EFFECT OF ENERGY MANAGEMENT PRACTICES ON ATTAINING COMPETITIVE ADVANTAGE AMONG MANUFACTURING FIRMS IN KENYA: A CASE OF SELECTED MANUFACTURERS IN NAIROBI COUNTY

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A Thesis Report Presented to the Institute of Postgraduate Studies of Kabarak University in Partial Fulfilment of the Requirements for the Award of the Degree of Doctor of Philosophy in Business Administration (Strategic Management).

KABARAK UNIVERSITY

NOVEMBER, 2017

DECLARATION

Declaration by the Student:

The research project is my own work and to the best of my knowledge it has not been presented for the award of a degree in any university or college.

Sign:_____Date: _____

Yatich Kiptum Henry

GDB/M/1229/09/12

RECOMMENDATION

To the Institute of Postgraduate Studies:

The research thesis entitled **"Effect of Energy Management Practices on Attaining Competitive Advantage among Manufacturing Firms in Kenya: A Case of Selected Manufacturers in Nairobi County."** and written by **Yatich Henry Kiptum** is presented to the Institute of Postgraduate Studies of Kabarak University. We have reviewed the research thesis and recommend it be accepted in fulfilment of the requirement for award of the degree of Doctor of Philosophy in Business Administration (Strategic Management).

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God Bless You All.

DEDICATION

To my wife Elzeba, daughter Faith and son Fabian.

ABSTRACT

Studies on energy management have focused principally on environmental conservation, reduction in operation and production expenses, energy savings, lower utility bills, and minimization of energy wastage. However, the gains of energy management practices can be transferred to competitive advantage strategies among manufacturing companies in Kenya so as to boost their efforts in attaining competitiveness. Success in managing competitive advantage arises out of a firm's ability in identifying and implementing actions that can give the company an edge over its rivals and attain competitive advantage. Manufacturing firms in Kenya are the highest consumers of both electricity and petroleum products. Literature reviewed showed that a sizeable number of multinational companies have left the Kenya market due to high energy costs. In this regard, the study posits that there is need to transfer the gains of energy management practices to competitive advantage strategies. The study objectives were: to determine the effect of implementing energy management regulations on attaining competitive advantage, to examine the effect of implementing company energy management policy on attaining competitive advantage, to assess the effect of implementing energy efficient technology on attaining competitive advantage, and to assess the effect of energy expenses on attaining competitive advantage among manufacturing firms. The study adopted a survey research design, with a study population of 1,459,870 employees employed by manufacturing firms in Nairobi County. A sample of 399 respondents was selected randomly from selected firms in Nairobi County and its surrounding areas. Questionnaires were used to collect primary data while secondary data was obtained by reviewing previous studies in the area of study. Data analysis was done using descriptive statistics (mean, standard deviation, and frequency distributions). Inferential statistics included correlation for test of association, chi-square for test of agreement and regression for test of hypothesis. The study found that energy management regulations, company energy management policies, energy efficient technology and energy expenses are significant predictors of competitive advantage with an explanatory power of 44.8%. The study also revealed that employees are not adequately informed on energy management practices in the sector. Average energy expenses in the sector stood at 10.5% of the total revenue. The study showed that gains from energy management practices can be transferred to competitive strategies such as product differentiation, reduced energy costs, and increased profits. The study recommends that manufacturing firms should consider energy management practices as part of their core strategic agenda in assessing and reviewing their energy management practices. The government agencies and Kenya Association of Manufacturers should assist in implementing energy management regulations, through stakeholder involvement at firm level, offering incentives and rebates in acquisition of energy efficient technologies. Future studies may focus on the influence of firm size, inflation and taxes on competitive advantage. It should be noted that energy management practices yield enormous benefits to all stakeholders and that the practice should not only be considered a competitive tool but rather as a universal practice in attaining competitive advantage.

Key words:
Energy Management Practices, Energy Management Policy, Energy Efficient Technology, Competitive Advantage.

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ABBREVIATIONS

AAPOR: American Association for Public Opinion Research.

ANOVA: Analysis of Variance

API: American Petroleum Institute

CCPs: Centre for Cooperation with the Private Sector

CEEC: Centre for Energy Efficiency and Conservation

CEMP: Company Energy Management Policy

CEOs: Chief Executive Officer's

CO_2: Carbon Dioxide

EEPs: Energy Efficiency Practice(s)

EET: Energy Efficient Technology

EEXPs: Percentage Energy Expenses (Electricity and Petroleum) on Total Revenue

EMA: Energy Management Awards

EMBs: Energy Management Benefits

EMC: Energy Management Commission

EMPs: Energy Management Practices

EMRs: Energy Management Regulations 2012

ERC: Energy Regulatory Commission

FA: Factor Analysis

FOREX: Foreign Exchange Rates

GDP: Gross Domestic Product

GOK: Government of Kenya

HVAC: Heating, Ventilation and Air-conditioning

IEA: International Energy Agency

IEA_k: Institute of Economic Affairs, Kenya

JIT: Just In Time

KAM: Kenya Association of Manufacturers

KENGEN: Kenya Electricity Generating Company

KES: Kenya Shilling

KIPPRA: Kenya Institute for Public Policy Research and Analysis

KMIA: Kenya Motor Industry Association

KPLC: Kenya Power and Lightening Company

KPMG: Klynveld Peat Marwick Goerdeler (an accounting firm)

KWh: Kilowatt

LED: Light Emitting Diode

LPG: Liquefied Petroleum Gas

Ltd: Limited Company

MoEP: Ministry of Energy and Petroleum

MOHEST: Ministry of Higher Education Science and Technology

NACOSTI: National Commission for Science Technology and Innovation

NEED: National Energy Education Development Project

NESC: National Economic and Social Council of Kenya

OGPI: Oficina de Gestión de Proyectos Internacionales/ International Project Management Office

RAIPLY: Rai Plywoods (Kenya) Ltd

RR: Response Rate

SAS: Statistical Analysis Software

SBUs: Strategic Business Units

SEEC: Spirit Energy Efficiency Company

SMEs: Small and Medium Enterprises

U.S: United States of America

UK: United Kingdom

UNEP: United Nations Environmental Programme

UNIDO: United Nations Industrial Development Organization

USA: United States of America

USD: United States Dollar

VIF: Variance Inflation Factor

OPERATIONAL DEFINITION OF TERMS

Company Energy Management Policy:

This refers to specific tailored energy management guidelines or actions taken by individual companies in practicing energy efficiency (ERC, 2012).

Competitive Advantage: This is the benefit gained by manufacturers through energy efficiency. They include lower production costs, increase in profit, improved product and service value (Walker, 2004).

Efficiency: The use of less energy resource through related technology and related efficiency practices so as to reduce the overall cost spent by manufacturing firms in petroleum products and electricity so as to produce a desired result (World Energy Council, 2013.

Employees: Refers to all mid-level management staff, supervisors, managers, and top managers of the selected manufacturing firms in Nairobi and its Environs (GOK, 2012).

Energy Efficient Technology:

This refers to the investment made by firms in their electricity and petroleum energy consumption processes so as to reduce waste and save costs. Investment in energy saving equipment or machine was treated by the study as being technologically efficient. (Taylor, 2012).

Energy Expenses: Refers to the percentage cost on overall revenue by manufacturing companies. (Willox, 2012).

Energy Management Practices:

These are policy or documented procedures by individual firms or organizations which provide guidance on the management of electricity and petroleum products. (ERC, 2012).

Energy Management Regulations:

This refers to The Energy Management 2012 (GOK, 2012).

Energy Savings: Refers to the reduction of energy units consumed per unit of production (Kiema, 2014).

Energy: Refers to petroleum and electrical sources of energy (World Energy Council, 2013).

Large Firm: Refers to a firm, trade, service, industry or a business, which employs more than 50 people (GOK, 2012).

Small Firm: Refers to a firm, trade, service, industry or a business which employs between 10-50 people (GOK, 2012).

Strategy: This is a careful plan, method, tactic or approach chosen by manufacturing firms to improve its competitive advantages. (Walker, 2004).

Sustainability: This is the ability of manufacturing firms to continue a defined competitive behaviour for a long period of time usually less than 8 years (Meyer, 2008).

CHAPTER ONE

INTRODUCTION

1.1 Introduction

The chapter presents the background to the study, statement of the problem, objectives, hypotheses, significance of the study, scope, limitation and delimitation

1.2 Background to the Study

Energy management practices (EMPs) are, "policies and initiatives that encourage companies to adopt energy management". It involves monitoring, tracking, analysis and planning of energy use (International Energy Agency, 2012). The discussion on energy efficiency management has attracted the attention of world leaders, business managers, policy makers, environmentalists, scholars, and many continue to be drawn to the debate. This has been attributed largely to the significant benefits arising out of the practise. According to the GOK (2010) energy efficiency refers to the use of less energy to provide the same level of service or output.

However, Taylor (2012) defines energy efficiency as the installation of energy efficient technologies and implementation of practices that are designed to reduce energy wastage and eliminate energy losses in homes and business firms. Manufacturing firms across the world incur huge energy expenses through energy bills. The fundamental question is whether modern manufacturing firms practice energy efficiency or not. If they do, what are the significant benefits arising out of energy efficiency practices? Can these benefits be transferred to other competitive processes? and can the gains assist a firm in attaining competitive advantage? In modern economies, if the above significant questions are adequately addressed, then a sustainable competitive firm can be fostered.

In 2013, the U.S. was just 39% efficient in energy use. This implies that 61% of the firms and households did not practise energy efficiency (Fischer, 2013). Fischer (2013) further argued that there was energy wastage stemming from electricity generation (because most power plants in the USA are relatively inefficient) and the transportation sectors (internal-combustion vehicles) are notoriously inefficient, though they were getting better. These findings place a gloom situation on developing economies, where the transportation sector is composed of second-hand vehicles which are not fuel efficient. Bai (2013) observed that 41% of all global firms considered energy management as an extremely important endeavour to their firms. However, 64% of these global firms focused on carbon reduction and not on universal practice of energy efficiency as a strategy in attaining all firms' competitive advantages. In addition, cost savings was noted to be the leading driver of all energy efficiency initiatives (Bai, 2013).

Studies in the US showed that energy efficiency between 2002 and 2007 reduced 5% of the nation's electricity demand and saved Americans $16 billion on energy bills, which is equivalent to 27 million cars (Audrie, 2008). This is a tremendous achievement which if replicated by manufacturing firms in developing economies such as Kenya, can assist their firms' attain an overall competitive performance. Harrison (2011) found that most companies target on average, a 25% reduction in their energy consumption and cost savings. The study further noted that about 70% of companies believed cost-cutting is the driver of their energy management goals, and 53% stated that they had set energy efficiency goals at least partly because it is "the right thing to do". Another study carried out by (Singh, 1995) stated that in countries such as Malaysia, Indonesia, Ghana, Zimbabwe, Colombia, and Turkey, the average energy Expenses from total income by manufacturing firms ranged between 0.5% and 3%. These findings provide evidence that most firms have not realized the salient

importance of energy efficiency practices in attaining its competitive strategies. Firms in modern economies focus largely on cost reduction, environmental management, and attainable green energy. This is an indicator that less effort has been made towards transferring the gains of cooperative energy efficiency practices in attaining competitive advantages.

Bloomberg New Energy Finance, which is a research company based in UK, observed that investments made by most countries and firms are based on the use of clean energy as a measure of ensuring management. Its report focuses on the investments made by nations on clean energy. However, they do not refer to the transfer of such benefits in attaining competitive advantages (Zindler, 2014). Lacey (2013) stated that developed economies are more concerned with energy management than its production. He refers to the comments made by Laitner, a visiting fellow at the American Council for Energy-Efficient Economy, who noted that in 2010 America expenses on energy management improvements across its sectors has continued to increase by 80% since 2004 (Laitner, 2013). It is further noted energy management focus has been on utilities, manufacturing, construction, appliances, and automobiles. Through energy management in the American economy, Lacey (2013) states that the energy management initiatives have resulted in per capita income increase of 84% since 1950 (Lacey, 2013).

A firm's competitive strategy may be good at one point in time, but may go off course when managers get out of touch with actual realities of business situation (Gregory, 2009). These situations include but not limited to cooperative energy efficiencies. Gregory continues to point out that some of the methods that firms have applied in its competitive process are; low-priced products, high incentives, rebates, discounts, and after-sale services. Competitive advantage is derived primarily from a firm's ability to build and defend its actions, resources,

and capabilities that are more productive than those of its rivals. These tangible and intangible advances are the clearest path to long-term performance gains (Walker, 2004). A company's strategy on the other hand refers to a set of related actions that managers take to increase their firm's performance. The challenge with most companies is the desire to achieve superior performance relative to its competitors. In this regard, it can be argued that, if a company's strategy results in superior performance, then the firm are regarded as having a competitive advantage (Hill & Gareth, 2007).

Electricity, fuel and gas remain as the major energy resource and expense in any manufacturing company today. Practicing energy management of these energy resources can have multiple positive results in addition to attaining gained competitive advantages of such firms. Gregory (2009) further makes a notable recognition that, for firms who blend in the resource-based view for competitive advantage should know that superior performance can be attained through creation and through bundling resources in unique combinations. His study therefore made observations as to what contributes superior performance. One fundamental strategy that the current study investigated is the ability of energy management benefits being applied in attaining competitive strategies.

The Climate Leaders Conference held from 2008-2016, have focused primarily on climate change, carbon emission and its reduction (Audrie, 2008) and (Steve, 2016). The conferences noted that despite the improvements in energy management, global energy demand is expected to double by 2050. The conference further observed that global recession has affected Africa heavily; the economic growth and that energy and poverty issues remained as a major concern. Poverty alone has been burdening the continent because its electricity demand has continued to increase, and energy security has tightened as the result of the lack of the required investment and increasing power shortages across the continent.

This implies that energy availability remained elusive for many users in the years to come. Through energy management strategies, energy savings is expected to reduce energy demands by a significant percentage, other than attaining the firm's competitive strategies. It is also noted by the study that population with access to electricity is no more than 30% in Sub-Saharan Africa. In Africa, energy subsidies and energy management are issues that are viewed by politicians and energy leaders in the region to require action (World Energy Council, 2013). This study therefore addressed the issue of energy management, by ensuring that the manufacturing sector pays a great emphasis on efficient energy practice and so to enhance attainability of its competitive advantages.

In Africa, Bennett (2001) found that the two principal motivations for the implementation of energy efficiency practices are environmental benefits and financial benefits. He further noted that some of the challenges faced in implementing energy efficiency practices are users who believe that they understand their energy problems better that anyone else, resistance to change, perceiving energy as a minor input cost, expensive efficient technologies, and uncertainties in committing resources to long-term projects. He remarked that there is an abundant evidence of energy efficiency practices that make economic sense. In addition, an energy efficient practice is relevant for many African countries that lack the capacity to meet their electricity demand. As an output of the study, energy-efficiency-earnings (The 3-Es strategy), educational programmes and training were identified as the viable mechanisms. In this regard, it should be noted that if energy efficiency practices are adopted by all manufacturing firms, the resultant benefits to the firm, society, environment and society are vast. Mlamo (2004) observed that the South African government had set a target of (12%) energy efficiency target by 2014. He further noted that energy efficiency opportunities in Africa are often disregarded owing to the simple fact that users of such resources are unaware that they exist. He concluded that one of the most cost-effective ways of maximizing a firm's

profitability is the adoption of appropriate energy efficiency practices, which in this case, the current study proposes that energy management should be considered universal practices which need to be practiced by all firms. However, the study does not explain how such gains can be transferred to attain a firm's competitiveness.

In 2005, the Government of South Africa introduced a voluntary energy efficiency Accord. Since then, numerous companies have continued to sign into the accord. In 2007, 15 of the companies that signed the accord reported significant savings in electricity use, with an overall electricity demand reduction of (12%). In combining the total number of companies enlisted for the program, it was observed that energy savings of up to (38%) was achieved. This therefore translates to lower utility bills for the firms (Government of South Africa, 2008). The South African government recommended energy investments through agreements, and government commitment through incentives. It further highlighted that some of the challenges faced in energy efficiency implementation programs were; finance, organizational commitment, and lack of training and awareness. The fundamental question that arises out of such studies is the notable benefits that would arise if all firms were to practice energy efficiency on attaining their competitive processes.

The challenges on energy efficiency are further presented as strategies by (Xiaohua, 2013; Mlamo, 2004) that identified education, training, efficiency standards, appliance labelling, accreditation, regulation, audits, and information sharing as the avenues of enhancing energy efficiency practices. The Department of Environmental Affairs and Tourism in South Africa in 2005 also supported the above recommendations (Government of South Africa, 2005). Such studies consider lack of information, hidden engineering costs, imperfect information for consumers, regulatory failures, and behavioural failures such as self-control problems by the users of energy sources as contributory challenges in attaining an effective energy

efficiency system. As such, the current study attempt to propose that with such enormous benefits arising out of energy efficiency practice, the practice should be carried out by all manufacturing firms, due to its significant benefits to government, society, environment, and all manufacturing firms.

In Kenya, Kirai (2004) presented findings of a study that showed poor uptake of energy efficiency practices by industrial firms. This owed to the fact that there was no assistance given by government to firms, low involvement by company CEOs, perception of expensive technology, and the size of firm as the challenges facing adoption of energy efficiency practices. Although, there was notable training of over 250 firms in efficiency practices, few firms invested in the exercise. The payback period for such practices was 1 year, 2 months. The study recommended seminars, awareness training, energy audits, and technology upgrades as the measures of promoting energy efficiency practices.

Under its Vision 2030, GOK (2007) observed that the manufacturing and commercial sectors are dominated by electricity and petroleum energy sources while the traditional sector is dominated by wood. Energy costs are noted to be one of the critical challenges towards economic prosperity hence, efficiency in these energy sources is essential. The government further recommends that for the country to attain economic prosperity, increase in energy management practices is essential. The current study proposes that with such significant attention given to energy efficiency practice, it should be a shared responsibility by all firms in attaining their individual competitive strategies.

The study by Kirai (2007) further established that the ever-increasing energy costs, severe lack of energy efficiency practices in Kenya, insecure energy sources and reliance on imported petroleum products as some of the challenges affecting the economy. His study focussed on the entire economy and not to the manufacturing sector only. He also

recommended for the energy sector continuous efficiency awareness and information sharing among players. The study also proposed guidelines, short courses, legal frameworks, and government support programmes which can be instituted in all manufacturing firms to boost their efforts on energy efficiency and attaining their competitive strategies. The findings of the study indicated poor energy efficiency adherence with up to 30% energy losses among sector players for which Kenyan manufacturers are the largest consumers of electricity and fuel. The reluctance in the practice of energy efficiency practices renders the salient benefits of energy efficiency elusive. The study however did not address the ability of such practices being practiced by all firms to attain a firm's competitiveness. United Nations Environmental Programme (2011) observed that for efficient of petroleum products used by motor vehicles; the average consumption of diesel driven vehicles in Kenya was 1 litre per 11 kilometres while consumption of petrol was 1 litre per 13.88 kilometres. Consumption per kilometre in developed economies such as the US, Japan, China and European Union is lower at an average of 16.3 kilometres per litre, showing that the efficiency of their motor vehicles is higher than their Kenya counterparts (UNEP, 2011).

A report by KNBS (2012) showed that the manufacturing firms own fleets of vehicles which consume significant amounts of petroleum products and that most of its fleet are not fuel efficient due to age factor. In its study carried out between 2008-2011 KNBS found that the manufacturing sector's transport section consumed an average of 524,775 tonnes of petroleum products and 3,180,000 KWh of electricity per year, making the sector the highest consumer of electricity and the second largest consumer of petroleum products. Being such a high consumer of these two resources, and the fact that energy efficiency practices uptake is low; the current study examined the current statuses with an aim to establishing its salient benefits and promotion of universal acceptance of energy management practices by all manufacturing firms as a means of achieving their competitive advantage.

