such a manner to minimize errors, defects and have the capability to reproduce/repeat over different quality state. Quality is one of the vital competitive strategies used by most firms; high quality

improves efficiency and firm performance. Finally, the conclusions are similar to Yong and Wilkinson (2002) conclusions that for a firm to succeed it has to recognize and practice quality management as a strategic tool for future success.

5.3 Recommendations

Policy recommendations are that the government through the ministry of industrialization and through other trade agencies and regulators can employ the study findings to spur the growth of the industrialization sector since it is one of the main agendas in the current government objectives, Big 4 and also the core objective of Vision 2030, and Sustainable Development Goals (SDG's).

The study findings were that data based management decision making adoption by business enterprises is in agreement. The government should conduct training and sensitizations and training, through its various ministries and agencies, to encourage manufacturing firms to adopt data based management decisions inorder to augment their performance.

Other study findings were that data based management decisions significantly and positively impact on operational performance. More specifically, data based management decisions impact on cost improvements and operational performance. The government should enhance quality improvement of manufactured products through its agencies which include; Kenya Bearue of Standards (KEBS) and the Anti-Counterfeit Authority in order to enhance the performance of manufacturing firms. It should also provide a conducive environment to enable the manufacturing firms

reduce their cost of doing business by for instance, reducing electricity tarrifs and reducing taxes and fees applicable.

Stakeholders in the Kenyan manufacturing industry which include; managers, analysts, and industry experts can utilize data management decisions to drive competitiveness sustainably in order to ensure business continuity over the long term. Venture capitalists can equally be armed with the trends that define this industry and the expected direction in establishing/firming up their investment options, strategies and critical success factors within their intended manufacturing plants. This is based on study findings that data based management decisions significantly and positively impact on operational performance.

5.5 Limitations of the Study

Due to time and cost challenges, the scope of the study was limited to manufacturing companies in Nairobi. Thus, it has not been determined if the result findings would hold for the manufacturing firms in the rest of the country. Furthermore, it is uncertain whether similar findings would be replicated in other countries. Since the study employed primary sources of data through the use of questionnaires, there was the challenge of non-response of some of the questions in the questionnaire or even the respondents not returning the entire questionnaire. The data could also not be used in its raw form, and had to be coded into Statistical Packages for Social Sciences. Thus, delays were imminent as data was to be edited and processed further before the researcher could be able to compile it.

5.6 Areas for Further Studies

On the basis of information gathered and the knowledge gained in this study, the researcher has suggested some areas for further research. The current study's scope was limited to the manufacturing companies in Nairobi County, Kenya. A similar study can be done on the rest of the manufacturing firms in the other counties in Kenya. Thus, a study can be done on data based management decisions and operational performance of large manufacturing firms in Kenya.

The R squared determined that other factors not included in the study to some extent influence operational performance, thus a study can be conducted on factors that influence operational performance. An example of opic would be, Data based management decisions and training in manufacturing firms in Kenya or Relationship between performance, data based decision making and budget allocation to training. The study would have shed more light if extended to cover the level of training offered by the management, percent of budget expenditure on training and origin of firm owners or rather firms originality. This would explain why some firms have adopted use of data based decisions than others and the reasons behide adoption of the same. Primary data was solely utilized in the study, alternative research can be employed using secondary sources of data. Multiple linear regression and correlation analysis were used in this research, further research can incorporate other analysis methods like factor analysis, Granger causality, cluster analysis, and discriminant analysis.

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APPENDICES

Appendix I: Questionnaire

PART 1: General /Demographic Information

This questionnaire has been designed basically to collect data on the impact of data based management decision making and performance of large manufacturing firms in Nairobi. The data collected will be treated with a very high degree of confidentiality and it's is meant for academic purpose only.

For each of the statements, kindly answer all questions either by ticking in the boxes or writing in the spaces provided.