The average age of vehicles driven in Kenyan roads is 15 years and their efficiency erodes as it ages. American vehicles have a road lifespan of 11.4 years, European Union is less than 5 years while Japan it is between 7-8 years. In Kenya, the average road usage is double the world standard and three times the average of the most efficient road transport systems (Kenya Motor Industry Association, 2014). The association asserts that when vehicles get older, they consume more fuel, and become inefficient in energy usage thus increasing operating costs. In their recommendations, they propose the use of the newest possible efficient technologies in their fleet of motor vehicles.

United Nations Environmental Program (2014) indicated that if Kenya invests in green economy, its national GDP would exceed (12%), or KES 3.6 trillion (equivalent to USD 45 billion) by 2030. Per capita national income would double from KES 39,897 (USD 498.70) to KES 69,702 (USD 871.30), and this is realizable if the country invests only (2%) of its GDP. The report further claims that a green economy increases agricultural yield by (15.5%) from the current yield. This is because agriculture accounts for up to (65%) of national exports. The report also notes that Kenya is already implementing policies and initiatives to move towards a green economy. In energy consumption, the report finds that more green energy investments could produce a (2%) reduction in energy consumption and an expanded supply of electricity. The report made recommendations to the government to consider adopting targeted clean energy solutions for households and institutions, such as energy efficient lighting and appliances; and, making additional investments in renewable energy, such as geothermal, solar, wind and biofuel energy (Njoroge, Zorba & Muia, 2014). Such occurrence provides an energy efficiency practice. However, the transfer of energy efficiency gains in attaining a firm's competitive advantages is not discussed. This, therefore, provided an

impetus for the study to investigate the adoption of energy efficiency practices in attaining a firm's competitive positions.

The Kenya Energy Efficiency Accord launched in September 2011 on energy management, 19 KAM member companies signed up voluntarily committing themselves to reduce their energy consumption between (5%) and (15%) by 2016. In November 2012, another ten companies also signed-up. In considering such developments, it can be argued that the Kenyan firms are taking a step forward in realization of the benefits associated with energy efficiency practices (Centre for Cooperation with the Private Sector, 2013). However, by the end of 2016, the cumulative consumption for petroleum products in the manufacturing sector had increased by 8.9% and 2.9% for electricity. In this case, the manufacturing sector consumption showed an increasing trend rather than a reducing trend thus indicating that the sector is yet to reduce its consumption. Therefore, there is need for the reduction efforts to be enhanced and this can occur through the practice of energy efficiency practice (KNBS, 2017). Energy efficiency is one of the core functional strategies as noted by Hill and Gareth (2007). Increasing energy prices erodes Kenya's competitiveness in international trade (KAM, 2013). Considering this statement, it is a fact that the manufacturing firms who use much of electrical and petroleum energy for most of their processes bear the burden of such incidences.

The Energy Regulatory Commission (ERC) in Kenya developed the Energy Management Regulations (2012) through the Energy Act 2006. The Act requires users of energy to put in place energy efficiency practices in all sectors. This means that all firms should develop energy performance benchmarks that can be graded upon. In addition, these benchmarks can be used to measure efficiency performance and is instrumental in enforcing compliance of established regulations. The Kenya's manufacturing sector is the third largest consumer of

energy in Kenya (Moraa, Etyang & Mwabu, 2011). This is the sector that leads all other sectors in electricity consumption and the second largest consumer of petroleum products should embrace energy efficient practices. The study further notes that continuous use of electricity and petroleum products has been rising, resulting in increased costs in terms of energy bills and production expenses (Moraa, Etyang & Mwabu, 2011). The findings are supported by earlier studies carried out by (ERC, 2010). In Kenya, the shortage of fuel and high electricity prices remain the major problems to the manufacturing sector. The sector uses up to (35%) of their total revenues on energy resources. The report also indicates that the country's annual loss of energy due to inefficiencies is between 10% and 30% (CCPS, 2013).

Kenya officially launched its energy efficiency accord in September 2011. At the time of launch, 19 companies committed themselves to reduce energy consumption by 5-15% from 2011-2016. As at September 2013, through the Energy Efficiency initiatives, the companies who had embarked on the process had managed to save more than 46,000 Gigajoules of energy, which equalled approximately 132 million Kenyan Shillings. This amount when converted to electricity consumption per household can equal 83,000 Kenyan citizens. During the same period, some companies managed to reduce their energy intensity by more than 40% (CCPs, 2013). Energy efficiency is one of the best practices that lead to a cleaner, quicker, and cost effective means in enhancing energy use and securing future energy. This also included reduced demand and conservation to the environment (API, 2014).

The ability to transfer the gains of efficient energy use to competitive strategies such as a product differentiation, cost leadership and higher profit margins contributes immensely to attaining a firm's competitive strategies, and thus the current study was carried out to establish if there existed a relationship between energy management practices in attaining a firm's competitive advantage.

1.2.1 The Concept of Competitive Advantage

In "modern competitive strategy" competitive advantage is defined as the ability of a firm to effectively invest in resources and capabilities in order to raise value or lower costs (Walker, 2004). This therefore, increases a firm's competitiveness. He continues to assert that, for the competitiveness to be attained, a superior market position must be defended against industry forces and that such positions should be difficult to imitate. From this argument, Walker raises a significant question as to what are the forces. It can therefore be inferred that such forces require firms to raise their minimum threshold in order to compete. Without a solid understanding of how organization's positions its products in the market and protects their position from competition, a firm may not be in a position to defend its market position or attain its competitiveness in the local and in the global economy. Energy management practices thus become an essential approach that firms can adopt in order to attain its competitive gains. Walker concludes further by asserting that, "it is not possible at times to understand the sources of competitive advantage" (Walker, 2004, p. 9). According to Kannan and Boie (2003) reduced energy use and lowered energy costs enhances a firm competitiveness.

Empirical studies on energy management have focused their discussions on clean energy and environmental management, whereas the current study aims at bringing to fore the need for an all-inclusive energy management practice as a way of defending established strategic positions such as access to low cost raw material, lower product and service prices, brand position, quality of service, high profits, network effect/market share among many other positions.

For modern societies to prosper, availability of sufficient energy such as electricity and fuel is necessary (Mckinsey & Company, 2009) observed that. The report points out that since the

oil crisis of 1973 and 1979 the world's energy needs and demand have grown and continues to grow. Fuel prices in return are expected to continue to rise. The report concludes that, many companies have attempted to outperform its competitors by practising energy management so as to reap the benefits of cost advantage. Today, manufacturing firms are known to still use old technology and machinery for their processes, technology and equipment's. Such firms have less emphasis on energy management as long as the company meets its production targets (KPMG, 2014). In Kenya, the above findings mirror the truth about its energy demand. As such, practising energy management becomes a viable strategy to reduce costs and create surplus energy for the growing demand and enable firms attain competitive advantage.

In Kenya the entire manufacturing sector employs a significant number of employees with an indication of continued increase (Munguti, 2013; KNBS, 2014). The entire manufacturing sector contributes 10% of the total GDP in the Kenyan economy and is highly energy intensive due to its refrigeration, transportation and electrical use in all plants. As such, there is need for energy management practices to be embedded in the sector competitive strategies, so as to facilitate attainment of competitiveness by companies.

1.2.2 Electricity Demand and Projection in Kenya

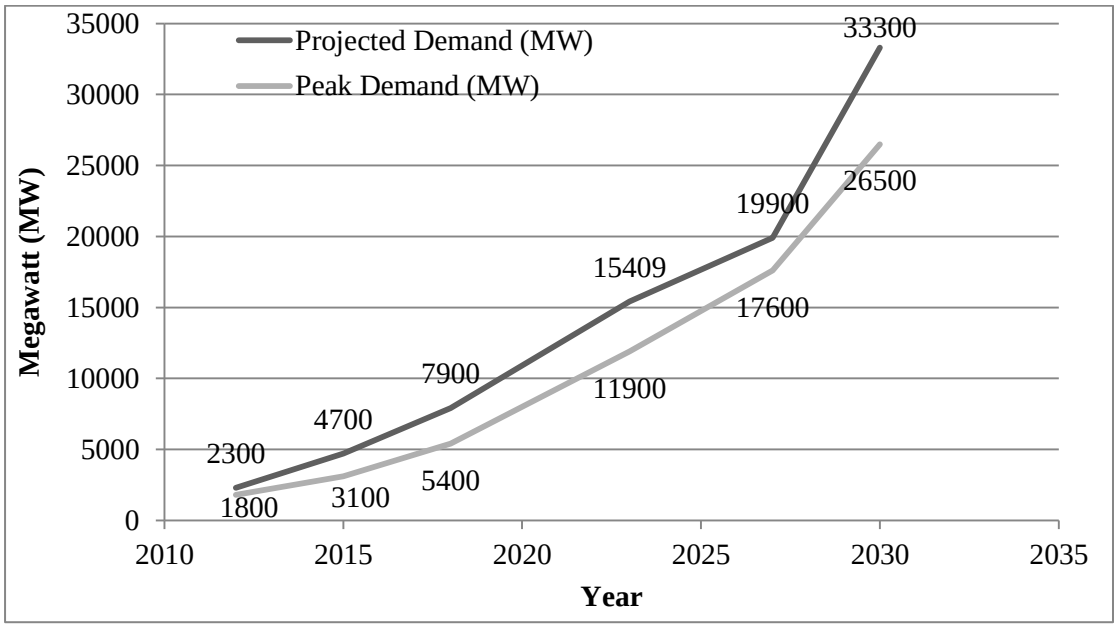

Figure 1.1: Projected Power Demand in Kenya

Source: Ministry of Energy and Petroleum (2013)

KenGen through the Ministry of Energy and Petroleum also notes that the driver of this energy demand by the year 2018 is the manufacturing sector.

Energy management is neither visible nor easily measured. However, it improves competitiveness as well as security by expanding the provision of energy (Tromop & Rosenfeld, 2013). International Energy Agency (IEA) provides the following as some of the energy management benefits (IEA, 2013): It leads to better health, improved room temperatures, and reduces respiratory diseases; It increases product market value; It reduces demand for energy from energy management limits and lowers investments needed to install additional energy infrastructure to meet high demand; Companies operating costs and utility decreases and raises firm's profit through reduced operating costs; it can also provide consistency and improvement in quality and output. IEA further suggested that the multiple benefits from energy management in the overall manufacturing sector may be worth up to

2.5 times the value of energy savings which is significant enough in enabling firm attain its competitive advantage.

Inflation in developing nations affects competitiveness of a firm. According to Pettinger (2016) an inflation rate of 3% or 4% is preferable. If inflation rises above 4%, then this creates rise in product costs and uncertainty. Such occurrence will affect a firm's profitability. Inflation may also lead to increase in employee wages which the firm may not afford hence negates the desire to reduce firm's overall costs. In addition, firms may limit its investment options for the future due to unforeseen costs, and demand for its products. In this case, it can be inferred that if inflation in Kenya is high than other nations, then manufacturing firms become less competitive than its international competitions with substitute products or services. A higher inflation rate will also erode the gains of foreign exchange rates through imports of raw materials such as petroleum products, hence increasing the costs of petroleum expenses for manufacturing companies (Pettinger, 2016; Wijesekera, 2017). It is therefore important to note that there is need for energy management practices to be practiced so as to reduce the effects of inflation on firm's ability in attaining competitive advantage.

According to Beck and Chaves (2011) noted that in the long run, taxes are passed forward into a firm's input costs, increasing a firm's product price and negating its competitiveness in the international markets. The study further argued that introduction of tax increases the cost of purchasing particular resources. In the current study, an increase in petroleum or electricity tax increases the overall firm's energy expenses proportionately.

1.2.3 Energy Management Challenges

Oimeke (2013) noted that the challenges facing energy management practices include; High cost of introducing efficient and cost effective technologies, Lack of awareness, Inadequate incentives, Inappropriate and limited credit and financing mechanisms on equipment, Lack of standards, Lack of codes of practice such as regulations for enforcements and inadequate capacity to promote and monitor penetration of energy management. In overcoming the challenges, it recommends; sensitization campaign, develop energy management standards for equipment's and facilities, introduce energy auditors training curriculum, carry out site inspections and interviewing and licensing energy auditors and audit firms.

The IEA (2010) noted that some of the challenges facing energy management programs include; price distortions, Lack of understanding of Energy Management investments, lack of awareness, lack of sufficient information, the encouragement of energy providers to sell energy rather than invest in cost-effective energy management, Lack of affordable energy management technologies and Insufficient capacities for identification, development implementation and maintaining energy management investments.

The energy management uptake in South Africa has been slow because of low levels of awareness of its benefits, lack of available technologies, and the alternative priorities of companies. In 2005, South Africa introduced energy management in all sectors of energy consumption; the strategy set a national target for energy management of 12% by 2015 (Haw & Hughes, 2007). Kenya has also had initiatives to ensure energy management, but this has not been yielding the required substantive results. This includes the attempt to allocate funds to promote energy management. United Nations Industrial Development Organization reported in 2013 that the Kenyan government had allocated KES. 2,036,193.03 For the energy management programmes but KES. 598,563.23 were actually released. Though this is

a step towards reducing consumption, this presents a challenge in promoting energy management practices in the sector (UNIDO, 2013). The study by Bennett (2001) agrees with later findings in relation to the challenges faced by African countries.

He notes that the major barrier to the implementation of energy management is the mind-set the main problems facing Africa are health, education, and poverty. Therefore, energy management remained as the least of their concern. This is undoubtedly true given the number of abandoned initiatives towards energy management being viewed with suspicion by recipient African nations especially when funded by foreign countries. Lack of energy management awareness in Kenya is likely to remain for long since most companies lack the information. In addition, there is lack of national strategy to coordinate energy management despite the Energy Management Regulations of 2012 (Mbogori, *et al.,* 2013) and (GOK, 2015). In their research commissioned by the Kenya Energy Regulatory Commission, the researchers made a startling revelation that, "Energy management is a relatively new concept amongst engineers and facility managers, little is known about the potential for saving energy and even less is done". The overall aim of energy management is to reduce consumption without affecting productivity or increase utility costs (Oimeke, 2013). He further observed that energy management measures contribute direct savings on the energy expenses by firms. Manufacturing processes involves conversion of raw materials into finished goods and in this case, there are opportunities to exercise energy management improvement in order to reduce costs and reduce environmental impact (Contet & Konig, 2012). However, other challenges experienced by firms when adopting and implementing energy management programmes are;

Uncertainty about the energy prices: Energy prices keeps on fluctuating and this, affects greatly company profitability and hence the competitiveness of a firm. In Kenya, basic commodities such as maize flour, wheat flour, sugar, rice, and fuel form the bulk of products

for which more money are being allocated to. In UK, as noted by Rademaeker *et al.* (2011), the food and drinks processing industry is dominant and more than 90% of the industry players, are expected not be able to switch to renewable energy sources and longer term investment due to their relatively limited financial resources. In this regard, therefore, energy management becomes a necessary strategy for such firms.

Access to knowledge: Access to knowledge has also been identified by Rademaeker *et al.* (2011) as a major strategy towards organizational resource management especially for SMEs. In addition, the potential use of technology to raise heat or to create steam is a barrier that faces the whole industry regardless of its size because technology needs to be tested yet and finances for such schemes require substantial amounts of investment.

Despite the benefits that accrue with energy management, a study in United Kingdom (UK) on water management standard in 2009, and cited in Rademaeker *et al.* (2011), shows that companies are reluctant to replace old and inefficient technologies due to pay back time for investment being uncompetitive. The study concludes that; the manufacturing industry's major issues of concerns are energy use in an order of priority. Generally, measures adopted in addressing resource management demonstrated a mix of measures. As such, the report concludes that, "there is substantial room for improvement in this sector to improve resource management performance." Associated with energy management, is a reward system can be introduced for highly efficient firms who perform well in energy management. Investments in resource management at the product level may be difficult, but it should be encouraged in the areas of energy management (Rademaeker *et al.*, 2011). It is worth noting that all firms and stakeholders need to support such strategic initiatives in energy efficient practices. Energy Management leads to a decrease in production costs and increases the competitiveness of a

company. The International Energy Agency (2012) lists three key barriers that hinder the practice of EMPs as follows:

Financial barriers: Under this premise, most companies lack access to capital, lack of know-how in energy-savings project, desire to grow and expand the business, and maximization of profits.

Informational Barriers: Most companies lack requisite knowledge and access to EMPs information and existing related informational technology. In addition, majority of companies focus on productivity expansion and improvement while perceiving energy management programmes as a non-core activity. It is also observed that in majority of the companies, staffs who procure energy-using equipment are different from staffs that pay for the bills. With such disjointed tasks, efforts to promote energy management practices may not be realized.

External barriers: Most companies are threatened with unpredictable technologies and unknown regulations and regulatory policies. The lack of skilled auditors and other service providers provides energy users with little option on proper timing for adoption and practice of energy management practices.

Further, the Government of Kenya through the value added tax (VAT) Act of 2013 and its subsequent amendment Act of 2014 exempts importers from value added tax (VAT) and income duty on certain plant and machinery that promote energy efficiency technology. Companies that wish to import solar cells and modules that do not contain diodes, batteries or similar equipment are free from import duty and exempt from VAT (GOK, 2013; GOK, 2014). Photovoltaic (PV) cells and light-emitting diodes, together with wind-powered generating sets that have already been assembled, are subject to a 5% import duty and 16%

VAT. It should also be noted that wind engines (wind mills) are free from import duty and exempt from VAT though costly to purchase. In addition, hydraulic turbines and water wheels are free from import duty but pay 16% VAT. With such taxes, the Kenyan Manufacturers may not stand the chance of importing such technologies for their industries.

The Kenya Association of Manufacturers (2015) indicates that the practice of energy efficiency is yet to be embraced by all firms, yet it yields enormous financial and environmental benefits. Therefore, the study aimed at establishing the effect of adoption of energy management practices and its relevant benefits in attaining competitive advantages in manufacturing firms. It should also be distinguished that Energy Efficiency Management Practices (EEMPs) should be practiced as a cooperative action by all manufacturing firms in the quest to transfer the efficiency gains in attaining their strategic competitive processes.

In UK, lighting alone is one of the most energy intensive end use by commercial firms, representing over 20% of the nation's electricity consumption (Harrell & Kulkarni, 2004). Kenyan manufacturers on the other hand are faced with high-energy costs compared to its neighbours, which decreases investment and discourages potential investors from running business in the country. Wakiaga (2017) indicated that, rising cost of production caused by high energy cost is one of the key factors in the exit of manufacturing companies. As such, it becomes costly for companies to invest in the country and thus becoming one of the reasons why most companies have migrated or closed their firms (Olingo, 2016).

1.2.4 Energy Management Benefits in the Manufacturing Sector

A study carried out on energy management practices in plastic manufacturing companies in the U.S observed that the companies would enhance their productivity, and profits if they implement energy management practices. The study recommended among many others energy management awareness be carried out to all employees in the manufacturing

companies (U.S. Department of Energy, 2003). Through investment and upgrading of its facilities, the spirits industry in the UK through Spirit Energy Efficiency Company (SEEC), managed to reduce the energy used to produce a litter of pure alcohol by 18%, since the scheme was set up in 1999. Growth of production seems to have decoupled from CO_2 reduction, because the previously mentioned reduction was accompanied by a 22% of production increase. The following table shows energy management benefits achieved by firms in the UK.