PART 1: Bio Data

1. Level of study (please tick one)
   Primary □ Secondary □ College □ University□
2. Gender (please tick one)
   Female □ Male □
3. Age (please tick one)
   18-25 years □ 25-35 years □ 35-45 years □ 45-55 years □ 55-65 years □
   65-75 years □ 75 years and above □

4. Total sales per month (Kshs) (please tick one)
   Below 20,000,000 □ Between 50,000,000-100,000, 000 □
   Between 100,000,000-150,000,000 □ Over 150,000,000
   □

5. Please indicate your firm's years of operation
   0 -2years □ 3 -5 years □ 6-10 years □
   11 -15years □ Over 15 Years □
6. The Number of Employees in your firm
   50 -150 □ 150-250 □ 250-350 □ Over 350 □

PART 2: Quality management decisions

This section is about quality data base decisions that a business can adopt to outdo its competitors. For each of the statements, please use the scale given below to indicate your level of agreement by ticking the level of agreement on a scale of 1-5: 5-Strongly agree, 4-Agree, 3-Neutral, 2-Disagree and 1-Strongly Disagree

	5	4	3	2	1
Policies are developed based on data analytics and insights generated.					
The most relevant inventory checks are determined by use of data and analytics.					
We utilize artificial intelligence to learn factors and key behavior traits of potential customers.					
Most elements of quality management decisions are done through data analystics.					
Quality cost centres are monitored through data capture and analysis					
Quality conformance of product design is monitored through data analysis .and insights generated.					

PART 2: Procurement management decisions

This section is about procurement data based decisions that a business can adopt to outdo its competitors. For each of the statements, please use the scale given below to indicate your level of agreement by ticking the level of agreement on a scale of 1-5: 5-Strongly agree, 4-Agree, 3-Neutral, 2-Disagree and 1-Strongly Disagree

	5	4	3	2	1
We use data to decide among variety of e-procurement technologies such as e-sourcing, e-auctions, and electronic data interchange (EDI) to transact with suppliers.					
Data based management decisions have been utilized to secure goods and services.					
Data analytics is used to have information like supplier availability, flexibility, and risk associated like quality, lead time among others.					

Procurement receives product specifications using data based management decisions.					
We make most decisions based on data.					
Data is used extensively when it comes to partnership and receiving raw materials.					

PART 3: Marketing management decisions

This section is about marketing management data based decisions that a business can adopt to outdo its competitors For each of the statements, please use the scale given below to indicate your level of agreement by ticking the level of agreement on a scale of 1-5:
5-Strongly agree, 4-Agree, 3-Neutral, 2-Disagree and 1-Strongly Disagree

	5	4	3	2	1
Key customers are determined through data based management decision.					
Decisions regarding new, and customer satisfaction and sales is through data analysis.					
We have embraced the use of big data and information across marketing decisions.					
Our main competitors are determined through data nalytics and insights generated.					
We combine use of market intelligence and data to decide packaging decisions.					

PART 4: Operational performance

This section is about data based management decisions that a business can adopt to improve operational performances. For each of the statements, please use the scale given below to indicate your level of agreement by ticking the level of agreement on a scale of 1-5: 5-Strongly agree, 4-Agree, 3-Neutral, 2-Disagree and 1-Strongly Disagree.

COST	5	4	3	2	1
Customer service general cost has been managed downwards largely according to plan.					
Machine and employee productivity has been on upwards trend.					
Organization plan to net new and promising business opportunities has largely been achieved					
QUALITY	**5**	**4**	**3**	**2**	**1**
Customer satisfaction has improved according to standards set and market in general.					
Service level agreement (SLA) has improved mainly according to plan.					
Customer complaints have been successfully solved and reduced the same in general.					

Appendix II: Large Manufacturing Firms in Kenya

Energy Sector	
Kenwestfal Works Ltd	A.I Records (Kenya) Ltd
Rumorlh East Africa Ltd	Module Engeneering Systems Ltd
Assa Abloy East Africa Ltd	Amedo Centre Kenya Ltd
Nationwide Electricals Industries	Kenya Scale Co. Ltd
Aucma Digital Technology Kenya Ltd	Kenya Electricity Generating Company Ltd
Kenya Shell Ltd	Avery (East Africa) Ltd
Optimum Lubricants Ltd	Libya Oil Kenya Limited
Baumann Engeneering Limited	Power Technics Ltd
Pentagon Agencies Reliable Electricals Engeneers Ltd	Centurion Systems Limited
Manufacturers and Suppliers (k) Ltd	Digitech East A frica Limited
Sanyo Armo(Kenya) Ltd	Eveready East Africa Limited
Marshall Fowler (Engineers) Ltd	Specialised Power Systems
Frigorex East Africa Ltd	Mecer East Africa Ltd
Metlcx Industries Ltd	Holman Brothers (E.A) Ltd
Ibera Africa Power (EA) Ltd	Synergy Pro Ltd
International Energy Technik Ltd	Tea Vac Machinery Limited
East A frican Cables Ltd	Kenwest Cables Ltd
Chemical Sector	
Anffi Kenya Ltd	Match Masters Ltd
Imaging Solutions (K) Ltd	Maroo Polymers Ltd
Basco Products (K) Ltd	Bayer East A frica Ltd
United Chemical Industries Ltd	Interconsumer Products Ltd
Continental Products Ltd	Odex Chemicals Ltd
Osho Chemicals Industries Ltd	Oasis Ltd
Procter and Gamble East Africa Ltd	Beiersdorf East Africa Ltd