Table 1.1: Energy Efficiencies Achieved in a UK Packaging Industry

Company	Improvement programme	Energy Efficiency attained
Diageo's Leven Bottling and Packaging Plant (Carbon Trust Energy Efficiency Award 2009)	• Installation of thermostatic temperature controls in the dispatch area and bottle storage warehouses; • Two high-speed doors were installed between warehouses to retain heat; • New controls installed to automatically shut down compressed air and electricity supplies when the lines are not in use.	• Annual savings of 750 tons of CO_2; • Reducing costs by £150,000 a year.
Chivas-Strathclyde Grain Distillery	• Energy efficiency and heat recovery investments; • Process control; • Management development Between 2005-2008:	• Annual energy consumption and CO_2 emissions reduced by 7%; • Increased production by 24%.
Glen Grant Distillery in	• Investment of £400,000 on energy management measures:	• Increase of Spirit production by 4%;

Rothes	• Replacing steam traps to save energy on pumping; • Installing multi-pass condensers to raise the water discharge temperature from the cooling system to heat up the still charges.	• Gas savings reduced costs by over £80,000 a year.
Glenmorangie Distillery	• A £250,000 investment aiming at recovering latent heat from new wash stills to heat other process waters.	• 175 tons of CO_2 expected to be saved per year with less than one-year payback period.
Diageo's-Roseisle Distillery	• Built-in heat recovery systems that permit heat from distillery cooling systems to be used at an adjacent malting.	• Less fossil fuel requirements.
Ian Macleod Distillers' Glengoyne Distillery	• Installing an economizer on the boiler, and an improved heat recovery system.	• Expected 5% less gas usage; 80 tons of CO_2 saving per year.

Source: (Rademaeker, Asaad, & Berg, 2011)

In Options for Resource Management Indicators (2012) a country such as Bulgaria's had the highest share of taxes on energy which was occasioned by the country's high energy intensity than to the tax rate. The report clarifies that an expected increase in energy management could reduce the share over time, (European Commission, 2012). This attests the evidence that resource management can result in competitiveness of a firm. Previous study by Cambridge Econometrics and Verco pointed out that investment in installation of energy management measures in fuel is significant since such a programme generates greater macroeconomic benefits – more jobs and greater growth (Lewis *et al.,* 2013).

In USA, Johnson (2013) remarked that firms, which practice energy management, are 2.7 times more likely to increase investments than other organizations. It further observed that

large majorities of decision-makers in every country surveyed – from 71% in Australia to 93% in China and India – considered energy management very or extremely important to their organizations. Globally, 41% rated energy management as extremely important, the same as in 2012. Such evidence provides possibilities for manufacturing firms to foster energy management practices in attaining its competitive strategies (Johnson, 2013).

The World Bank studies of Africa in 2013 recommended that policy makers should consider promoting energy management and pursue green energy, which aims to address the energy deficit at no further cost to the environment; and build competitive regional power pools coupled with the requisite legal and regulatory framework (World Economic Forum, 2013). Increased energy management is a key strategy with low trade-offs and huge win-win opportunities (Bleischwitz, 2009). Pernick *et al.* (2013) reported in his findings that spending on smart building energy management services is projected to grow from $291 million in 2012 to $1.1 billion by 2020. He observed that in USA, Nest Labs that is a Silicon Valley start-up in 2010 by two former Apple iPod and iPhone engineers are now shipping about 45,000 of its Nest thermostats every month to consumers for use in regulating heating apparatus.

Kenya has one of the largest manufacturing sectors in sub-Saharan Africa, and expansion of the sector forms a significant part of the country's development strategy. Climate change causes real problems for the manufacturing sector. Kenya is largely dependent on hydropower (electricity), which constitutes about 50% of the total national energy production. Manufacturing sector is affected mostly due to increased frequency of droughts which creates water scarcity that compromises hydroelectric power generation resulting in additional operating costs for running generators or paying more for electricity due to increased use of thermal-based sources (Government of Kenya, 2013). The current study

proposes that, if all manufacturing firms practice energy management due to its diverse notable benefits, then the resultant paybacks can be transferred to attaining their competitive processes.

1.3 Statement of the Problem

Petroleum and electricity are the two main components of energy sources used by manufacturing companies in Kenya (IEA, 2015). The Institute of Economic Affairs (2013) observed that in Kenya, petroleum products are imported both in crude and refined form for which the manufacturing sector remained the second largest consumer of the petroleum products. Due to lack of adequate electricity to support both the manufacturing and the domestic sector, the country operated diesel generators to generate additional electricity during the dry seasons when water levels in the hydro dams run low. The Energy and Environment Partnership (2014) and GOK (2016) found that the main sources of energy in Kenya are wood fuel (68-70%), petroleum (21-22%) which included petrol, diesel, paraffin, and electricity (9%). It argued that the Kenyan industrial sector consumes approximately (60%) of the total electricity generated and because of frequent power outage, company production was always averaged at approximately 9.3% (IEA, 2015).

There are strong pointers that manufacturing firms end up paying high energy costs occasioned by energy wastage, inadequate supply and continuous instability in prices (Energy Regulatory Commission, 2012; Kirai, 2004; CCPs, 2013; & KAM, 2015). This erodes their competiveness in national, regional and international markets, as well as reducing their profit margins. Olingo (2016) contends that high power costs are pushing manufacturers out of Kenya to other countries such as Egypt, South Africa and Ethiopia. The report shows that Sameer Africa, Cadbury, Eveready, Procter and Gamble, Reckitt Benckiser, Johnson and Johnson, Bridgestone, Unilever and Colgate Palmolive have left the Kenyan market for Egypt

and South Africa, where electricity costs are lower. In Kenya, the cost of electricity ranges from KES 15-17 per kWh compared with Uganda's KES. 4 per kWh; Tanzania's KES.12 per kWh; Egypt's KES 11 per kWh; Ethiopia's KES 9 per kWh and South Africa's KES 6 per kWh (Wakiaga, 2017; KIPPRA, 2016).

According to the findings by Kenya Institute for Public Policy Research and Analysis (KIPPRA, 2016), some manufactures have migrated to other countries attributing high-energy costs as one of the main contributing factor to their exit. KIPPRA (2016) also showed that Kenyan Manufacturers have been facing stiff competition from companies located in these competing nations owing to their ability to purchase electricity at a lower cost. Ethiopia, Uganda, Egypt and South Africa offered their investors an assurance of dependable and less costly energy as one of the key incentives as compared to the government of Kenya. This has made some of major manufacturing firms in Kenyan firms to exit the Kenyan economy.

1.4 Purpose of the Study

The overall objective was to assess the effect of energy management practices on attaining competitive advantage among manufacturing firms in Kenya.

1.5 Objectives of the Study

i) To determine the effect of implementation of energy management regulations on attaining competitive advantage among manufacturing firms in Kenya.

ii) To examine the effect of implementation of company energy management policy on attaining competitive advantage among manufacturing firms Kenya.

iii) To examine the effect of implementation of energy efficient technology on attaining competitive advantage among manufacturing firms Kenya.

iv) To assess the effect of percentage energy expenses on attaining competitive advantage among manufacturing firms in Kenya.

1.6 Research Hypothesis

H_{01}: Implementation of energy management regulations has no significant effect on attaining competitive advantage among manufacturing firms in Kenya.

H_{02}: Implementation of company energy management policy has no significant effect on attaining competitive advantage among manufacturing firms in Kenya.

H_{03}: Implementation of energy efficient technology has no significant effect on attaining competitive advantage among manufacturing firms in Kenya.

H_{04}: The percentage energy Expenses has no significant effect on attaining competitive advantage among manufacturing firms in Kenya.

1.7 Significance of the Study

The study sought to assess the effect of the practice of energy management practices in attaining a firm's competitiveness. The research findings are expected to assist manufacturing firms to establish suitable energy management actions, and make appropriate adjustments for their energy usage and implement appropriate policies to address energy inefficiencies. The government may use the study recommendations to further the cause for energy management practices so as to reduce wastage and create surplus energy thereby reducing the shortage of fuel, gas and electricity that faces the nation. Scholars may also utilize the study findings for further research. In addition, it may also increase the body of knowledge in strategic management of resource usage.

1.8 Scope of the Study

Nairobi County and its environment is a host to 399 manufacturing firms representing a percentage presence of approximately 47% of all firms registered with Kenya Association of Manufacturers. With such number of firms located in Nairobi County, an adequate representative sample was drawn from selected firms so as to gather data for purposes of answering the research objectives and hence generalizing the findings to Kenya's manufacturing sector at large. With the kind of data required by the study such as expenses on electricity and petroleum resources, the managers of the selected companies were requested to provide percentage estimates only on energy expenses. The data collected on energy costs was therefore insufficient since all the company management targeted by the study were not able to provide actual financial output for all firms sampled. However, for the study to adequately address the research objective, the percentage estimates were used.

1.9 Limitations of the Study

Tanaka (2008) observed that in collecting industrial data, the difficulty of a thorough data collection and the issue of confidentiality of information becomes a challenge. It is in this view that the limitation of this study was the unwillingness of the surveyed firms to provide actual energy expenses values on energy for analysis. In addition, one of the limitations that arose in the course of the study is the effect of intervening variable on competitive advantage since the study only tested the direct and indirect effects of energy management practices on attaining competitive advantage. In the current study, the intervening effect of energy management practices which is the macro environment (tax and inflation) were not examined, and the study recommended the study of this variable in future studies.

1.10 Assumptions of the Study

The study expected that all the participants answered the research questions truthfully. The study therefore assumed that the management of the companies selected gave the right percentage estimate of their expenses on electricity and petroleum energy resources.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter focuses on literature that is relevant to the study. It presents theoretical review, empirical review, conceptual framework, critique of past studies, research gaps and conclusions. It also gives attention to energy management practices and their effects on competitiveness of the firm. Review of literature related to the study was done on the relationship between energy management practices and competitive advantages in manufacturing firms. The effect of energy management practices and its salient benefits on a firm's competitive strategies is also discussed.

2.2 Theoretical Review

A Firm is able to attain competitive advantage when it is able to achieve a set of actions that allows it to perform better than its rivals. Currently, there is no best theory that explains the energy management paradox. However, varied theories of competitive advantage that have been advanced are adopted by the study. These are; Resource-Based theory, Knowledge-Based Theory, Capability-Based Theory and Transient-Based Theory.

2.2.1: Resource-Based theory (RBV)

Ansoff (1965) and Chandler (1962) as cited by Wang (2014) stated that the resource-based theory (RBV) has its focus on the firm's internal environment as strength for attaining competitive advantage and emphasises that a firm's resources can be harnessed so as to compete in the environment (Ansoff, 1965; Chandler, 1962). Penrose (1959) as cited by Wang (2014) noted that the company resources, the way in which they are utilized, are fundamental to secure the firm's competitiveness within an industry. Wernerfelt (1984) noted

that in addition to owning resources, the firm's competencies are a critical component in its utilization. Barney (1991) contended that a firm's resources are the basic source of competitive advantage. He further argued that a firm should focus only on its important and useful resources and competencies so as to achieve its intended competitive edge among industry players. Powell (2001) further argued that firms needs to manipulate its important resources in such a way that it can attain competitive advantage. Distinctive competencies arise from two complementary sources: *resources and capabilities.* Resources are financial, physical, social or human, technological and organizational factors that allow a company to create value for its customers (Hill & Gareth, 2007).

Wang (2004) argued that a firm needs to assess its internal assets and capabilities such as physical assets and knowledge assets as well as human resources, so as to its capabilities. In the current study, posits that the ability of a firm to efficiently utilize its energy resources is a fundamental business strategy in attaining competitive advantage.

Ray, Barney and Muhanna (2004) are of the opinion that intangible resources such as human knowledge are best source of attaining competitive advantage as opposed to tangible resources. They further argue that, a firm can re-design its procedures, actions and habits so as to promote efficient use of its resources. As such, energy management practices become an essential avenue of attaining competitive advantage through human efforts (Ray *et al.*, 2004).

2.2.2: The Knowledge-Based view (KBV)

Human knowledge is the fundamental and most treasured resource for any firm (Tiwana, 2002). This is supported by Hamel and Prahalad (1994) who pointed out that the know-how of any firm's employees is the main driver for superior performance. Evans (2003) argued

that the use of organizational resource decreases when the know-how of its employees is enhanced.

Beckmann (1999) noted that information is imperative when organizational performance is being sought. In the current study, it is important that information on energy management is appropriate when energy management is required in attaining competitive advantage. Zack (1999) argues that innovative knowledge gives the firm a competitive edge over its competitors and as such knowledge in energy management becomes a fundamental need for every firm that seeks superior performance in the manufacturing sector.

Haas and Hansen (2005) suggested that a firm can apply its competences in performing significant activities so as to gain competitive advantage over its rivals. It is the study's viewpoint that such application of competencies can be considered in the practice of energy management so as to attain competitive advantage. In applying such knowhow to energy management, a firm will be able to boost its efforts for superior performance especially in the rapidly changing global business environment (Teece *et al.*, 1997).

Grant (1996) noted that one of the best competences is the activity-related capabilities which enables a firm to consider such aspects as related to energy management, given that manufacturing companies in Kenya are the largest consumers of electricity and the second largest consumers of petroleum products, hence the need for the firm to continually inform itself of the new methodologies and actions that can promote the attainment of competitive advantage (Sirmon *et al.*, 2003; KNBS, 2012; Zack, 1999).

2.2.3: Transient Advantage Theory (TA)

(McGrath, 2013) argues that business strategies should be formulated in such a manner that it guides the firm's behaviour for a longer period of time. The philosophy states that, since the

current business environment is evolving, opportunities continuously arise that can enable a firm to leverage competitive advantage. As such, once other rival firms leverage the competitiveness, the firm will have moved to other strategies-hence making business strategies transient and not permanent.

The current study argues that energy management practices are also evolving with newer technologies and innovations, hence the need for a dynamic change of tactic in ensuring that the firm continuously adopts such transient business strategies.

In energy management, Alcott (2005) argued that any management endeavours or improvements made in the use of energy resource leads to increase in total consumption of that resource rather than decrease it (Alcott, 2005). He further posits that with advancement in technological progresses, there is an increase in management of the resource used, with price and income benefits, but consumption increases. However, it can be inferred that, even though there exists a tendency of high consumption of the said resource, manufacturing firms can realize the advantages of economies of scale arising from Expenses reduction, energy savings and increased firm profit. In turn, such phenomenon of increased performance can be as a result of more investment of the accrued benefits from energy management practices in other competitive processes.

2.3 Empirical Review

Empirical review covered in this section, examined the studies and findings of previous studies in the field of energy management practices. It also discusses energy management initiatives in various economies that may lead a firm in attaining competitive advantage.

2.3.1 Energy Management Regulations in Manufacturing Firms

In Australia, energy management practices are compulsory for large energy using firms while in Denmark and Netherlands, it is a voluntary initiative (IEA, 2012). The Government of South Africa (2008) noted that the world energy assessment suggests a cost reduction of up to 35% over a period of 20 years, if the appropriate policies are implemented in support of existing energy management practices.

The National Environmental Policy (2013) observed that Kenya is dependent largely on Electricity and Petroleum sources of energy. The policy document recommends that in order for the country to be energy efficient; "the country's energy policies must ensure a robust and efficient energy system that is secure and sufficient." This therefore promotes industrial competitiveness and economic growth.

Energy audits when carried out can lead to huge savings of between 15% to 30%. As such, Kenyan Companies such as Spin Knit and British American Tobacco (BAT) have enjoyed savings of more than 25% in expenses (Makambo, 2012). The energy audits found that flower firms in Kenya enjoyed energy savings of between 3,500 kWh to 40,000 kWh per year and cost savings of between KSh. 71,000 to Ksh.811, 000 if energy management practices are implemented. In this case, it can be argued that; if all manufacturing companies implement the same, then the overall savings for both cost and usage is vast. Carbon Trust (2011) also states that energy management practice yields a cost savings of 5% to 25%.

Wajer and Helgerud (2007) in their study in Europe notes that firms that practice energy management are expected to report to national data gathering systems, energy usage data once a year. This will enable the national data systems carry out analysis so as to advise individual firms on where opportunities exist for energy management. In addition the study revealed that companies that benchmark its energy management practices stand a higher chance of permanently eliminating inefficiencies that might be identified.

A survey in United States, found that manufacturing firms consumed more than 40% of all energy produced (Jasinowski, 2000). He further asserts that 60% of manufacturing firms in America saw electricity management as a means of reducing their bills by up to 20%. A significant number of the firms investigated considered introducing energy management information for its employees. It was further observed that 4% of manufacturing firms used alternative fuel sources for their vehicles other than petroleum products, 13% of these companies practiced car-pooling and mass transportation while 10% had energy information campaigns for its employees. In concluding their study, Jasinowski (2000) noted that manufacturing sector rely more on electricity and fossil energy than any other sector in all economies. The United States of America in 2012 introduced tax incentive opportunities for energy management programmes (Southface Energy Institute, 2011). The strategy involved tax deductions calculated from income before total tax liability is calculated. This move became essential in promoting energy management practices and encouraging firm commitment. The research recommended the following energy management practices to be adopted in the United States of America:

Increase the efficiency of all motor generators and motor-driven systems: According to the study, an efficient machine, car or equipment, the lower the operating costs. If a manufacturer upgrades its machines, they become energy-efficient and this lowers the total operational

costs incurred by the company. This ultimately makes the firm more competitive in the market. In achieving such efficiency, a manufacturer needs to run regular maintenance of all motor machines and equipment in order to identify problems before they break down. In doing so, firms have the added advantage of finding spare parts early in advance which helps them minimize "downtown" if such machines were to break down.

Improve building lighting: Manufacturers need to install high-efficiency lighting systems and make use of natural day lighting in order to lower their lighting expenses. Such endeavour also lowers improves lighting quality.

Upgrade heating, ventilating and cooling systems: Manufacturers are advised to use high-efficiency heating, ventilation, and air conditioning (HVAC) equipment by using computer-controlled equipment. These firms can also reduce their HVAC output on weekends and at night, in order to reduce energy costs and contribute to manufacturer's competitiveness.

Capture the benefits of utility competition: Negotiation with energy providers on prices of electricity, fuel, and gas leads to a lower Expenses on utility bills by the manufacturer.

Empower employees to do more: Training employees and energy management practices campaign enables the company staff to aid in energy management programmes. Continuous communications of gains made through such activities motivates employees to adhere to such practices.

Explore energy savings through increased use of the internet: During meetings, firms can use teleconferencing or videoconferencing rather than having to transport employees to venues for meetings. This reduces transport costs to that might have been incurred by the firm.

Implement comprehensive facility energy and environmental management: Manufacturing firms can higher energy management manager or consultant who keep track of company's energy expenses and design a corporate energy management plan. The Regulatory Assistance Project (2012) argued that energy management measures in energy use comprise; repairing equipment, replacing equipment with those that consumes less electricity, and installing new equipment that consumes less electricity.

A report presented by Beacock and Kingham (2005) concluded that companies need to; provide an energy management policy to all staff, and promote awareness campaign on energy management practices. These also includes the use of constant reminders notices at the workplace such as switching off unnecessary lights while involving employees in setting up energy management practices, and use of incentives and rewards in motivating staff who show commitment in energy saving practices. In Africa, energy demand increases at the rate of 8% annually. It is expected that this trend creates a huge energy deficit in African economies, thus pushing energy prices even higher. This occurrence calls for better energy management practices in manufacturing firms, which are known to be the highest consumers of electricity, petroleum products and gas.

Oimeke (2013) concurs with other researchers that for firms to promote energy management practices, awareness and dissemination of information for efficient use of energy are imperative. He further, recommended that companies can strengthen consultancy services, promote research and development in the field of energy management, formulate and facilitate implementation of pilot projects, and give financial assistance to institutions for promoting efficient use of energy, assist in the preparation of energy management educational curriculum, provide incentives for companies that make investment in energy management practices, collaborate with Kenya Bureau of Standards in importation of energy

efficient technologies and participation in international co-operation programmes relating to energy management practices. These recommendations are further supported by Energy Regulatory Commission and Lemmy *et al.* (2013) who proposed; introduction of building standards, setting energy management targets with industry, negotiating with industry players, research and development initiatives, both of which can be realized by enforcing the Energy Management Regulations of 2012.

In Kenya, some sub-sectors such as sugar, starch, meat, dairy and the drinks industry are known to use more electrical and fossil energy at the core of their operations. Such energy resources are essential for boiling, evaporation, pasteurization, drying and cooling. With rising energy prices, firms ought to adopt certain measures to achieve further energy management levels and attain its competitiveness (Rademaeker *et al.,* 2011). In addition, the researchers summarized the measures of energy management practices to include: adoption of sector specific best practices, implementation of energy audits, integration of energy management concept in the daily business operations, benchmarking energy use depending on the size of plant and operations, seizing opportunities offered through national energy management schemes, such as energy management programmes provided through the Kenya Association of Manufactures (KAM), and use of alternative treatment methods for water recovery such as anaerobic treatment.

Energy management standards, such as the use of tax and fiscal policies, are measures that can be adopted in energy management endeavours also. The current study aims to link the benefits of such efficiency endeavours to attaining competitive advantages, since previous studies anchor on environmental conservations, cost reductions and reduced energy demands (Cantore, 2011).

2.3.2 Company Energy Management Practices in Manufacturing Firms

Company energy management practices in one cement manufacturing company between 2003-2013 found that through such practices, the company was able to reduce their energy cost as a proportion of total revenue by more than 5%. This highlighted the need for tailor-made company energy management guidelines in today's competitive business environment. Training and sensitization on energy management practices also becomes a key aspect in ensuring that an organization achieves its energy management goals in attaining competitive advantage (Kamath & Sinha, 2014).

International Energy Agency (2012) and United Nations Industrial Development Organization (2008) notes that as part of company energy management initiatives, providing incentives and rewards for drivers, training employees, involving staff during networking events, reviewing case studies and providing energy management guidance materials to employees supports the promotion of better energy management initiatives. The agency further recommends vibrant energy policy, management involvement, continuous energy reviews, benchmarking, target setting, and audits as some of the practical strategies in enhancing energy management initiatives.

Kenya Association of Manufacturers through the Centre for Energy Management and Conservation provides training and energy audits on energy management to manufacturers in Kenya. It also oversees the yearly Energy Management Awards (EMA), which recognizes major and attainable gains in energy management through company energy management initiatives among participating companies (Laurea, 2015). This therefore enables manufacturers to strive in implementing better energy management practices by developing individual management practices and enhance their efforts in attaining competitive advantage.

International Project Management Office (OGPI) (2013) through a presentation made by Oimeki observed that Kenya is yet to establish an Energy Research Institute, or Energy Research Labs that can carry out energy use and energy management studies. This therefore, hinders firms that have not implemented company driven energy management practices as a strategy in attaining competitive advantage. GOK (2015) notes that the government had planned to set minimum energy management standards for certain machines and to increase awareness of energy management and related technologies so as to improve organizational energy management practices. However, this is yet to be realised fully as a pivotal strategy in enhancing energy management practices among the manufacturing firms in Kenya.

Hill and Gareth (2007) states that for a company to be efficient, management practices have to be adopted. This is because a company being a device for transforming inputs (labour, land, capital, management and technological knowledge) into outputs (the goods and services produced), there is need to engage in practices that yield benefits for its competitive strategies. They further argue that the simplest measure of energy management is the quantity of inputs that it takes to produce a given output. This implies that when a company is efficient in its energy use, it requires fewer inputs such as energy to produce its products and services. This in turn lowers its cost structure. An efficient company therefore reaps the benefit of lowered costs than its rivals. UNIDO (2008) in its studies among member countries proposed a raft of recommendations policies for enhancing energy management in developing nations and transitional economies. The study submitted that target-setting agreements, setting up energy management standards, establishing system optimization training and tools, staff capacity-building to create system optimization experts, documentation, and provision of government tax incentives and recognition as strategies that can be adopted to promote energy management.

Natural Resource of Canada (2002) in its studies of firms in Canada revealed that companies should carry out energy audits as the first step in developing organizational energy management programs. It further established that energy audit varies between organizations but the ultimate goal is to improve energy management and decrease energy costs. Their study also established that organization engage external consultants carry out energy audits and there were great opportunities to be pursued in utilizing internal resources. In its conclusion, Natural Resource Canada (2002) notes with great importance that energy audits enable organisations to verify effectiveness of its energy management opportunities.

Environmental Protection Agency (2013) established that recommending that successful benchmarking by companies on energy management programs should be specific from firm to firm and that is should conform to the structure and culture of every organization. It further stated that all organizations stand to benefit by implementing benchmarking initiatives and that such approach may not wholly address the requirements of every firm. The U.S Department of Energy (2014) in its studies in USA, established that organizations aspiring to practice energy management should establish a criteria and documentation that enables companies to refer to when purchasing new motor equipment. As such, organizations are able to identify and determine the energy and cost savings requirement for such machines and equipment. This enables the firm to replace old and inefficient product with premium efficient units.

Energy Saving Trust (2016) in its study in the UK documented that companies should automated its lighting systems for energy efficient lamps; it further stated that companies should install automatic switch-off for daylight use, although manual control of light fittings are allowable. The study further recommended that automatic controls should be installed in lit areas so that it can automatically switch of when the area is unoccupied. Johnson (2012) in his study of UK firms also recommended that automation of lighting sensors is ideal for areas

where lighting might be left on when not in use. He noted that with such installations, companies can save up to more than 80% in energy costs. In addition, he noted that the dimming of lights automatically with daylight controls will also extend the lamp life hence saving costs for the organisation. McCallum (1997) in his study of Canadian firms revealed that with automaton of heating systems, firms experience a higher level of comfort in buildings and in equipment used because heat is automatically controlled around-the-clock. As such, energy savings are realised and energy costs are reduced. Further, Kosir *et al.* (2010) in its study carried at Siemens company noted that automation of ventilation and cooling systems leads to proper system regulation and automatic control. In addition, they argued that energy savings and cost savings cannot be realized without investing in sufficient automatic control mechanisms.

Figure 2.1, shows the process in favour of energy management resource use in firms to create competitive advantage (Hill & Gareth, 2007).

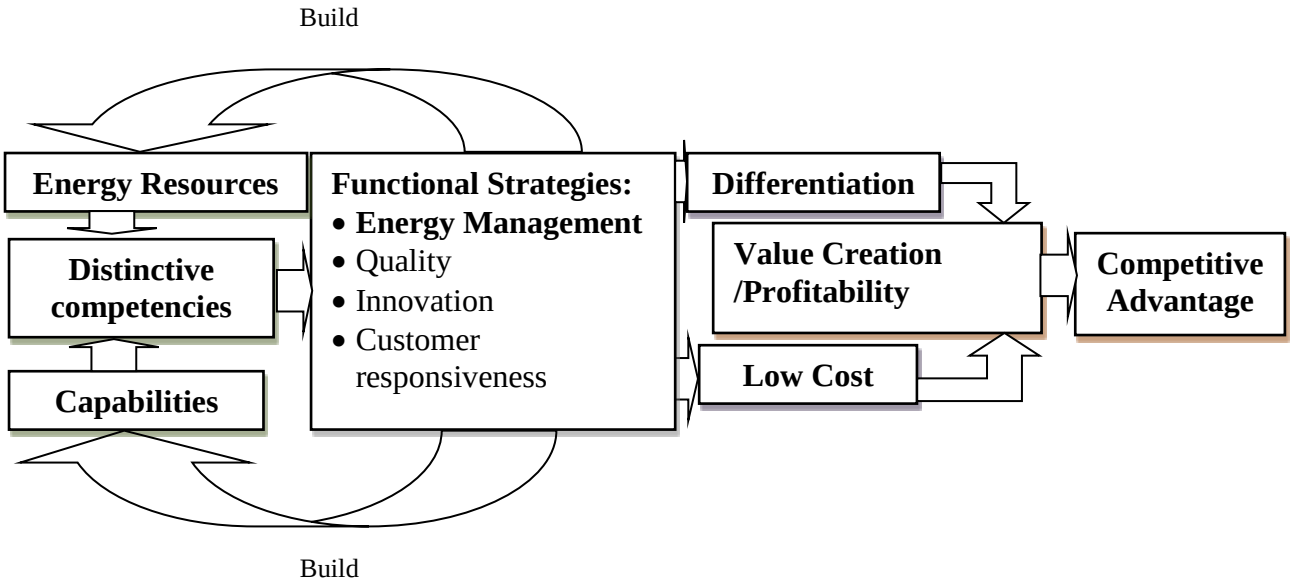

Figure 2.1: The Roots of Competitive Advantage

Source: (Hill & Gareth, 2007).

Hill and Gareth further stated that energy management can be attained by adopting the following practices:

Through learning: This implies that company's costs can be lowered if employees learn continuously by repetition. Such practice leads to increase in productivity over time, and unit costs fall as individuals learn the most efficient way to perform a particular task.

Through experience: A company that wishes to become more efficient and lower its cost structure must try to ride down the experience curve as quickly as possible. This meant that firms has to construct efficient manufacturing facilities before it begins to generate demand for their products and pursuing other cost reduction strategies accruing from the learning effects.

Through flexible manufacturing, and mass customization: The best method to achieve high energy management and lower the company's costs is to produce more standardized outputs in mass. However, in this regard, the advancement in technology has provided firms with better means of mass production and flexible manufacturing.

Through materials management: Improving the energy management of materials-management, which requires the adoption of just-in-time (JIT) inventory systems, which facilitates the transportation and receipts of components into the production process by minimizing time wastage, hence a cost saving strategy.

Energy Management through human resource: Productive employees in a company can increase sales, and boost revenue. Adopting the best hiring methods, training on energy usage, use of teams, introducing pay for performance, are among the best methods of introducing energy management in a company.

Energy Management through information systems: In this case, the increased adoption and use of computer technology, internet, the spread of fibber optics and wireless technology has created some operating efficiencies and a lower cost structure.

Energy Management through a firm's infrastructure: The structure, culture, style of strategic leadership and control system forms the overall company's infrastructure. Improving these elements can help a firm increase its energy management and lower overall costs. An appropriate infrastructure such as developing energy management policies and regulations can help foster commitment to energy management and promote cooperation among different functions in pursuit of efficient goals.

Energy Management through research and development: Through research, firms can identify opportunities that they can exploit to attain greater energy management. This can be achieved by identifying measures and technologies that can enable a firm manage its energy consumptions and invest in technologies that can assist the firms reduce any wastage. Lighting is also one of the most energy intensive end use in buildings, representing over 20% of the electricity consumed, with commercial buildings taking the vast majority. Other consumers of electrical energy are machinery, appliances such as water heaters, cooling systems, chargers and electronic equipment's (Harrell & Kulkarni, 2004). With such consumptions, there is need to practice energy management in the manufacturing firms.

Energy management improvement of existing technologies is a basic, yet significant, way of addressing both energy security and environment concerns (Tanaka, 2008). His finding focuses on energy management and its application in industry. However, he focuses his attention on environmental benefits. Such findings support previous scholarly findings, which focuses majorly on environmental concerns. This study posits that the salient benefits of energy efficiencies can be transferred to a firm's competitive strategies as a means of

attaining gained competencies. He further proposes the following energy management measures for industries; thermal energy management of equipment, energy consumption intensity, absolute amount of energy consumption, and diffusion rates of energy efficient facilities. It can therefore be argued that there are different indices that need to be investigated so as to be used for different applications in energy management strategies, for which the study attempts to research on.

Pitigala and Hoppe (2011) argued that manufacturing firms in Nigeria remit about 43% of the total tax burden to its respective government. Alegana (2014) also concurs with the argument that taxation in Kenya influences the choices that firms make in their investments quests. Such taxes include company tax, value added tax, business permit fees, This has the long-term effect of affecting the firm's profitability as well as a competitive edge with other rival firms, without attributing the effect on energy management practices. This also implied that manufacturing firms may perform poorly in the international business environment and there was need for energy management practices to be practiced so as to reduce the effects of taxation on firm's efforts of attaining competitive advantage.

2.3.3 Energy Efficient Technology in Manufacturing Firms

Hartmann and Huhn (2009) observed that energy management in industries can be increased through customized information technology solutions. As such, related innovative information technology software can be applied by industrial related firms so as to monitor its consumptions and usage. In addition, the use of renewable energy such as solar is expected to also increase exponentially by the year 2020. The use of low-consumption combustion engines and energy saving technologies are also expected to be in use globally and that fuel consumption vehicles were expected to fall by 17% by the year 2010. This is also expected to support sustainability initiatives by nations of the world (Victoria, 2007).

UNIDO (2012) observed that technological standards, improvements and maintenance promoted reduction of electricity consumption in China by 20%. As such, it creates additional energy for supply and reduction of energy expenses. This can be replicated in Kenya and manufacturers advised on the significance of technological investments in energy source usage. Backlund *et al.* (2012) states that a gradual practice of energy management leads to a reduction of operating costs and increases competitiveness and productivity of the company. This revelation, can present greater opportunity for manufacturing firms to enhance its competiveness through cost reductions.

Evaluation by Wilkinson and Kituyi (2006) revealed that an ineffective technology leads to high production costs and thus high product price. As such, companies can reduce such costs by adopting efficient technologies in their production systems and processes. Audrie (2008) revealed that some of the causative factors of high-energy consumption are improper installation and poor maintenance of machinery and apparatus. Friedmann *et al.* (2008) reported that the use of low-energy technologies, reduction of wattage in electricity bulbs and lamps such as LED were some of the energy management practices that manufacturing firms can institute.

Energy management practices, as noted by NEED (2012), include the use of technology that requires less energy to perform the same function. Energy management practices can also be attained through policy guidelines, and training of users (Ihuthia & Wang'ombe, 2012). It is therefore necessary to point out those actions such as awareness by employees, training, responsiveness, efficient technology use and other form of behaviour change in the use electricity and fuel results in the use of less energy and its conservation and that in implementing new technologies, personnel that introduce such technologies must often serve as both technical developers and implementers for it to be effective (Barton & Kraus, 1985).

2.3.4 Energy Expenses in Manufacturing Firms

In Australia, Willox (2012) observed that more than 25% of firms incur high-energy expenses from (electricity, gas and other fuels). He further found that, on average 27% of companies he studied spent the equivalent of more than 2% of their sales revenue on energy, and 73% of the firms spent 2.5%. The report asserted that business expenses on energy as a percentage of turnovers increased between 2008 and 2011 and the trend was expected to continue. The National Statistics publication of the United Kingdom (2012) notes that in UK, energy prices have been increasing steadily since 2004. Price increase on electricity and petroleum products erodes competitive strategies attained by firms; hence there is need for manufacturing firms to practice energy management in support of its competitive initiatives. The U.S.A Energy Information Administration in its Annual Energy Outlook (2013) predicted a continued energy price increase both for petroleum products and for electrical energy in the years to come (Conti, 2013). In this regard, there is need to practice energy management so as to reduce Expenses and transfer the gains to other firms' competitive strategies.

Manufacturers in the US economy incur direct energy cost resulting from energy costs during product making process (industrial 36.7%), maintenance of office operations (commercial 16.25), receiving raw materials and delivery of finished products (transportation 27.3%) and employees' household's Expenses on energy which has indirect effect on wages and salaries (residential 19.8%) (Jasinowski, 2000). This showed that manufacturers are still faced with high energy costs which can be reduced by adopting energy efficient practices and transferring the gains to competitive strategies.

McKane (2011) as cited by IEA (2012) and the Retail Industry Leaders Association report (2013) as cited by Jamieson and Hughes (2013) argues that the practice of energy management has a pay-back period of 3 years with reduction on energy consumption costs of

between 10-30%. The study further notes that energy costs remained as one of the key organizational operating costs and that a 10% reduction in energy cost leads to a corresponding 8% increase in sales. In addition, the above study found that energy audits, reduced energy consumption by up-to 20% through appropriate recommendations. The above studies agree with the findings of Kamath and Sinha (2014) which observed that energy audits enable organizations to understand its consumption levels of specific processes, appliances and machinery so as to be able to make appropriate recommendations on energy management practices.

As demand for world energy continues to outstrip supply with USA, China, Russia and India leading the consumption list, energy prices is expected to continue rising over a long term period. As a result, many companies should strive to outperform its competitors through better energy usage so as to secure the cost advantage and increase their market share. As such, it has now become imperative for firms to know the cost of its energy usage and that energy management should be a key variable in every decision making process (Hartmann & Huhn, 2009). According to the International Energy Agency (2008) as cited by Hartmann and Huhn (2009) it is expected that by the year 2020, the price of oil per barrel will have increased to 110 USD/barrel and with such occurrence, supply is likely to surpass demand. This phenomenon is likely to affect most companies and economies negatively in terms of production and operating costs. In this case, companies need to focus on energy management practices so as to gain greater competitiveness. This is because Energy management practice promotes an increase in profitability for firms (Cooper, 2014).

The tendering and purchase processes in companies should also demand for standardized requirements and innovative features that foster energy management (Hartmann & Huhn, 2009).

According to UNIDO (2012) high-income consumers of petroleum, electricity and related sources energy spend between 5% to 10% of their income. As such, this presents opportunities for energy savings and cost reductions through energy management practices. According to Fawkes *et al.* (2016) companies in Sweden are considered energy intensive organization if its energy costs are at least 3% of the value of the company's production value. This therefore may not be the same case with companies in developing countries, since most of its processes remain inefficient.

A study by McCoy *et al.* (2014) commissioned by the Australian government found that 72% of the sampled companies spent more than 10% of their total revenue on energy sources. It further revealed that businesses consider energy Expenses of 2% to 3% of sales revenue to be high. The same study also showed that companies that spend more than 3% on energy costs and profitability less than 10% are classified as having high exposure to energy costs while those than spend less than 3% with profitability greater than 10% are classified as low exposure companies. The study proposed the following classification with regard to energy costs:

Very high impact	:	energy Expenses is >15%
High impact	:	energy Expenses is between 3-15%
Medium impact	:	energy Expenses is >1%
Low impact	:	energy Expenses is <1%

2.4 Conceptual Framework

Conceptual framework is a structure that indicates the direct and indirect relationship between dependent variable (competitive advantage) and the independent variable (energy management practices). In the current study, the dependent variable is competitive advantage among manufacturing companies while the independent variables are energy management regulations, company energy management policy, and energy efficient technology and energy expenses. The framework shows the relationship of the independent variables on the dependent variable.