Cooper K Brands Ltd	Polychem East Africa Ltd
Sadolin Paints (E.A.) Ltd	Blue Ring Products Ltd
Sara Lee Kenya Limited	PZ Cussons Ltd
Rayal Trading Co. Ltd	BOC Kenya Limited
Saroc Ltd Reckitt Benckiser (E.A) Ltd	Carbacid (CO2) Limited
Buyline Industries Limited	Revolution Stores Co. Ltd
Crown Berger Kenya Ltd	Super Foam Ltd
Soilex Chemical Ltd	Chemicals AND Solvents E.A. Ltd
Crown Gases Ltd	Strategic Industries Limited
Chemicals and Solvents E.A. Ltd	Coates Brothers (E.A.) Limited
Decase Chemical (Ltd) Supa Brite Ltd	Deluxe Inks Ltd
Unilever Kenya Ltd	Coil Products (K) Ltd
Murphy Chemical E. A. Ltd	Desbro Kenya Limited
East Africa Heavy Chemicals(1999) Ltd	Syngenta East Africa Ltd
Colgate Palmolive(E.A.) Ltd	Elex Products Ltd Synresins lTD
Kel Chemicals Limited	European Cosmet
Tri-clover Industries(k) Ltd	Ken Nat Ink & chemical
Kemia Internationational Ltd	Galaxy Paints & Coating Co Ltd
Twiga Chemical Industries Limited	Vitafoam products Limited
Grand Paints Limited	Magadi soda company Limited
Henkel Kenya Limited	Redsea Chemist
Orbit chemicals	Johnson and Johnson
Dura coat	
FOOD & BEVERAGE SECTOR	
Aquamist Limited Premier Food Industries	Agrinea agricultural Development Ltd
Brookside Dairy Limited	Belfast Millers Limited
Proctor & Allan (E.A) Ltd	Bidco oil Refineries Limited
Candy Kenya Limited	Bio foods Products Limited
Premier Flour mills Limited	Prominsdor (Kenya) Limited

Capwell Industries Limited	Trufoods Limited
British American Tabacco Kenya Limited	Carlton Products (EA) Limited
Breakfast Cereal Company (K) Ltd	UDV Kenya Limited
Chirag Kenya Limited	Unga Group Limited
Broadway Bakery Limited	E & A Industries Ltd
Usafi Services Ltd	Kakuzi Limited
C.Czarnukal Sugar (EA) Ltd	Excel Limited
Uzuri Food Ltd	Centrofood Industries Ltd
Cadbury Kenya Ltd	Erdemann Co.(K) Ltd
Valuepak Food Ltd	W.E. Tilley (Muthaiga) Ltd
Coca Cola East Africa Ltd	Highlands Canner Ltd
Kenya Wine Agency Ltd	Koba Water Ltd
Confec Industries (EA) Ltd	Corn products Kenya Limited
Kevian Kenya Ltd	Cut Tabacco (K) limited
Super Bakery Limited	Kwality Candies & Sweets Ltd
Lari Diaries Alliance Ltd	London distillers (K) LTD
Crown Foods Limited	Deepa Industires
Spin Knit Dairy Ltd	Home Oil Manji Food Industries Ltd
Highlands Mineral Water Ltd	East African Breweries Ltd
Biscuits and cookies	Melvin Marsh International
Del Monte Kenya Ltd	East African Sea food Limited
Insta Products (EPZ) Ltd	Glacier Products Limited
Jambo Biscuits (K) Ltd	Mt. Kenya Bottlers Ltd
Kenblast Lmited Nairobi Bottlers Ltd	Frigoken Ltd
Giloil Company Ltd	Karirana Estate Ltd
Kenafric Industries Ltd	Farmers Choice Ltd
Miritini Kenay Ltd	Jetlak Food Ltd
Mini Bakeries (NBI) Ltd	Global Allied Industries Ltd
Kenya Breweries Ltd	Kenya Nut Company Ltd