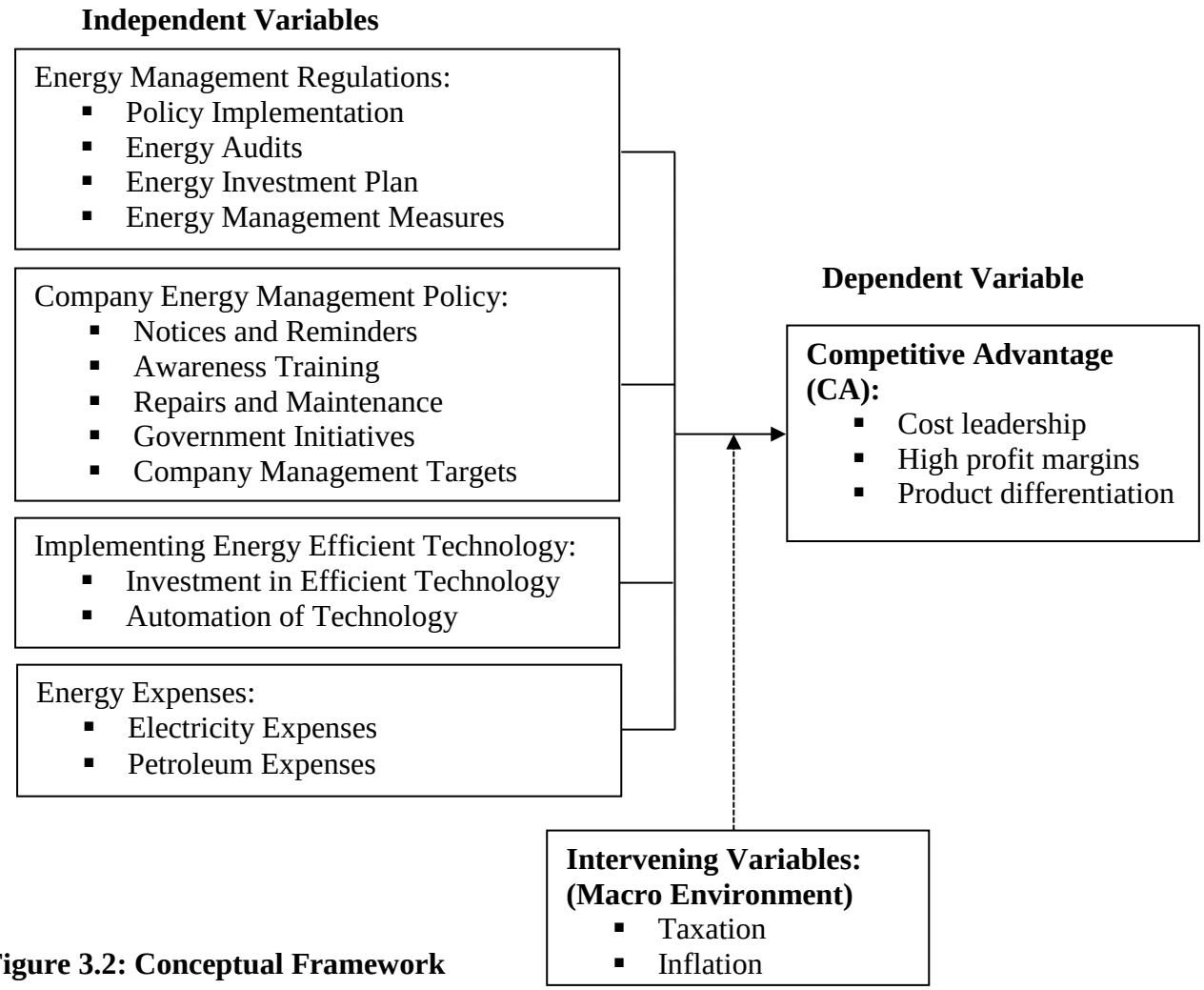

Figure 3.2: Conceptual Framework

The study presents competitive advantage as the dependent variable of primary interest. The researcher's objective was to comprehend and explain this variable, by way of assessment to predict if an association exists with the independent variables. Macro environmental factors such as; tariffs, taxes, company decisions, interest rates, inflation, Foreign Exchange (FOREX) fluctuations, and cartels in the oil industry surfaces between the moment the independent variables start operating in influencing the dependent variable and the moment their impact is felt on it. These are variables that affect the dependent variable and the study has little control on them.

2.4.1 Energy Management Regulations Variables

These refers to Policy Implementation, Energy Audits, Energy Investment Plan, and Energy Management Measures. These are all well-articulated in the energy (energy management) regulations, as designated under The Energy Act, 2006. The Act directs manufacturers and other consumers of electricity and petroleum products to adopt the energy management practices specified, failure to which, penalties will be enforced on non-compliant firms. The effect of not complying is a fine of KES. 1 Million or KES. 30,000 per day.

The Kenya Energy Regulatory Commission (ERC) published the Energy Management Regulations, 2012 to enable consumers carry out energy audits on their firms or households with guidance from licensed auditors recommended by Energy Regulatory Commission. The Energy Bill, 2015 contains a significant clause where the Energy Regulatory Authority is mandated with the authority to coordinate, develop and implement a prudent national energy management and conservation programme (GOK, 2015). This mandate enables the authority advice and conduct energy audits for purposes of advising consumers of electrical energy appropriately. The same bill also stipulates penalties for non-compliance such as; fine of not less than two hundred and fifty thousand shillings, or to a term of imprisonment of not less

than nine months, or to both for failure to comply with the authority requests for energy utilization data of their premises.

The audits are scheduled to take place every three years. The regulations require that the targeted companies have to set up a committee and appoint an energy officer in addition to developing and submitting organizational energy management guidelines to The Energy Regulatory Commission for approval. Companies are also required to submit audit reports and implementation plans to the commission for consideration. The Energy Management Regulations of 2012 highlights four key issues to be considered by energy management practicing firms as hereunder:

The policy enumerates the following as initiatives to be undertaken by firms:

(i) That the owner or occupier shall develop an energy management policy for the facility.

(ii) That the owner or occupier shall within one year of classification file the energy management policy for every designated facility with the Commission for approval before implementation.

(iii) That the owner or occupier of a facility shall designate an energy officer for every designated facility, who shall be responsible for the development and implementation of energy management and conservation.

(iv) That the owner or occupier of a facility shall maintain records of information for every designated facility for a minimum period of five years from the date of occupation of the facility, which shall include –Monthly and annual electricity, fuel and water consumption. It also includes; Monthly production data or occupancy levels; and up to date building plans, infrastructure plans and floor area drawings.

Energy Audits: The energy audits provide for the following to be adhered to by firms:

(i) That the owner or occupier shall cause an energy audit of the facility to be undertaken by a licensed energy auditor at least once every three years.

(ii) That the owner or occupier shall submit the report of the audit to the Commission in a manner approved by the Commission, within six months from the end of the financial year in which the audit is undertaken.

(iii) That an energy auditor shall upon completion of an audit execute a quality assurance declaration.

(iv) That Energy Regulatory Commission or its agent may subject the energy audit report to verification after giving not less than fourteen days' notice to the facility owner or occupier.

Energy Investment Plan: Under this clause, the firms are expected that:

(i) An owner or occupier of designated facilities shall within six months from the end of the financial year in which an energy audit is undertaken, prepare and submit to the Commission an energy investment plan for the next three years, setting out proposals for the conservation of energy during that period.

(ii) An energy investment plan under paragraph (1) shall be reviewed after every three years.

Energy Conservation Measures: Under the clause, firms are expected that:

(i) That the owner or occupier shall take measures to realize at least 50% of the identified and recommended energy savings specified in the energy investment plan by the end of three years and thereafter at every audit reporting date.

(ii) That an owner or occupier to whom these Regulations apply may investigate the inclusion of the relevant components of an energy investment plan into a project to be

registered under the clean development mechanisms or any other carbon finance mechanism which may be in place from time to time.

Implementation Reports: Under this clause, the firms are expected that:

(i) That every designated facility shall submit an annual implementation report

(ii) That a facility owner or occupier who fails to submit an implementation report within the stipulated time shall be liable to a penalty not exceeding thirty thousand shillings for each day or part thereof that the breach continues.

(iii) That the Commission or its agent may conduct an inspection to verify compliance with the implementation report.

(iv) That the Commission shall issue a compliance certificate on request by facilities complying with these regulations.

Audit by the Commission: That under the clause:

(i) The Commission or its agent may, after giving not less than fourteen days' notice to the facility owner or occupier, undertake an energy audit at its own cost.

(ii) The owner or occupier shall allow the Commission or its agent access to the facility for purposes of such audit.

In addition to the above requirements, Energy Regulatory Commission also imposed a fine of KES.1 million, a year imprisonment for the facility head or both if they delay in submitting the implementation report. Firms that delay to submit are to be fined also KES. 30,000 per day (Korir, 2015).

2.4.2 Company Energy Management Policy Variables

These include Notices and Reminders, Awareness Training, Repairs and Maintenance, Government Initiatives, and Company Management Targets as required by Energy Regulatory Commission. When firms implement energy management practices, the end result is accrued savings on running and energy costs to the firm. It also leads to energy savings. These savings therefore, can attain its competitiveness in the market by creating a surplus income which can be invested in other strategic areas or can be used to even lower performance of other strategic business units (SBUs). However, in the absence of such policies, energy consumptions and costs are likely to remain high or increase significantly, thus may hurt the firm's strategic management initiatives already implemented.

The Energy Management Regulations, 2012 requires that manufacturing companies in Kenya should be able to prepare and submit to Energy Regulatory Commission an energy management policy for approval and implementation. As such, by the end of 2016, the Energy Regulatory Commission (ERC) had approved 268 company energy policies in Kenya. These company energy policies are specific and suitable to individual company's energy management targets and plans (Energy Regulatory Commission, 2016). UNIDO (2013) in its practical guide for implementing an energy management system recommended a wide range of strategies that companies could adopt when considering the practice of energy management. The report recommended a day-to-day monitoring and analysis of energy consumption, continuous improvement of energy management practices, calibration of machines and equipment, appointment of energy management officers, and communicating expectations to all staff. In addition, the report also recommended management commitment to energy management, establishing objectives and targets, establishing energy management teams, continuous analysis of energy usage, and benchmarking energy management efforts among industry players. Further, the report recommend the use of competence personnel

tasked with energy management, carrying out internal audits, management reviews, computing annual energy trends, and prioritizing opportunities identified during the implementation of organizational energy management policies.

2.4.3 Energy Efficient Technology Variables

This is include Investment in Efficient Technology and Automation of Technology adopted by firms that entails; efficient lighting technology, energy efficient engines, automatic lighting sensors, and installation of artificial intelligence to monitor power consumptions. Investment in such technologies ensure that firms monitor their energy usage in order to enhance saving and reduce its Expenses.

2.4.4 Energy Expenses Variables

These include Electricity Expenses and Petroleum Expenses. These are the cost incurred by firms on electricity and petroleum products. It is expected that these costs vary from firm to firm and from those practicing and not practicing energy management. As such, cost savings incurred by energy efficient firms can be used as a means of attaining competitiveness or may be transferred to other competitive strategies.

2.4.5 Competitive Advantage

Competitive advantage is the criterion variable or predicted variable under investigation. Firms create advantages through cost leadership, higher profits and product differentiation as a result of strategic decisions being made and implemented. The fundamental goal of energy management is lower production costs and enhanced energy savings. However, other factors may influence the attainability of the advantages gained through energy management practices. In addition, other benefits may emerge from the practice of energy management

such as transferring benefit gained from lower energy costs in improving product and service value, market share, high profits, and increasing uninterrupted firm processes.

2.5 Research Gaps

Studies in Kenya by United Nations Environmental Program (UNEP) (2014) focused on the gains of energy management on the nation's gross domestic product (GDP). However, it does not indicate if these gains can be transferred to a firm's competitive strategies.

Further, in Kenya, studies by the Kenya National Bureau of Statistics (KNBS) (2012) focussed on the levels of energy consumption by manufacturers in Kenya. However, the studies does show what measures need to be practised by manufacturing companies to boost energy savings and costs, given that the sector is largest consumer of electricity and the second largest consumer of petroleum products. The study does not also show any evidence of transferring the gains of energy management to attain firm competitive processes.

Further studies in Kenya by Kirai (2007), Cantore (2011), Tainter (2011) and Oimeke (2013) focused principally on environmental management such as the use of green energy in reducing pollution. However, the current study focused the transfer of energy management gains to attain competitive advantage strategies. The Government of Kenya (2007) under its Kenya Vision 2030 flagship suggested that there was need to study on what actions are to be taken so as safeguard electricity and petroleum source of energy. It therefore became imperative that a study be carried out on how the practice of energy management practices can be harnessed to attain firm's competitive strategies. Studies in Kenya by Centre for Cooperation with the Private Sector (CCPs) (2013) focussed on the benefits of energy management practices to the environment. However, the current study focussed on transferring the gains of energy management practices to attain competitive advantage

strategies. It should also be noted that the study by (Kirai, 2004) focussed on the commitment of energy by manufacturing firms in Kenya but did show how the gains can be used in attaining competitive advantage nor recognised energy management practices as a shared endeavour that can be used to attain every firm's competitive advantage.

In attempting to investigate the challenges facing energy management practices in Kenya, Kirai (2007) proposed guidelines that manufacturing companies can adopt to reduce its energy costs and enhance energy savings. However, his study does not indicate in which way the gains from energy management practices can be used in attaining other firm competitive processes. Hill and Gareth (2007) states that for a company to be efficient, energy management practices have to be adopted.

Empirical studies in South Africa in 2008, focused on introduction of voluntary energy management Accord where it was found that companies that signed the accord reported significant savings in electricity use, with an overall electricity demand reduction of (12%). In combining the total number of companies enlisted for the program, it was observed that energy savings of up to (38%) was achieved. This therefore translates to lower utility bills for the firms (Government of South Africa, 2008). However, the finding does not indicate how these gains can be transferred to attain competitive advantage strategies. Further studies in the U.S found that the gains of energy included increased productivity and lower carbon emission, however the study does not indicate if the gains from energy management practices can be transferred to other competitive strategies (U.S. Department of Energy, 2003). Africa World Bank studies in 2013 considered competitiveness of firms through investment in green energy (World Economic Forum, 2013). However, the current studies focused on the implementation of energy management practices in attaining competitive advantage.

Moreover, the studies were carried out regionally while the current study focused on manufacturing firms in Kenya.

Creyts (2007), Granade *et al*. (2009), McKinsey and Company (2009) observed that there are great benefits resulting from energy management. However, their studies focused on reduction of energy consumption and carbon emissions, while the currents study focused on transferring the gains of energy management practices to competitive strategies. Kiema (2014) focused on the effect of instability of energy prices and high energy costs on economic growth, while the current study focused on the transfer of energy management gains in attaining other competitive processes. The current study opines that with decision by the Kenya Association of Manufacturers (KAM) to establish a Centre for Energy Management and Conservation (CEEC), gains in energy management need to be studied so as to transfer the gains to competitive advantage.

Gillingham *et al*. (2011) focused on barriers to the adoption of energy management practices such as lack of information, market failures and other related issues that have led to inefficient and low investment in energy management (Gillingham *et al*., 2006) while the current study focussed on the effect of adoption of energy management practices in attaining a firm's competitive advantages. Gillingham *et al.* (2011) further recommended that future research should focus on adoption of energy management practices with an aim of providing a framework for developing economically efficient policies to address actionable failures and as a result enhance firm competitiveness.

Therefore, the current study examined the effect of adoption of energy management practices among Kenyan manufacturers, with the possibility of transferring the gains of energy efficient practices in attaining competitive strategies. In attempting to investigate the uptake of energy management practices in attaining competitive advantages, the current study

focused on the effect of implementation of energy management practices by all firms as a cooperative imitative strategy in attaining competitive strategies. In addition, firms can competitively choose which area of interest to transfer the gains of energy efficient practices, hence retaining its competitive advantage in the market.

Table 2.1: Summary Critique of Existing Literature and Research Gaps

Study	Focus	Findings of the study	Knowledge Gaps	Findings/Contributions of the current study
Bai (2013)	Empirical focus on global analysis of trends in energy management.	41% of all global firms considered energy management as an extremely important endeavour to their firms. However, 64% of these global firms focused on carbon reduction	Empirical knowledge exists in Kenyan manufacturing sector on the significant role of energy management benefits	Empirical evidence show that energy management benefits contributes significantly in attaining competitive strategies and hence superior firm performance
Bennett (2001)	Empirical study on energy management in Africa for sustainable development-A South Africa Perspective	That the two principal motivations for the implementation of energy management practices are environmental benefits and financial benefits.	Can the financial benefits be transferred to competitive strategies?	That there is a fundamental contribution of the energy management benefits in attaining a firm's competitive processes
Mlamo (2004)	Empirical investigation of aspects of strategy	• That that energy management opportunities in Africa are often	Can the users of such resources be enlightened	That stakeholder involvement and government support is

	formulation and implementation within the Kenyan private sector	disregarded owing to the simple fact that users of such resources are unaware that they exist. He concluded that this is one of the most cost-effective ways of maximizing a firm's profitability • That education, training, management standards, appliance labelling, accreditation, regulation, audits, and information sharing as the avenues of enhancing energy management practices.	cooperatively to enhance the uptake of energy management practice?	key in promoting the practice of energy management
Moraa, S., Etyang, M., & Mwabu, G. (2011)	The Demand for Energy in the Kenyan Manufacturing Sector.	That the sector leads in electricity consumption and the second largest consumer of petroleum products and spends up to 35% of its revenue on energy bills. The study further notes that continuous use of electricity and petroleum products has been rising,	That there is need to practice energy management so as to reduce the costs	That the reduced costs and energy savings benefits can be transferred to competitive strategies in enhancing competitive advantage both locally and internationally which currently stands at

		resulting in increased costs		10.5%. That the competitiveness of the Kenyan firm will prevent investors from migrating to other countries with lower energy costs and abundant availability
Kirai (2004)	*Area of focus:* Promotion of energy management in industries: experiences from Kenya.	That there was poor uptake of energy management practices by industrial firms. And this owed to the fact that there was no assistance given by government to firms, low involvement by company CEOs, perception of expensive technology, and the size of firm as the challenges facing adoption of energy management practices.	That there is need for stakeholder involvement and information sharing?	That government agencies such as Energy Regulatory Commission, MoEP, and KAM should play a role in sensitization of energy management regulations, through enhanced stakeholder involvement. That the GOK should enhance the use of incentives

				and rebates in acquisition of energy efficient technologies for manufacturing firms
Jacinta *et al.* (2015)	The adoption of energy management measures by firms in Africa: case studies of cassava processing in Nigeria and maize milling in Kenya	They found that the average adoption of energy management, process control and technology adoption stood at 52.5%, 42.5% and 37.5% respectively, giving an average of 44.2%	That there is need to transfer the gains of energy management practices to Competitive Advantage strategies	That there is need to establish if employees in the sector were aware of energy management practices and whether the firms were practicing them

Source: Empirical Data

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter describes the research approach, design, population of study, sample, sampling method, data collection instruments as well as the methods of analysis.

The study adopted a mixed methods approach. The approach enabled collection of facts and relevant information from respondents regarding the effect of energy management on attaining competitive advantage among manufacturing firms (Hussey & Hussey, 1997). On the other hand, it facilitated the collection of both quantitative and qualitative data which was then analysed by the study so as to answer the research objectives (Creswell, 2003). A combination of qualitative and quantitative data provided an understanding of the research problem which facilitated the development of hypotheses for potential quantitative analysis (Wyse, 2011). The advantage of such approach is the ability of precision, objectivity and rigor in carrying out business research studies (Bryman & Bell, 2003).

3.2 Research Design

The study utilized survey research design. This enabled the researcher to collect data by sampling respondents selected manufacturing firms in Nairobi Kenya (Hussey & Hussey, 1997). Thereafter, it enabled statistical analysis to be carried out so as to make generalization or inferences on the manufacturing sector (Curtis & Curtis, 2011). The design enabled data to be collected from a selected group of respondents by describing, recording and analysing variables under investigation as they exist, without manipulating them (Kothari, 2004). Through this approach, the study gathered comprehensive information about the research objectives which enabled the study answer its objectives satisfactorily.