Nairobi Flour Mills Ltd	Global Beverages Ltd
Nas Airport Services Ltd	Rafiki Milliers Ltd
Kenya Sweets Ltd	Nestle Kenya Ltd
Global Fresh Ltd	Alpine Coolers Ltd
Rezco Ltd	Pembe Flour Mills Ltd
Wrigley Company (EA) Ltd	Spice World Ltd
Alpha Fine Foods Ltd	Alliance one Tabacco Kenya Ltd
Pearl Industries Ltd	Patco Industries Ltd
Softa Bottling Co. Ltd	Smash Industires Ltd
Al-Manhra Industries Ltd	Gonas Best Ltd
Re-Suns Spices Ltd	Palmhouse DaIries Ltd
Hail & Cotton Distillers Ltd	Smash industries Ltd
Flexoworld Ltd	Excel chemical ltd
Famiar Generating Systems Ltd	Equatorial Tea Limited
Energy pak (k) Limited	Crown berger (K) Ltd
Ecolab East Africa (k) Ltd	Bogani industries ltd
Eastern Chemical Industries Ltd	Bosky Industries Ltd
Dormans	Devani ltd
United millers	Pepsi
Tropical heat	Pea food industries
PLASTIC & RUBBER	
Betatrad (K) Ltd	Prestige Packaging Ltd
Haco Industries (K) Ltd	BlowPlast Ltd
Prosel Ltd	Hi-Plast Ltd
Bobmil Industries Ltd	Qplast Industries Ltd
Jamlam Industries Ltd	Sumaria Industries Ltd
Kamba Manufacturing (1986) Ltd	Super Manufacturers Ltd
Kenpoly Manufacturers	Kentainers Limited
Kici Rubber Industries Ltd	Nairobi Plastic Industries

Techpak Industries Ltd	Nav Plastics Ltd
Kingway Tyres & Automart Ltd	Uni-Plastics Ltd Ombi rubber
Treadsetter Tyres Ltd	Packaging Masters Ltd
L.G Harris & Co Ltd	ACME Containers Ltd
Lanneb Plastic Industries Ltd	Metro Plastics Kenya Ltd
Plastic Electricons	Raffia bag (K) ltd
Afro Plastics (k) Ltd	Rubber products Ltd
Ombi rubber rollers Ltd	Packagaging Industries Ltd
Dune Packagaging Industries Ltd	SafePak Ltd
Plastic & Rubber Industries	Sameer Africa Ltd
Elgitread (K) Ltd	Sanpac Africa Ltd
Polytex Industries Ltd	Elson Plastics of Kenya Ltd
Polyblend Limited	Polythene Industries ltd
Silpack Industries Ltd	Solvochem East Africa Ltd
Five Star Industries Ltd	General Plastics Ltd
Premier Industries Ltd	Malplast industries
METAL AND ALLIED	
Alloy Street Castings Ltd	Nails and Steel Products Ltd
Nampak Kenya Ltd	Apex Street Ltd
Rolling Mill Division	Orbit Engineering Ltd
Napro Industries Ltd	Rolmil Kenya Ltd
Specialized Engineer Co.(EA) Ltd	ASL Ltd
Sandiv Kenya Ltd	ASP Company Ltd
East Africa Foundry Works (K)Ltd	Steel Structures Limited
Steelmakers Ltd	Sheffied Steel Systems Ltd
Tononoka Steel Ltd	City Engineering Works LTD
Steelwool (Africa) Ltd	Elite Tools Ltd
Booth Exrusions Lts	General Aluminum Fabricators Ltd
Crystal Industries Ltd	Welding Alloys Ltd