3.3 Location of the Study

The study was carried out in Nairobi County and its environs. There are 399 manufacturing firms located in Nairobi County and its surrounding areas which makes Nairobi County the only county with the highest concentration of manufacturing firms with a percentage presence of approximately 47% of all firms registered with KAM. According to the Kenya Association of Manufacturers (2015), there are 14 sub-sectors in the manufacturing sector, 12 of these specialize in processing and value addition while the other two offer essential services. The sectors are classified by the type of raw materials imported or end products and 853 firms Kenya are registered with KAM. In addition, some firms may be small or large depending on the number of workers they employ (GOK, 2012). With such number of firms located in Nairobi County, an adequate representative sample was drawn from Nairobi so as to gather data for purposes of answering the research objectives and hence generalizing the findings to Kenya's manufacturing sector at large.

3.4 Population of the Study

KNBS (2014) observed that the manufacturing companies in Nairobi County and its environs has approximately 1,459,870. The population was adequate for the study, given that Nairobi region hosts the highest number of manufacturing companies. Population, according to Slater and Curwin (2008), is the total number of units, persons or households possessing certain specified characteristics, and is of interest to the researcher from which a sample can be derived to draw inquiries. The success of any research depends on the extraction of required information from the appropriate population. The sampling frame was obtained from the management of the firms selected prior to the actual data collection. A sampling frame is the list of all units of analysis in a study population (Curtis & Curtis, 2011).

3.5 Sampling Procedure and Sample Size

3.5.1 Sampling Procedure

The study employed purposive sampling in selecting firms in Nairobi County for the study. The firms selected were used to represent the manufacturing firms in Kenya, who engage in diverse business endeavours depending on the type of product as shown in Table 3.1. However, some segments were not located in Nairobi due to the availability of raw materials and therefore, those in the food and processing segment were given more consideration, since the country is an agriculturally oriented economy (Kenya Association of Manufacturers, 2015). The lists of companies selected are shown in Annex F. A simple random sampling was then applied in selecting respondents from the selected firms. Simple random sampling ensured that every item in the population had an equal chance of being included in the sample (Kothari, 2004). It is rare to collect data from the entire population in a study because of practical constraint (Curtis & Curtis, 2011). A sample is a unit of the target population that is of interest and with sufficient characteristics that can be used to give data required for analysis (Slater & Curwin, 2008). It also refers to a smaller group obtained from a study population (Mugenda & Mugenda, 2003). The most crucial factor that determines the size of a sample to be studied is the representation that a researcher wants a sample to have and possession of the characteristics to enable it have the information being sought. It is effective to collect data from a small representative sample than the whole population due to cost and logistical considerations.

3.5.2 Sample Size

This study considered a sample of 399 respondents obtained using Yamane (1967) formula selected at 95% confidence level as shown below as adequate;

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

$$n = \frac{1{,}459{,}870}{1 + 1{,}459{,}870\,(0.05^2)}$$

$$n = \frac{1{,}459{,}870}{3650.675}$$

$$= 399$$

Population N=1,459,870

Where:

n = Desired sample size

N = Population size

e = Significance level/ Probability of error

Table 3.1: Sample Size Distribution

S/No	Manufacturing Firms in Nairobi	Membership Representation in the sector	Employees Sampled
1.	Chemical and Allied Sector	9%	36
2.	Energy, Electrical and Electronics	5%	20
3.	Food and Beverages	22%	89
4.	Leather and Footwear	1%	3
5.	Metal and Allied Sector	9%	36
6.	Motor Vehicle Assemblies and Accessories	6%	24
7.	Paper and Board Sector	8%	32
8.	Pharmaceutical and Medical Equipment	3%	12
9.	Fresh Produce	2%	8
10.	Plastics and Rubber	3%	11
11.	Textile and Apparels	7%	28
12.	Timber, Wood and Furniture	2%	8
13.	Building, Mining and Construction	3%	12
14.	Multinationals, ICT, Service and Consultancy	20%	80
		100%	**399**

Source: Kenya Association of Manufacturers (2015)

3.6 Instrumentation

This study utilized a self-administered questionnaire which was more practical and ensured that a large amount of data was collected from as many respondents as possible; they are also less time consuming. It was less costly, and was easily analysed objectively with the help of statistical software. It is also important to note that they were easily distributed among respondents and which allowed them to respond to the questions within an agreeable time frame between the researcher and the respondent (Ackroyd & Hughes 1981; Mugenda & Mugenda, 1999). Secondary data was retrieved from past studies and related literature studies obtained from government agencies, journals, books, previous student theses and online articles. According to Creswell (2012) in survey, researchers collect data using questionnaires or interviews. These data were then analysed statistically to describe trends about responses to objectives and to test hypotheses. Purposive sampling enabled the study to reach the targeted firms that held the specific characteristics sought by the study.

3.6.1 Pilot Study

To ensure reliability, a pre-test study was done. The questionnaire was piloted in RAIPLY (Rai Plywoods) Company, a wood products company based in Eldoret. Test-retest method was applied to the same employees two weeks after the first administration. All the items in the two tests were scored separately and averaged for the whole group and correlated. Spearman's Rank Correlation was used in establishing the consistency in filling the questionnaire and the employees' ability to understand the purpose of the study.

3.6.2 Validity of the Questionnaire

Validity is the extent to which an instrument measures what it purports to measure (Kimberlin, 2008). Saunder *et al.* (2003) further stated that validity refers to the reality of the

study findings. As such, content validity was used in the study. To ascertain the validity of the questionnaire, the instrument was submitted to the supervisors at the school of postgraduate studies of Kabarak University as well as colleagues and researchers from School of Business and Economics at Mount Kenya University. They were requested to scrutinize and confirm the items in the instrument by way of ensuring that they are logical and adequate to collect the desired data and whether they cover all the areas under investigation in the study. There being no statistical test to determine whether a measure adequately covers a study area, content validity usually depends on judgment of experts in a particular field.

3.6.3 Reliability of the Instrument

This is the degree to which the research instrument yields consistent results after repeated trials. Reliability is influenced by random error of which if it is high, reliability is low. Errors can arise due to instruction and language difficulty (Mugenda & Mugenda, 1999). The Cronbach's Coefficient alpha after the test-retest method showed a reliability value at $\alpha \geq 0.7$ on the piloted questionnaire. The calculated values for the distributed questionnaire for the final analysis, all met the same threshold also as shown in Table 4.1 in chapter 4.

3.7 Data Collection Procedure

The researcher obtained a letter of authority from the Institute of Postgraduate at Kabarak University, which was submitted to National Council for Science and Technology (NACOSTI) for further approval. Thereafter, the permit to collect data from NACOSTI and the letter issued was presented in all relevant ministries of the Kenyan Government which acknowledged the permission to proceed to data collection. Four research assistants were contracted to assist in collecting data. Each assistant was issued with a badge, letter from Kabarak University, NACOSTI permits and letter of introduction to all companies selected.

They were also inducted on the ethical considerations when collecting data. They were also requested to carry their national identity cards and the researchers contacts were also indicated in the letter of introduction.

Research questions, which were relevant to the information needed, were formulated, and distributed by the researcher to the respondent together with the research assistants, with a request to fill and return them. The study utilized structured questionnaire with both open-ended and closed-ended questions. This method was more suitable for the study since it sought for factual answers and opinions relative to the simple 5-Point Likert scales. The questionnaires were distributed to the middle level staff, and the 19 financial managers for the purpose of obtaining percentage energy expenses of selected companies. It was possible to collect relevant and sufficient information to help the researcher meet the objectives of the study. This method enabled the study to obtain objective information with no influence with regard to the study objectives (Mugenda & Mugenda, 2003).

Secondary data was retrieved from past studies and related literature such as studies by Kenya Association of Manufacturers, Kenya National Bureau of Statistics annual reports, Energy Regulatory Commission reports, International Energy Agency, Institute of Economic Affairs, United Nations Development Organization, Online Journals, and Unpublished student theses.

3.8 Data Analysis

The data was analysed using both descriptive and inferential statistics. It was then presented using Tables and Figures.

3.8.1 Descriptive Statistics

Descriptive statistics included frequency distribution, mean, standard deviation and percentages. The 5-Point Likert scale data were averaged to obtain continuous data on the 9 variables for each independent variable. The 9 averaged mean scores were then subjected to descriptive and inferential analysis. Seva (2014) notes that averaged means are useful in Likert scales types data so as to facilitate further quantitative analysis. However, he also noted that Likert scale type of data can be simplified further into arithmetic means by totalling all individual responses and calculating the arithmetic mean scores.

3.8.2 Inferential Statistics

Correlation were used to estimate and establish the association between the variables under investigation while multiple regression analysis was used to fit a linear relationship dependent variable on independent variables and F-test to test the hypothesis on the significant effect of energy management practices on attaining competitive advantage. Test for agreement done using chi-square.

The model specified for the study is as hereunder:

$$Y = a + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_{4+} e$$

Where:

Y= Competitive Advantage (CA)

a=the constant value or y-intercept

β_1, β_2, β_3 and β_4= parameters to be estimated

X_1=Implementation of energy management regulations (EMP)

X_2= Implementation of company energy management policy (CEMP)

X_3= Implementation of energy efficient technology (EET)

X_4= Percentage energy expenses on electricity and petroleum products on total revenue (EExp)

e=error term/stochastic term

The Likert scale scores were averaged scales (1-5) which were then used in correlation and multiple regression to establish the relationship among variables. F-test for multiple linear regression was used to find out if significant difference existed between response among the sampled manufacturing firms.

$$F = \frac{R^2/(k-1)}{(1-R^2)/(n-k)}$$

Where:

F = F-test for Linear Regression

R^2 = Explained Variation

$1 - R^2$ = Unexplained Variation

n = Number of Samples/groups

k = Number of Independent

Hypothesis 1: Implementation of energy management policy has no significant effect on attaining competitive advantage among manufacturing firms. Ho_1: $\beta_1 = 0$

Hypothesis 2: Implementation of company energy management policy has no significant effect on attaining competitive advantage among manufacturing firms. Ho_2: $\beta_2 = 0$

Hypothesis 3: Implementation of energy efficient technology has no significant effect on attaining competitive advantage among manufacturing firms. Ho_3: $\beta_3 = 0$

Hypothesis 4: Percentage energy Expenses has no significant effect on attaining competitive advantage among manufacturing firms. Ho_4: $\beta_4 = 0$

Table 3.2: Table Summary of Hypotheses Testing Framework

Hypothesis	Test criteria
H_{01}: Implementation of energy management policy has no significant effect on attaining competitive advantage among manufacturing firms	$p \leq 0.05$ Reject H_{01} if $p \leq 0.05$
H_{02}: Implementation of company energy management policy has no significant effect on attaining competitive advantage among manufacturing firms	$p \leq 0.05$ Reject H_{02} if $p \leq 0.05$
H_{03}: Implementation of energy efficient technology has no significant effect on attaining competitive advantage among manufacturing firms.	$p \leq 0.05$ Reject H_{03} if $p \leq 0.05$
H_{04}: Percentage energy Expenses has no significant effect on attaining competitive advantage among manufacturing firms.	$p \leq 0.05$ Reject H_{04} if $p \leq 0.05$

Source: Research Objectives

3.9 Ethical Consideration

The researcher sought authorization from NACOSTI, while MOHEST, County Government of Nairobi Education Directorate, Kenya Association of Manufactures, were notified before the researcher embarked on data collection. The Ministry of Energy and Petroleum was also notified before carrying out data collection from respondents. Participants were also assured of their privacy and confidentiality of data collected during the entire process of carrying collecting data.

The research instrument was critically examined to ensure that it did not in any way aggravate the respondents. Respondents were also given assurance that the findings of the study would only be limited to the study.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND DISCUSSION

4.1 Introduction

The chapter presents the research response rate, assessment of reliability, test for normalcy, linearity, homogeneity, demographic characteristics, education levels, firm size, percentage energy Expenses, and descriptive analysis of all the study variables. Also presented in this chapter are the correlation analysis and regression results.

4.2 General and Demographic Information

4.2.1 General Information

This captured the response rate and reliability test as hereunder:

Response Rate: According to American Association for Public Opinion Research (AAPOR, 2010), response rate is the end results or outcome for surveys. A high response rate helps to ensure that the survey results are representative of the survey population (Data Analysis Australia, 2013; Wyse, 2012). The study targeted a sample of 399 respondents. The researcher managed to successfully collect data from 314 of them. This represented a response rate of 78% of the sample size. The researcher considered the response rate to be good enough, since it was above appropriate threshold of 55.6% (Baruch, 1999).

The data were thereafter coded and cleaned through extensive checks for consistency. The data was then analysed using a set of descriptive and inferential statistics using Statistical Package for Social Sciences (SPSS) and Statistical Analysis Software (SAS).

Assessment of Reliability of Study Measure: Table 4.1 provides a summary of test results for the reliability test carried out after data collection and analysis was completed. The results revealed that the threshold of 0.7 cronbach's alpha was met.

Table 4.1: Summary of Cronbach Alpha Reliability Coefficients

Variables	Measures	Cronbach Alpha coefficients
Energy management practices	Energy Management regulations	0.799
	Company energy management policy	0.837
	Energy efficient technology	0.701
	% Expenses on electricity and petroleum	0.772
Competitive advantage	Cost leadership	0.752
	Higher profit margins	0.766
	Product differentiation	0.703

Source: Research Data

The study assessed the psychometric properties of the constructs despite the fact that many of the measures used in this study were adopted from well-established scales in the extract literature. Cronbach's alpha coefficient was used to measure the reliability of the scale. The coefficient was used to determine the inter consistency or average correlation of items in the survey instrument to gauge its reliability (Sekaran, 2003). The measures of study variables each had a Cronbach's alpha coefficient greater than 0.70 (Table 4.1). The study measures were found to be highly reliable in that they all had an alpha coefficient greater than the minimum accepted Cronbach's alpha coefficient of 0.70 which was the predetermined cut off point.

Assessment of Normality, Linearity, Homogeneity: In order for the results to be subjected for further statistical analysis, it was necessary to assess the assumptions of normality, linearity and homogeneity as shows in Table 4.2.

Table 4.2: Results of Tests of Statistical Assumptions

Variable	**Normality Test (Shapiro-Wilk Test)**	**Homogeneity (Levene's Test)**
Threshold assumption	P > 0.05	P < 0.05
Energy Management Regulations	0.597	0.026
Company Energy Management Policy	0.096	0.000
Energy Efficient Technology	0.507	0.284
Percentage Energy Expenses	0.363	0.000

*Dependent Variable-Competitive Advantage (CA)

Source: Research Data

The data were tested for the key assumptions of parametric nature. Data normality was tested using a non-parametric goodness of fit test, the Shapiro-Wilk test. This is a goodness-of-fit measure for continuous scaled data which tests to determine if the sample was obtained from a uniform distribution. This test evaluates and compares the cumulative distribution function for variables within a specified distribution (Malhotra & Dash, 2011**)**. The goodness-of-fit test assessed whether the observations could logically have come from the specified distribution. The results of the test revealed that the data were normally distributed (Table 4.2).

Homogeneity of variance was also tested (heteroskedasticity test) as shown in Table 4.2. This refers to the assumption that the dependent variable exhibits similar amounts of variance across the range of values for an independent variable (Gastwirth *et al*., 2009). The test was done using Levene's test of homogeneity of variances. The test was statistically significant at p=0.05 except for energy efficient technology, hence the assumption that the population variances are equal was rejected and the study concluded that energy management practices exhibited different amount of variance towards the dependent variable. The study noted that the significance for equality of means was statistically significance at p=0.05 hence the study concluded that the difference between means were likely due to chance and was considered for further analysis as shown in Annex L.

4.2.2 Demographic Data

*Number of Years Worked * Employee Gender:* In an effort to establish the experience of the respondents, the firm employees were required to state the number of years they have worked in their manufacturing firm and their responses recorded in Table 4.3a and Table 4.3b.

Table 4.3$_a$: Number of Years Worked * Employee Gender

Years Worked

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-4 Years	212	67.5	67.5	67.5
	5-9 Years	68	21.7	21.7	89.2
	10 Years and Over	34	10.8	10.8	100.0
	Total	**314**	**100.0**	**100.0**	

Table 4.3$_b$: Years Worked * Employee Gender Cross tabulation

			Employee Gender		Total
			Male	**Female**	
Years Worked	0-4 Years	Count	164_a	48_b	212
		% within Years Worked	77.4%	22.6%	100.0%
	5-9 Years	Count	57_a	11_a	68
		% within Years Worked	83.8%	16.2%	100.0%
	10 Years and Over	Count	34_a	0_b	34
		% within Years Worked	100.0%	0.0%	100.0%
Total		**Count**	**255**	**59**	**314**
		% within Years Worked	**81.2%**	**18.8%**	**100.0%**

Each subscript letter denotes a subset of Employee Gender categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.232[a]	2	.006
Likelihood Ratio	16.432	2	.000
Linear-by-Linear Association	9.537	1	.002
N of Valid Cases	314		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.39.

Source: Research Data

From Table 4.3$_a$, the study revealed that 67.5 % of the total employees which was comprised of (77.4% male and 22.6% female, Table 4.3$_b$) had worked between 0 and 4 years while 21.7% of the employees which was comprised of (83.8% male and 16.2% female, Table 4.3$_b$) had worked between 5 and 9 years and 10.8% which was comprised of (34% male, Table 4.3$_b$) of the manufacturing firms' employees had worked for over 10 years. The results were also significant at 5% significant level indicating that years worked in a firm contributes significantly to the knowhow on energy management, hence enabling a firm attain competitive advantage. The results also indicated that manufacturing firms are able to retain 32.5% of their staff for long periods of more than 5 years, hence enabling the employees gain experience and familiarity with the company energy management efforts hence complementing the firm's efforts in attaining competitive advantage through energy management benefits. The findings also showed that majority of the company's employee's (67.5%) have worked for a short period, indicating a likelihood of high turnover among the newly employed staff. This likelihood of "turnover" makes it difficult for the company to provide continuous information and training on energy management practices to its staff. As a result, the firm is forced to keep training new employees as a result of those leaving the firm.

Table 4.4$_a$: Employee Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-29	91	29.0	29.0	29.0
	30-39	144	45.9	45.9	74.8
	Above 40	79	25.2	25.2	100.0
	Total	**314**	**100.0**	**100.0**	

Table 4.4$_b$: Employee Age * Employee Gender Cross tabulation

			Employee Gender		Total
			Male	Female	
Employee Age	20-29	Count	45_a	46_b	91
		% within Employee Age	49.5%	50.5%	100.0%
	30-39	Count	131_a	13_b	144
		% within Employee Age	91.0%	9.0%	100.0%
	Above 40	Count	79_a	0_b	79
		% within Employee Age	100.0%	0.0%	100.0%
Total		Count	255	59	314
		% within Employee Age	81.2%	18.8%	100.0%

Each subscript letter denotes a subset of Employee Gender categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	87.425[a]	2	.000
Likelihood Ratio	89.967	2	.000
Linear-by-Linear Association	73.734	1	.000
N of Valid Cases	**314**		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 14.84.

Source: Research Data

Table 4.4$_a$ showed that majority of the employees were youthful employees (74.9%) belong to the category of staff (20-39 years combined). These categories of staff are resourceful for a

firm in promoting their efforts of energy management practices in attaining a competitive edge among its rivals.

Table 4.4_b, showed that there are fewer female employees (18.8%) in the manufacturing sector compared to the male counterparts (81.2%). The results were also significant at 5% significant level indicating that employee age contributes significantly in duration of training and knowledge management on energy management, hence enabling a firm attain competitive advantage. This presents a gender imbalance concerns. However, it can be concluded that with the nature of work in the sector which is physical-intensive, female employees right from the training institutions are not attracted to programmes that can lead to employment in the sector, nor are they able to withstand such physical involving work that is characterising the manufacturing sector. It is also important to note that the sector is characterized with youthful employee population as shown in Table 4.4_b where 74.8% of the employees are between the ages 20-39 years combined. With such a vibrant populace, the manufacturing sector needs to tap into their abilities in training and sensitization so as to promote the practice of energy management practices which leads to attainment of competitive advantage and its sustenance thereof.

*Level of Education * Employee Gender:* To determine the level of education attained, the respondents were required to evaluate the level of education they had attained and their responses were captured as in Table 4.5.

Table 4.5: Education Level * Employee Gender Cross tabulation

Education Level * Employee Gender Cross tabulation					
			Employee Gender		Total
			Male	Female	
Education Level	Degree	Count	197_a	24_b	221
		% within Education Level	89.1%	10.9%	100.0%
	Diploma/Cert	Count	58_a	35_b	93
		% within Education Level	62.4%	37.6%	100.0%
Total		**Count**	**255**	**59**	**314**
		% within Education Level	**81.2%**	**18.8%**	**100.0%**

Each subscript letter denotes a subset of Employee Gender categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.751[a]	1	.000
Continuity Correction[b]	29.022	1	.000
Likelihood Ratio	28.388	1	.000
Fisher's Exact Test			
Linear-by-Linear Association	30.653	1	.000
N of Valid Cases	**314**		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 17.47.

b. Computed only for a 2x2 table

Source: Research Data

From Table 4.5, 29.6% (male and female) of the employees in the manufacturing sector had certificate or diploma level of education while 70.4% (male and female) had degree level of education. The results were also significant at 5% significant level indicating that education

level contributes significantly to the knowhow on energy management, hence enabling a firm attain competitive advantage. With such level of literacy in education qualification companies may not have a challenge in training staff, if they have to effectively implement energy management practices, which in return contributes to the attainment of competitive advantage in the manufacturing sector. However, the study notes that most companies have not taken advantage of their employee's literacy levels in facilitating the ease of sharing information on energy management practices. As such, this becomes an impediment to the conquest for competitive advantage in such a sector which superior performance is imperative for success.

4.3 Energy Management Practices-Chi-Square Goodness-of-Fit Test

The section presents the Chi-Square Test on whether employee responses followed a particular distribution (in this case, if the employees responses were the same across the different dimension) for both the independent and dependent variables of the study.

Energy management practice was the independent variable for the study and was assessed using four measures namely: energy management regulations, company energy management policy, energy efficient technology and percentage Expenses of electricity and petroleum on total revenue. On a scale of 1 to 5 (where *1 = Strongly Disagree, 2 = Disagree, 3 = Not Sure, 4 = Agree, 5 = Strongly Agree*), the respondents stated the effect of energy management practices adoption in their organizations. Each dimension for both the independent and dependent variable had further 9 variables which captured employee responses and their analysis presented in Tables 4.6, 4.7, 4.8 and 4.9.

4.3.1 Intensity of Energy Management Regulations (Chi-Square Test)

Table 4.6: Intensity of Energy Management Regulations (Chi-Square Test)

Test Statistics									
S/No.	**Variable**	**SD**	**D**	**NS**	**A**	**SA**	**Chi-Square**	**df**	**Asymp. Sig.**
1.	Member of ERC & Implementation of Energy Management Regulations	2 0.6%	25 8%	178 56.7%	96 30.6%	13 4.1%	349.981[a]	4	0.000
2.	Has Documented Policy with ERC		44 14%	140 44.6%	82 26.1%	48 15.3%	75.350[b]	3	0.000
3.	Has Energy Officer & Keeps Records of Energy Consumptions	11 3.5%	24 7.6%	138 43.9%	117 37.3%	24 7.6%	227.497[a]	4	0.000
4.	Carried At least One Energy Audit		62 19.7%	92 29.3%	113 36%	47 15%	33.592[b]	3	0.000
5.	Submitted Audit Report to ERC		88 28%	85 27.1%	92 29.3%	49 15.6%	15.096[b]	3	0.002
6.	Developed & Submitted Energy Management Investment Plan	7 2.2%	33 10.5%	99 31.5%	130 41.4%	45 14.3%	161.541[a]	4	0.000

7.	Reviews its Energy Management Investment Plan	12 3.8%	22 7%	152 48.4%	127 40.4%	1 0.3%	320.745[a]	4	0.000
8.	Prepared and Submitted Energy Management Implementation Report		57 18.2%	139 44.3%	106 33.8%	12 3.8 %	118.484[b]	3	0.000
9.	Firm Audited and Awarded Compliance Certificate	23 7.3%	23 7.3%	149 47.5%	94 29.9%	25 8%	207.019[a]	4	0.000

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 62.8.

b. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 78.5.

Note: Refer to Annex H: Chi-Square Frequencies for Goodness-of-Fit Test of agreement for Energy Management Regulations

Source: Research data

Energy Management Regulations had 9 variables that the study sought to gather responses to. In order for the study to obtain adequate feedback from respondents, the 5 Likert scale items were presented to the respondents and their responses analysed and presented in Table 4.6.

Membership with ERC and implementation of energy management regulations was statistically significant Chi-Square (χ^2 = 349.981[a] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether membership to Energy Regulatory Commission led to attaining competitive advantage among manufacturing firms, hence facilitating further analysis. The finding showed that manufacturing companies had diverse opinions on the contribution of membership to Energy Regulatory Commission in attaining competitive advantage, with majority of the respondents having a positive preference. As such, membership to Energy Regulatory Commission should be a consideration in attaining competitive advantage (Energy Regulatory Commission, 2012).

Documentation of policy was statistically significant Chi-Square (χ^2 = 75.350[b] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether documentation of company energy management policy led to attaining competitive advantage among manufacturing firms, hence facilitating further analysis. The finding showed that manufacturing companies had diverse opinions on the contribution of documented energy management policy in attaining competitive advantage, with majority of the respondents having a positive preference. The findings agree with (UNIDO, 2008) which noted that nations with an emerging and fast increasing manufacturing sector have a particular prospect to increase their competitiveness by applying energy-efficient best practices from the onset in their industrial facilities.

Having an energy officer and keeping of records of energy consumptions was statistically significant Chi-Square (χ^2 = 227.497[a] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether presence of energy officer and record keeping on energy consumptions data led to attaining competitive advantage among manufacturing firms, hence facilitating further analysis. The finding showed that manufacturing companies had diverse opinions on the contribution of presence of energy officer and record keeping on energy consumptions data in attaining firm competitiveness. The results showed that the presence of a company energy officer or staff that monitors energy expenses and consumption led to significant improvement in attaining competitive advantage among manufacturing firms. The study also noted that there was positive preference on the presence of a company energy officer or staff as a practice that can lead to attainment of competitive advantage through continued monitoring of energy consumptions. UNIDO in its study in USA and Mexico supports the current study finding by recommending a well-established system of independent auditors to assure compliance and uphold all certification processes of companies that practice energy management (UNIDO, 2008).

Carrying out of at least one energy audit was statistically significant Chi-Square (χ^2 = 33.592[b] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether conducting at least one energy audit led to attaining competitive advantage among manufacturing firms, hence facilitating further analysis. The finding showed that manufacturing companies had diverse opinions on the contribution of carrying out at least one energy audit in attaining firm competitiveness, with the respondents showing a preference for such practice. This indicated that if manufacturing company carried out energy audits, the resultant effect is a significant improvement in

attaining competitive advantage among manufacturing firms. Price and Wang (2007) as cited by (UNIDO, 2008) agrees with the study findings that energy audits remained as one of the key strategies in promoting energy management practice so as to enable the company control deviations that might impede organizational efforts in energy management efforts. Their study further stated that, collecting data on all major energy-consuming processes, collecting data on equipment and other related machinery in a plant, documenting technologies used in all production processes, and identifying opportunities for energy management improvement by a company assists in preparing detailed report with appropriate recommendations for the company to adopt. It concludes its report by supporting energy management audits as the essential first step in identifying opportunities that can contribute to an organization's energy management targets.

Submission of an audit report to ERC was statistically significant Chi-Square (χ^2 = 15.096[b] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether submission of audit report to the ERC led to attaining competitive advantage among manufacturing firms, with the respondents showing a preference for such practice, hence facilitating further analysis. This indicated that the submission of such reports contributed a significant improvement in attaining competitive advantage among manufacturing firms. Wajer and Helgerud (2007) in their study carried in 11 European countries agrees with the study findings that individual companies who practice energy management are able to report its energy usage data once a year to national data gathering systems. Their study revealed that data for each three years has to be reported. Hence, it becomes imperative that manufacturing companies in Kenya also become obligated in presenting its yearly reports to Energy Regulatory Commission for verification and recommendations on how to better energy management efforts.

Development and submission of energy management investment plan was statistically significant Chi-Square (χ^2 = 161.541[a] at p < 0.05). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether developing and submitting energy management investment plan to Energy Regulatory Commission led to attaining competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that the submission of energy management plan to ERC contributes a significant improvement in attaining competitive advantage among manufacturing firms. UNIDO in its study findings carried out in the USA and Mexico further agreed with the study finding by stating that evaluations of energy management efforts and action plans helped firms to focus their attention on energy management and identify low-cost energy management options within a commonly agreeable investment benchmarks (UNIDO, 2008).

Reviewing of energy management investment plan was statistically significant Chi-Square (χ^2 = 320.745[a] at p < 0.05). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether reviewing energy management investment plan led to attaining competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that compliance in continued revision of energy management plan does contribute to improvement in attaining competitive advantage among manufacturing firms. Studies by UNIDO albeit agrees with the findings but recommends typical reviews of energy management practices by an independent third party and be updated as need arises in response to changes over time. UNIDO further argued that energy reviews should focus on company's energy usage and uses, its energy management measures, a timeframe for implementing energy management measures and expected results (UNIDO, 2008).

Preparation and submission of energy management implementation report to ERC was statistically significant Chi-Square (χ^2 = 118.484[b] at p < 0.05). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether preparing and submission of energy management implementation report led to attaining competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that the preparation and submission of energy management implementation report contributes a significant improvement in attaining competitive advantage among manufacturing firms. The study finding agrees with UNIDO which recommended that certification of compliant organization enhances the practice of energy management among manufacturing organizations (UNIDO, 2008). Hence, this should be a requirement among all manufacturing firms in Kenya.

Firm auditing and award of compliance certificate was statistically significant Chi-Square (χ^2 = 207.019[a] at p < 0.05). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether firm auditing and awarding of compliance certificate led to attaining competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that auditing of manufacturing firms and awarding of compliance certificate contributed to improvement in attaining competitive advantage among manufacturing firms. Natural Resource of Canada (2002) supports the study finding by noting firms should carry out energy audits since it remained a fundamental step in developing organizational energy management program. It further states that energy audit varies widely from one organization to another but the ultimate goal is to improve energy management and decrease energy costs. The guidelines acknowledge that external consultants usually carry out energy audits and organizations have a great opportunity in utilizing internal personnel. In its summary, Natural

Resource Canada (2002) notes with great emphasis that energy audits enable a firm to verify effectiveness of its energy management opportunities.

The summary result for objective 1 is supported by the Energy Management Regulations which requires that all manufacturing companies should enforce and adopt the Energy Management Regulation (Energy Regulatory Commission, 2012). Studies in Australia agrees with the current result by establishing that energy management practices are compulsory for large energy using firms while in Denmark and Netherlands, it is a voluntary initiative (IEA, 2012). The Government of South Africa (2004) report also points out that the world energy assessment leads to a cost reduction of up to 35% over a period of 20 years, if the appropriate policies are implemented in support of existing energy management practices. In Kenya, energy management practices also are a voluntary exercise since the government seem to lack capacity in enforcing energy management regulations 2012, and this explains why the sector still incurs high cost on petroleum and electricity as shown in Table 4.9, with an average Expenses of 10.5% of their revenues.

The report by (ERC, 2016) shows that 268 company energy management policies were approved for implementation by the end of 2016. However, the current study findings show that most employees in manufacturing companies are “not sure” if it is being implemented in their companies. This implied that due to the stiff penalties of KES. 1 Million Levied if a company does not submit the guidelines for approval, most companies were fulfilling the requirement without the desire of implementation in their companies. The incidence is no different from the U.S. where most manufacturers have chosen not to participate in voluntary government energy management programs and organizations (Jasinowski, 2000). This disagrees with the findings in Kenya which showed that the Kenya Energy Efficiency Accord launched in September 2011, saw 19 KAM member companies sign up voluntarily

committing themselves to reduce their energy consumption of between (5%) and (15%) by 2016 with 10 more companies registering in 2012. However, by 2016 the consumption in the manufacturing sector had increased by 2.9% for electricity and 8.9 for petroleum products with a likelihood of more increase in consumption (KNBS, 2017).

The Kenyan manufactures also face the same predicament as their counterparts in the U.S where government involvement is very low or absent and the Kenya Manufactures Association are seen to be leading the cause (Jasinowski, 2000). The findings by (Fischer, 2013) supports the results of the current study in that that in 2013, the U.S. was just 39% efficient in energy use. This implies that 61% of the firms and households did not practise energy management and the same scenario is not different in Kenya. The current study findings are also supported by studies in South Africa (Mlamo, 2004) who established that energy management opportunities in Africa are often disregarded owing to the simple fact that users of such resources are unaware that they exist.

However, the study shows that a few companies that participate in the yearly energy management awards organized by Kenya Association of Manufacturers (KAM) are able to implement such guidelines (Kiema, 2014 & Laurea, 2015). In addition, findings from a report presented by Beacock and Kingham (2005) resolved that companies need to; provide an energy management policy to all staff, and promote awareness campaign on energy management practices which is not so, in the current situation.

4.3.2 Intensity of Company Energy Management Policy (Chi-Square Test)

Table 4.7: Company Energy Management Policy (Chi-Square Test)

		Test Statistics							
S/No.	Variable	SD	D	NS	A	SA	Chi-Square	df	Asymp. Sig.
1.	Notices & Reminders on Energy Conservations Actions			56 17.8%	172 54.8%	86 27.4%	69.274[a]	2	0.000
2.	Employees are Trained on Energy Efficiency Measures	1 0.3%	2 0.6%	53 16.9%	170 54.1%	88 28%	314.312[b]	4	0.000
3.	Company Benchmarks With Other Firms		22 7%	13 4.1%	165 52.5%	114 36.3%	206.688[c]	3	0.000
4.	Firm Reviews and Analyses Data on Energy Use		57 18.2%	72 22.9%	151 48.1%	34 10.8%	98.611[c]	3	0.000
5.	Frequent Check-ups on Motor-Powered Equipment and Machines		66 21%	39 12.4%	181 57.6%	28 8.9%	188.191[c]	3	0.000
6.	Investment in Insulation & Mouldings	12 3.8%	80 25.5%	95 30.3%	115 36.6%	12 3.8%	146.796[b]	4	0.000

7.	Company Gets Tax Relief for	2	68	116	116	12	190.522[b]	4	0.000
	EE Practices	0.6%	21.7%	36.9%	36.9%	3.8%			
8.	Received Energy Auditors	1	56	73	150	34	197.497[b]	4	0.000
		0.3%	17.8%	23.2%	47.8%	10.8%			
9.	There are Energy Reduction	24	56	60	139	35	129.599[b]	4	0.000
	Targets	7.6%	17.8%	19.1%	44.3%	11.1%			

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 104.7.

b. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 62.8.

c. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 78.5.

Note: Refer to Annex I: Chi-Square Frequencies for Goodness-of-Fit Test of agreement for Company Energy Management Policy

Source: Research Data

Company Energy Management Policy had 9 item questions that the study sought to gather responses to. In order for the study to obtain adequate feedback from respondents, the 5 Likert scale items were presented to the respondents and their responses analysed and presented in Table 4.7.

Notices and reminders on energy conservations actions was statistically significant Chi-Square (χ^2 = 69.274[a] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether notices and reminders on energy conservations actions led to attaining competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that notices and reminders on energy conservations actions contributed to improvement in attaining competitive advantage among manufacturing firms. The findings and recommendations by (UNIDO, 2013) supports the study findings, by establishing that; the successful implementation of an energy management practices requires the commitment and determination of staff at every level of the firm. It further recommends that during the planning phase for energy management, firms should identify staffs that have both a direct and indirect influence on energy usage within the firm and in addition, the training needs for those people so as to achieve the desired objectives .

Employee training on energy efficiency measures was statistically significant Chi-Square (χ^2 = 314.312[b] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether training of employees on energy efficiency measures led to attaining competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that training of employees on energy management practices led to significant improvement in attaining competitive advantage among manufacturing firms. Studies by

UNIDO supports the current finding by stating that capacity-building is one of the key avenues to create system optimization experts, now and in the near future, who can advance the practice of energy management practices (UNIDO, 2008).

Company benchmarks with other firms was statistically significant Chi-Square (χ^2 = 206.688[c] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether company benchmarks with other firms led to attaining competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that benchmarks on energy management practices leads to significant improvement in attaining competitive advantage among manufacturing firms. UNIDO (2013) agrees with the current study findings that in addition to securing top management commitment when implementing energy management practices, there is need for benchmarking or comparing the company's efforts on energy management practices from the entire manufacturing sector or part of the sector. In doing so, the availability of relevant benchmarks can provide evidence for improvement where possible. The same report recommends that companies that endeavour to practice energy management should measure and monitor their energy performance while comparing achievements with previous years. U.S. Environmental Protection Agency (2013) agrees with the study findings by recommending that successful benchmarking programs should be tailored to conform to the structure and culture of each organization. It further stated that, although a distinct approach may not address the requirements of every firm, all organizations stand to benefit by implementing a benchmarking initiatives. Wajer and Helgerud (2007) in their study in Europe is consistent with the study finding that benchmarking exercises enables a firm to eliminate identified inefficiencies in energy usage.

Firm reviews and analysis of data on energy use was statistically significant Chi-Square (χ^2 = 98.611[c] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether energy management reviews and analyses of data on energy use led to attaining competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that if manufacturing company frequently reviewed and analysed data on energy use, the resultant effect is a significant improvement in attaining competitive advantage among manufacturing firms. The findings by (UNIDO, 2013), agrees with the current findings in stating that energy auditors and managers appointed by respective companies have a role in providing guidance and advice to the company management on energy management efforts. In addition, they should also provide assistance in reviewing energy management activities to ensure organization objectives are attained with regard to energy management initiatives and action plans.

Frequent check-ups on motor-powered equipment and machines was statistically significant Chi-Square (χ^2 = 188.191[c] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether frequent check-ups on motor-powered equipment and machines led to attaining competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that frequent check-ups on motor-powered equipment and machines contribute a significant improvement in attaining competitive advantage among manufacturing firms. UNIDO (2013) agrees with the study findings by recommending that organizations need to check back on what has happened previously by frequently checking records such as training plans, operator logs, action plans and the various other spread sheet tools associated with energy management practices to ensure conformity.

The report further notes that once the company has a breakdown of the different energy uses, it is imperative to check energy usage by different systems against the energy bills incurred by the firm, so as to address inefficiencies that might arise out of the monitoring.

Investment in insulation and mouldings was statistically significant Chi-Square (χ^2 = 146.796[b] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether investment in insulation & mouldings led to attaining competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. It therefore, indicated that investment in insulations of heaters, and moulding machines contributes a significant improvement in attaining competitive advantage among manufacturing firms. The findings are supported by the recommendations from (UNIDO, 2013) which noted that insulation of piping is suitable in manufacturing systems to reduce the risk of leakage in welded joints and minimize heat loss for heat related systems.