Wire Products Limited	Gopitech (Kenya) Ltd
Kens Metal Industries Ltd	Metal Crown Limited
Warren Enterprises Ltd	East Africa Spectre Limited
Insteel Limited	Viking Industries Ltd
Heavy Engineering Ltd	Devki Steel Mills Ltd
Kenya Solar	Guan Candle Making machine Co.Ltd
Kenya Fluorspar company Ltd	Goods Chemistry Practice & Allied Company
Jet chemicals (K) Ltd	Goldrock Internal Enterprises
Imani Workshops	Gahir Engineering works Ltd
Hydraulic Hose & Pipe Manufacturers Ltd	Makiga Enginnering Services Ltd
Hill Converters (K) Ltd	Meltech Engineering & Construction Ltd
Heluk International Ltd	New World Stainless Steel Ltd
Simco Auto Parts Ltd	Sigma Engineering Co Ltd
Simco Auto Parts Ltd	Superfit Steelcon Ltd
Stainless steel products Ltd	Abu Engineering Ltd
Doshi group of companies	
Leather Products	
Bata Shoe Co. (K) Ltd	East Africa Tanners (K) Ltd
CP Shoes Leather Industries of Kenya Limited	C & P Shoe Industries Ltd
Alpharama Ltd	New Market Leather Factory Ltd
Pharmaceutical	
Alpha Medical Manufacturers Ltd	Madivet Products Ltd
Beta Healthcare International Ltd	KAM Industries Ltd
Novelty Manufacturing Ltd	KAM Pharmacy Limited
Biodeal Laboratories Ltd	Oss. Chemie(K) Pharmaceutical Manufacturing Co.
Bulks Medical Ltd	Dawa Limited
Universal Corporation Limited	Laboratory & Allied Limited
Gesto Pharmaceutical Ltd	Elys Chemical Industries
Cosmos Limited	Pharm Access Africa Ltd

Glaxo Smith Kline Kenya Ltd	Manhar Brothers (K) Ltd
Paper Sector	
Ajit Cothing Factory Ltd	Paper House of Kenya Ltd
General Printers Ltd	Associated Papers & Stationery Ltd
Paperbag Limited	Autolitho Ltd
Graphics & Allied Ltd	Print Exchange Ltd
Primex Printers Ltd	Icons Printers Ltd
Guaca Stationers Ltd	Bags and Balers Manufacturers (K) Ltd
Bag Envelope Converters Ltd	Interlabels Africa Ltd
Printpak Multi Packing Ltd	Jomo Kenyatta Foundation
Brand Printers Printwell Industries Ltd	Karatasi Industries Ltd
Business Forms & Systems Ltd	Punchlines Ltd
Prudential Printers Ltd	Cempack Ltd
Carton Manufacturers Ltd	Kitabu Industries Ltd
Kenafric Diaries Manufacturers Ltd	Colour Labels Ltd
Chandaria Industries Limited	D.L. Patel Press (Kenya) Limited
Creative Print House Kul Graphics Ltd	Dodhia Packaging Limited
Label Converters	Colour Print Ltd
Colour Packaging Ltd	East Africa Packaging Industries Ltd
Modern Lithographic (K) Ltd	Ramco Printing Works Ltd
Kenya Stationers Ltd	Kim – Fay East Africa Ltd
Elite Offset Ltd	Regal Press Kenya Ltd
Ellams Products Ltd	De La Rue
Paper Converters (Kenya) Ltd	
English Press Limited	
Wood and Furniture	
Kenya Wood Ltd	Tetra Pak Ltd
Shamco Industries Ltd	Slumberland Kenya Limited
Newline Ltd	Taws Limited

Timsales Ltd	Hwan Sung Industries (K) Ltd
Shah Timber Mart Ltd	Stapack Industries Ltd
Economic Flousing Group Ltd	Rosewood Office Systems Ltd
Furniture International Limited	United Bags Manufacturers Ltd
Uchumi Quick Suppliers Ltd	Fine Wood Works Ltd
Twiga Stationers & Printers Woodtex Kenya	
Textile Sector	
Africa Apparels EPZ Ltd	Fulch and Manek & Bros Ltd
Kenya Trading EPZ Ltd	Kikoy Co. Ltd
Spinners & Spinners Ltd	Storm Apparel Manufacturers Co. Ltd
Image Apparels Ltd	Le-Stud Limited
Straightline Enterprises Ltd	Alltex EPZ Ltd
Sunflag Textile & Knitwear Mills Ltd	Metro Impex Ltd
Alpha Knits Limited	Midco Textiles (EA) Ltd
Tarpo Industries Limited	Apex Apparels EPZ Ltd
Mirage Fashionwear EPZ Ltd	Teita Estate Ltd
Baraka Apparels (EPZ) Ltd	MRC Nairobi (EPZ) Ltd
Thika Cloth Mills Ltd	Bhupco Textiles Mills Limited
United Aryan EPZ Ltd	Ngecha Industries Ltd
Silver Star Manufacturers Ltd	J.A.R Kenya (EPZ) Ltd
YU-UN Kenya EPZ Company Ltd	Rolex Garments EPZ Ltd
Riziki Manufacturers Ltd	Yoohan Kenya EPZ Company Ltd
Brothers Shirts Factory Ltd	Vaja Manufacturers Ltd
Protex Kenya (EPZ) Ltd	Upan Wasana (EPZ) Ltd
Premier Knitwear Ltd	Blue Plus Limited
Motor Vehicle Assembly and Accessories	
Toyota East Africa Ltd	General Motor East Africa Limited
Megh Cushion Industries Ltd	Auto Ancillaries Ltd
Impala Glass Industries Ltd	Varsani Brakelining Ltd

Mutsimoto Motor Company Ltd	Bhachu Industries Ltd
Kenya Grange Vehicle Industries Ltd	Pipe Manufacturers Ltd
Unifilters Kenya Ltd	Kenya Vehicle Manufacturers Limited
Labh Singh Harnam Singh Ltd	Mann Manufacturing Co. Ltd
Building Sector	
Central Glass Industries Ltd	Kenbro Industries Ltd
Manson Hart Kenya Ltd	Bamburi Cement
Karsan Murji & Company Limited	Kenya Builders & Concrete Ltd
Reliable Concrete Works Ltd	Warren concrete Ltd
East African Glassware	Premium industries
East African Portland cement	Saj ceramics
Blue Triangle cement	Goodone ceramic
Savanna Cement	Tile and carpet

ANNEX

Annex: Diagnostic Tests

Diagnostic tests carried out in this study included; normality tests, homoscedacity tests, linearity tests, multicollinearity tests. Normality test was carried out using Shapiro wilk test which was supplemented by the Kolmogorov-Smirnov test. The homoscedacity test was conducted through scatter plots diagrams. Linearity test was conducted by confirming the conditions of normality and homoscedacity. Tests on Multicolinearity of data was carried out using tolerance and variance inflation factors (VIF).

Normality Tests

For the quality management decisions data series, the results in the table below.

Quality Management Decisions Test for Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
QMD	.385	38	.000	.714	38	.000

a. Lilliefors Significance Correction

The null hypothesis is that the data is normally distributed. Since the p value in both tests is less than the α (0.05), the null hypothesis is rejected. Hence, the data series is not normally distributed.

For the procurement management decisions data series, the results are displayed in the table in the preceding page.

Procurement Management Decisions Test for Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
PMD	.311	38	.000	.847	38	.000

a. Lilliefors Significance Correction

The null hypothesis is that the data is normally distributed. Since the p value in both tests is less than the α (0.05), the null hypothesis is rejected. Hence, the data series is not normally distributed.

For the marketing management decisions data series, the results are displayed in the table below.

Marketing Management Decisions Test for Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
MMD	.272	38	.000	.819	38	.000

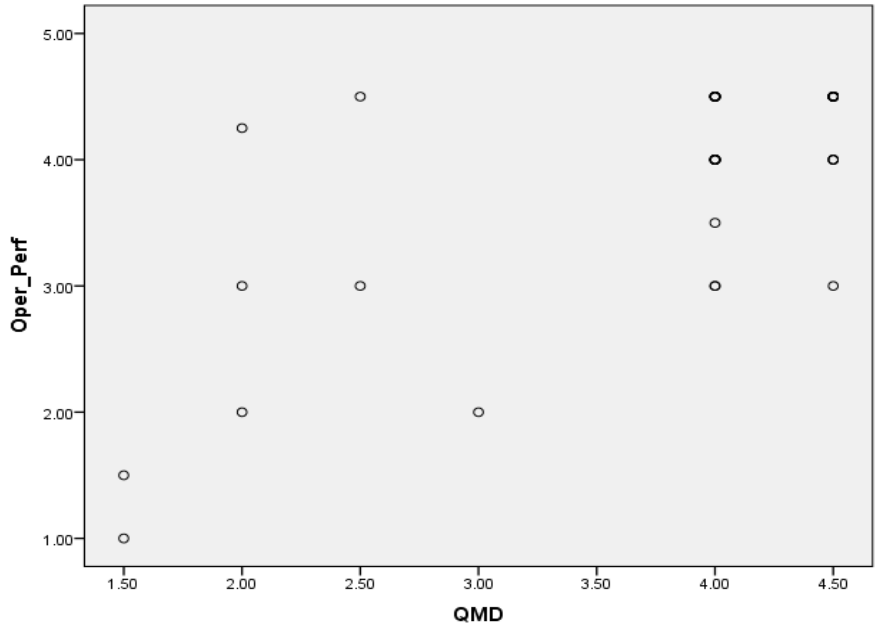
a. Lilliefors Significance Correction

The null hypothesis is that the data is normally distributed. Since the p value in both tests is less than the α (0.05), the null hypothesis is rejected. Hence, the data series is not normally distributed.

Tests for Homoscedacity

For the data series quality management decisions, the results are displayed in the figure in the following page.

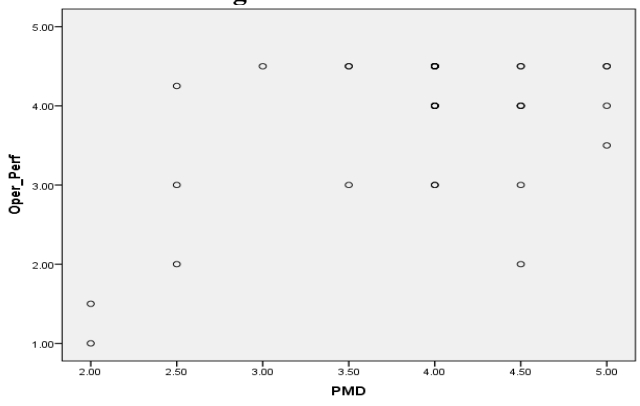
Quality Management Decisions Scatter Plot



The marjority of the plotted points do not coalesce around a line of best fit, thus indicating that there is no linear relationship between quality data based management decisions and operational performance. Therefore, there is presence of a heteroscedacity between the two variables.

For the data series procurement management decisions, the results are displayed in the figure below.

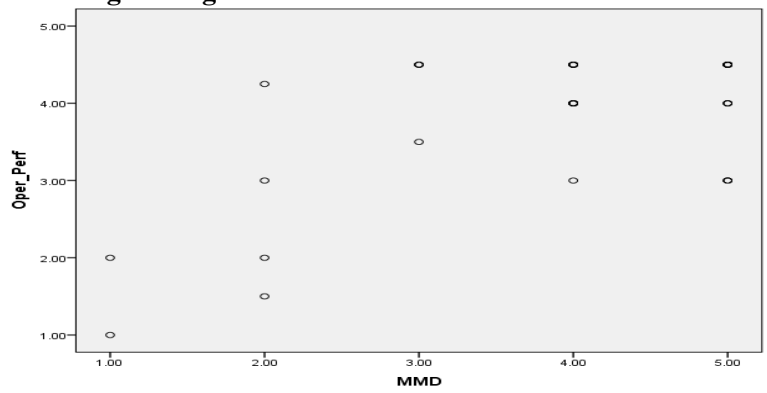
Procurement Management Decisions Scatter Plot



The marjority of the plotted points do not coalesce around a line of best fit, thus indicating that there is no linear relationship between procurement management decisions and operational performance. Therefore, there is presence of a heteroscedacity between the two variables.

For the data series marketing management decisions, the results are displayed in the figure below.

Marketing Management Decisions Scatter Plot



The marjority of the plotted points do not coalesce around a line of best fit, thus indicating that there is no linear relationship between marketing management decisions and operational performance. Therefore, there is presence of a heteroscedacity between the two variables.

Test for Linearity

All the predictor variables are not normally distributed and they do not exhibit homoscedacity, hence they are not linearly related to operational performance.

Tests for Multicollinearlity

Multicollinearity is a statistical phenomenon in which there exists a perfect or exact relationship between the predictor variables. When there is a perfect or exact relationship between the predictor variables, it is difficult to come up with reliable estimates of their individual coefficients. Thus, it will result in incorrect conclusions about the relationship between outcome variable and predictor variables. Results on test for multicolinearity of data carried out using tolerance and variance inflation factors (VIF) are displayed in the table below.

Multi-Collinearity Statistics

Model		Collinearity Statistics	
		Tolerance	VIF
1	QMD	.265	3.769
	PMD	.593	1.685
	MMD	.355	2.815

a. Dependent Variable: Oper_Perf

The VIF statistics are less than 10 and greater than one, and the tolerance statistics are greater than 0.2. Hence, there is no presence of multicollinearity between the predictor variables included in the model.