Company receipt of tax relief for energy efficiency practices was statistically significant Chi-Square (χ^2 = 190.522[b] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether provision of tax relief to manufacturing companies due to energy management practices led to attaining competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that provision of tax relief for energy management practices or initiatives by government agencies contribute to improvement in attaining competitive advantage among manufacturing firms. The findings agree with the recommendations by UNIDO that tax incentives and recognition is a major boost to the industrial sector in advancing the cause for energy management practices (UNIDO, 2008)

Visits by energy auditors was statistically significant Chi-Square (χ^2 = 197.497[b] at p < 0.05). This indicated that there was a statistically significant difference of agreement among manufacturing firms on the visits by energy management auditors led to attaining competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that when the government sends energy management auditors to conduct energy management audits in manufacturing firms, it contributes to improvement in attaining competitive advantage among manufacturing firms. The findings agrees with (UNIDO, 2013) which recommended in its study that energy management auditors when conducting internal audit needs to have adequate experience or training in systems audits and to understand the Energy Management System requirements.

Presence of energy reduction targets was statistically significant Chi-Square (χ^2 = 129.599[b] at p < 0.05). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether the presence of energy reduction targets led to attaining competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. The finding is supported by UNIDO which noted that target-setting agreement with relevant energy related organization is a significant effort towards enhancing firm competitiveness (UNIDO, 2008).

The overall results from Table 4.7 reveal a positive preference for company energy management policies towards the management of electricity and petroleum resources by manufacturing companies. The study finding illustrates that company initiated energy management practices can yield benefits that can be harnessed by manufacturing firms so as to improve its competitive advantages and also reduces expenses on electricity and petroleum

costs, which stood at an average annual expense of 10.5% of the total firm revenues as shown in Table 4.9.

The positive preference by manufacturing companies on the implementation of company energy management policy is consistent with the findings of Abed *et al.* (2015) which revealed that if companies consider energy management stickers and notes when purchasing equipment and machines, this can enable manufacturers to be informed by the informative labels affixed to manufactured products indicating products' energy performance and management in a way that allows for comparison between similar products or endorses the products' use. However, the ability by manufacturing companies in implementing company energy management practices is hampered by finance as indicated by ERC (2013) which showed that the largest barrier to implementation of energy efficient practices is finance and lack of sufficient incentive from government such as tax rebates and exemptions for importation and purchase of well labelled energy efficient technologies, equipment or machinery. UNIDO (2013) agrees to the current findings by recommending that care must be taken so that organizational policy is not just considered as a symbol of management commitment without actual commitment place to support it. Organizational energy management policy required continual improvement of energy performance, commitment to provide the necessary resources, commitment to provide the necessary resources, commitment to comply with all legal and other requirements, and support for the purchase of energy efficient products and services where economically feasible so as to promote the practice of energy management and enhance competitiveness of the firm.

The findings agree with Jasinowski (2002) who showed that nearly (60%) of manufacturers in USA foresaw the practice of electricity management providing a saving of up to 20% on their energy Expenses (Jasinowski, 2002). The report further showed that majority of the

manufacturers in USA would consider taking additional voluntary steps, such as developing an energy management information campaign for employees. The findings further revealed that approximately 85% of the companies answered “yes” when asked, “Has your company undertaken energy management actions in the past five years?”

The result further agrees with the findings in the U.S. studies, which showed that nearly 4 out of 10 company managers had been trained in energy efficient practices; and approximately 1 in 3 managers benchmarked against baseline energy use (Jasinowski, 2002). It is also important to note that the findings from the U.S. study shows that more than 90% of the companies had not developed company energy management policy; although 40% of them said they would consider developing energy efficiency information campaign for employees.

4.3.3 Intensity of Energy Efficient Technology Investment (Chi-Square Test)

Table 4.8: Investment on Energy Efficient Technology (Chi-Square Test)

Test Statistics

S/No.	Variable	SD	D	NS	A	SA	Chi-Square	df	Asymp. Sig.
1.	Motor-powered equipment has low energy consumption rating		67 21.3%	53 16.9%	132 42%	62 19.7%	49.898[a]	3	0.000
2.	Electronic equipment that has low energy consumption rating			208 66.2%	90 28.7%	16 5.1%	179.185[b]	2	0.000
3.	Motor-powered machines that has low energy consumption rating	19 6.1%	56 17.8%	179 57%	57 18.2%	3 1%	303.771[c]	4	0.000
4.	Company lighting system uses less energy wattage		179 57%	44 14%	53 16.9%	38 12.1%	173.006[a]	3	0.000
5.	Company lighting system is automated	17 5.4%	61 19.4%	109 34.7%	91 29%	36 11.5%	91.541[c]	4	0.000
6.	Installation of heating systems that are automated	17 5.4%	62 19.5%	108 34.6%	91 29%	36 11.5%	91.541[c]	4	0.000
7.	Installation of ventilating and cooling systems are automated	14 4.5%	55 17.5%	140 44.6%	81 25.8%	24 7.6%	163.038[c]	4	0.000

8.	Company electricity system is electronically monitored	99 31.5%	55 17.5%	136 43.3%	24 7.6%	92.344[a]	3	0.000
9.	Company buildings designed to allow natural light use	35 11.1%	60 19.1%	151 48.1%	68 21.7%	96.828[a]	3	0.000

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 78.5.

b. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 104.7.

c. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 62.8.

Note: Refer to Annex J: Chi-Square Frequencies for Goodness-of-Fit Test of agreement for Energy Efficient Technology

Source: Research Data

Energy Efficient Technology had 9 variables that the study sought to gather responses to. In order for the study to obtain adequate feedback from respondents, the 5 Likert scale items were presented to the respondents and their responses analysed and presented in Table 4.8.

Motor-powered equipment with low energy consumption rating was statistically significant Chi-Square (χ^2 = 49.898[a] at p < 0.05). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether motor-powered equipment with low energy consumption rating led to attaining competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. The results showed that investment in equipment or machines with low energy consumption rating led to a significant improvement in attaining competitive advantage among manufacturing firms. The U.S Department of Energy (2014) in its Premium Efficiency Motor Selection and Application Guide, agrees with the study finding that companies should have established criteria and documentation that enables companies to refer to when purchasing new motor equipment. As such, it will enable the company to identify and determine the energy and cost savings for such machines and equipment is so that that old and inefficient product is replaced with premium energy management units.

Electronic equipment with low energy consumption rating was statistically significant Chi-Square (χ^2 = 179.185[b] at p < 0.05). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether electronic equipment that had low energy consumption rating led to attaining competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that investment in electronic equipment with low energy consumption rating leads to significant improvement in attaining competitive advantage among manufacturing firms. The U.S Department of Energy (2014) further in its

guide agrees with the study finding that companies should purchase or replace machines that are inefficient with equipment and machines with lower energy consumption rating so as to enhance reduction of energy consumption costs.

Motor-powered machines with low energy consumption rating was statistically significant Chi-Square (χ^2 = 303.771[c] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether motor-powered machines that had low energy consumption rating contributed to the attainment of competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that the purchase of motor-powered machines that had low energy consumption rating does not contribute any significant improvement in attaining competitive advantage among manufacturing firms. UNIDO in its study in Mexico and USA agrees with the study findings. However, they recommend that, investment on energy efficient equipment should comply with ISO 9001 and 14001 standards (UNIDO, 2008).

Company lighting system with less energy wattage was statistically significant Chi-Square (χ^2 = 173.006[a] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether company lighting system with lower energy wattage consumption contributed to the attainment of competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that installation of lighting system that uses less energy power contributes a significant improvement in attaining competitive advantage among manufacturing firms. Energy Saving Trust (2016) in its recommendations for UK companies and households agrees with the study findings by noting that in terms of running cost, households and companies that have fixed lighting can consume up-to 15% of all

electricity use and this consumption can increase exponentially if a plug in lighting is also included. Energy Saving Trust further argued that a switch to 100% LED lamps would significantly reduce electricity power consumption for lighting, compared with the commonly used CFL/halogen solution.

Automation of company lighting system was statistically significant Chi-Square (χ^2 = 91.541^c at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether automation of company lighting system contributed to the attainment of competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that investment in automated lighting contributes a significant improvement in attaining competitive advantage among manufacturing firms. Energy Saving Trust (2016) agrees with the study finding and further recommends that for energy efficient lamps, companies should install automatic switch-off when daylight is sufficient, but manual control of light fittings allowable. It further recommended that automatic controls should be installed in lit areas so that it can automatically switch of when the area is unoccupied. Johnson (2012) in his study of UK firms also agrees with the study finding and recommends that automation of lighting sensors is ideal for areas where lighting might be left on when not in use. He notes that with such installations, companies can save up to 80%+ in energy costs. In addition, he notes that the dimming of lights automatically with daylight controls will also extend the lamp life.

Installation of heating systems that are automated was statistically significant Chi-Square (χ^2 = 91.541^c at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether installation of heating systems that are automated contributed to the attainment of competitive advantage among manufacturing

firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that investment in automated heating systems contributes a significant improvement in attaining competitive advantage among manufacturing firms. McCallum (1997) in his study of Canadian firms agrees with the study finding but makes a notable revelation that with automaton of heating systems, firms experience a higher level of comfort in buildings and in equipment used because heat is automatically controlled around-the-clock. As such, energy savings are realised and energy costs are reduced.

Installation of ventilation and cooling systems that were automated was statistically significant Chi-Square (χ^2 = 163.038[c] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether installation of ventilating and cooling systems are automated contributed to the attainment of competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that investment and installation of automated ventilation and cooling systems contribute to improvement in attaining competitive advantage among manufacturing firms with. Kosir *et al.* (2010) agrees that automated ventilation and cooling systems leads to proper system regulation and automatic control. In addition, they argue that energy savings and cost savings cannot be realized without would sufficient automatic control mechanisms being installed or implemented.

Company electricity system that are electronically monitored was statistically significant Chi-Square (χ^2 = 92.344[a] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether automated monitoring of company electricity system contributed to the attainment of competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence

facilitating further analysis. This indicated that if manufacturing company's electricity system is electronically monitored, it contributes significant improvement in attaining competitive advantage among manufacturing firms. Kosir *et al.* (2010), Johnson (2012) and Energy Saving Trust (2016) both are in agreement with automation of electricity use in establishment to reduce energy costs and create energy savings.

Company buildings designed to allow natural light use was statistically significant Chi-Square (χ^2 = 96.828[a] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether designing of company buildings to allow the use natural light during the day contributed to the attainment of competitive advantage among manufacturing firms, with respondents showing a preference for such practice, hence facilitating further analysis. This indicated that by company designing buildings to allow natural light use during the day leads to significant improvement in attaining competitive advantage among manufacturing firms. Johnson (2012) in his study of UK firms agrees that dimming of lights automatically with daylight controls will also extend the lamp life.

The results reveal a positive preference towards investment in energy efficient technologies by manufacturing companies. All variables for objective 3 were significant indicating that there exists a positive influence in improving competitive advantages among manufacturing firms. The findings from U.S. show that continuous machinery and equipment upgrades, leads to more energy-efficient manufacturing process and the more energy efficient a manufacturer will be. This leads to lower total operating costs and the more competitive the company will be in the marketplace (Jasinowski, 2000). The findings from U.S. also showed that installing high-efficiency lighting systems and using daylight will lower lighting costs and improve lighting quality. In U.S. Laitner (2013) showed that most companies operate

equipment and machines that are old and inefficient in energy consumption. However, with replacement with advanced technologies energy management is realized. The findings are further supported by Wilkinson and Kituyi (2006) who revealed that ineffective technology leads to high production costs and thus high product price.

The results also agreed with previous studies, where evidence from the finding by Jasinowski (2002) in USA showed that about 75% of manufacturing companies made efforts in lighting efficiency improvements in some or all of their plants, while nearly 50% did so in some or all of their offices; more than 55% said they had made Heating Ventilation and Airs Conditioning (HVAC) improvements in at least some of their offices, and all these increased their performance.

Jasinowski (2002) further showed that more than 50% of manufacturing companies in U.S. had improved the energy management of their motors. However, 40% of the companies attributed their efforts as being prompted by environmental concern and thus this was their second most important reason for energy management practices. However, 85% had energy Expenses savings as the first cause for practising energy management. The Kenyan manufacturers should also embrace the practice of reducing, reuse and recycling non-regulated materials while reducing emissions and discharges from their machineries and equipment's.

It is also important the findings are consistent with the findings by ERC (2015) that indicated that taxation policy in Kenya does not reward importers of fuel efficient vehicles and that the duty paid by importers of a motor vehicle is independent of vehicle fuel efficiency. This explains why manufacturing firms in Kenya are yet to embrace energy efficient technologies in the production processes. The report further reveals that the composition of hybrid vehicles imported in Kenya is less than 0.05% of total registrations vehicles registered, indicating that

almost 99.95% of all vehicles in Kenya are yet to adopt the modern technologies on fuel efficiency (ERC, 2015).

4.3.4 Expenses on Electricity and Petroleum:

Table 4.9: Firms' Annual Percentage Expenses on Electricity and Petroleum

	Expenses on Energy	σ
Manufacturing Firms Average Energy Expenses	**10.5%**	**1.25797**

Source: Research Data

As shown in the Table 4.9, the study results revealed that Expenses on electricity and petroleum was relatively high at $\bar{x} = 10.5\%$. This means that majority of manufacturing companies spent a high percentage of their gross revenues on electricity and petroleum products at 10.5% as shown in Table 4.9. The Standard deviation $\sigma = 1.25797$, showed that Expenses on electricity and petroleum were fairly diverse among firms in the manufacturing sector. This implied that there are strong indicators for energy costs to decrease or increase depending on companies' desire to practice energy management and vice versa.

The study findings concurs with the findings of Henri *et al.* (1999) who noted that firms have limited knowledge on newer technologies, and usually spend less finance on energy efficient technologies or related strategies which in turn increases consumption and thus costs. However, it disagrees with the findings of Singh (1995) who showed that in countries such as Malaysia, Indonesia, Ghana, Zimbabwe, Colombia, and Turkey, the average energy Expenses from total income by manufacturing firms ranged between 0.5% and 3%, while in Kenya, the average Expenses is significantly high at 10.5%. This implies that manufacturing firms in

Kenya spend a high percentage of its revenues on energy compared to other competing firms on a global perspective.

Carbon Trust (2011) stated that energy management practice yields a cost savings of 5% to 25% and this agrees with the findings of the current study deviation. This finding is supported by the findings of Kiema (2014) which showed that one unit of energy saved, corresponds to a saving of three units generated as a result of implementation of energy management practices and that in Kenya, energy costs and reliability has remained the biggest challenge to be overcome. Similar findings in USA were attained by Jasinowski (2002). The findings showed that nearly 60% of manufacturers in USA foresaw electricity management as providing a saving of up to 20% on their energy Expenses. Further, Jamieson and Hughes (2013) argues that the practice of energy management has a pay-back period of 3 years with reduction on energy consumption costs of between 10-30% of firm revenues.

Findings by ERC (2013) shows that manufacturing firms are aware of rising energy costs and the implications of energy management with regard to production costs. However, from the study findings, the high electricity and petroleum expenses reveals that manufacturing companies in Kenya have not taken steps to mitigate the high Expenses. The findings are also in agreement with ERC (2013) which showed that in Kenya, energy management practices can lead to firm's savings of between 10% to 20% in energy usage with a payback period of less than 2 years. However, it disagrees with the findings of Singh (1995) which found that in countries such as Malaysia, Indonesia, Ghana, Zimbabwe, Colombia, and Turkey, the average energy Expenses from total income by manufacturing firms ranged between 0.5% and 3%.

The study findings are further supported by the findings from Australia by McCoy *et al.* (2014) commissioned by the Australian government which found that 72% of the sampled companies spent more than 10% of their total revenue on energy sources. It further revealed that businesses consider energy Expenses of 2% to 3% of sales revenue to be high. The above study carried out in Australia also revealed that energy expense of between 3-15% of total revenue is considered to be of "high impact", hence the Expenses by Kenyan manufacturers of 10.5% falls under this category and that energy management practices can reduce this to a moderate impact or low impact of less than 3%. With an average Expenses of 10.5%, the findings also agrees with the findings of McCoy *et al.* (2014) that found 72% of firms in Australia spending an average of more than 10% of their revenues on energy sources. Although, the current study only focused on electricity and petroleum costs being the highest amount of resource utilized by manufacturing companies, the same is also similar with manufacturing companies in Australia.

The finding is also supported by studies from U.S. by Jasinowski (2002) who showed that more than 30% of the manufacturers said they would consider promoting car-pooling and mass transit so as to save on costs (less than 13% were able to fulfil their pledge). The same study also showed that more than 25% said they would consider using alternative fuel sources for their corporate fleets of vehicles (less than 4% currently do). However, in USA, 85%, approximately four out of five said the "most important" reason why they had improved their facilities' energy management was to "save money." The current study supports this finding and notes that manufacturing companies in Kenya should also emulate their counterparts in U.S. Findings by Kinyanjui *et al*. (2015) showed that the government should reduce the production costs for manufactured goods by reducing energy costs and source for cheap

electricity. This has been identified as a factor making manufacturing companies to exit the local markets to external markers such as Ethiopia, Egypt and South Africa (Olingo, 2016).

4.3.5 Summary of Energy Management Practices (Chi-Square Tests)

Table 4.10: Energy Management Practices (Chi-Square Test) Summary

No	Objectives	χ^2 >P
1.	Energy Management Regulations	P< 0.05
2.	Company Energy Management Policy	P< 0.05
3.	Energy Efficient Technology	P< 0.05

Source: Research Data

Energy Management Regulations variable dimensions for the study were significant at p = 0.05 for the study and this indicated that implementation and practice of energy management regulations led to significant improvement in attaining competitive advantage among manufacturing firms as shown in Table 4.10.

Company Energy Management Policy variable dimensions for the study were significant at p = 0.05 for the study and this indicated that when companies design and implement organizational energy management guidelines, it leads to significant improvement in attaining competitive advantage for the firm.

Energy Efficient Technology variable dimensions for the study were significant at p = 0.05 for the study and this indicated that adoption of energy efficient technology contribute significantly in enhancing competitive advantage for manufacturing companies.

When a combined response from employees is done, the study revealed that manufacturing companies in Kenya can enhance on the awareness of energy management practices among their staff so as to improve on the level of practice as opposed to earlier studies which placed

the level at 44.2% (Jacinta *et al.*, 2015). Findings by Chege *et al.* (2016) are in agreement with the current study findings that inefficiency in the manufacturing sector is inhibiting competitiveness of Kenyan manufacturing firms and due to lack of employee awareness in energy management, the gains of energy management practices remained a challenge to be overcome.

Findings by Aghion *et al.* (2005) found that the effect of competition on firms' or industries' willingness to innovate depends on their level of energy efficiency technology. Hence, the study findings reveal that manufacturing firms in Kenya are yet to embrace fully the practice of energy management in response to global competition as is evidenced by exodus of manufacturing companies (Olingo, 2016).

Studies carried out in Kenya and Nigeria on maize milling companies in 2015 by Jacinta *et al.* (2015) found that the average adoption of energy management, process control and technology adoption stood at 52.5%, 42.5% and 37.5% respectively. The current study notes that enhanced energy management practices among manufactures will improve the practice of energy management. From the current study findings, there is evidence that there are opportunities in employee training, and awareness which can be exploited so as to promote improvement in energy management practices in the Kenyan manufacturing sector, albeit with more efforts required to combat the soaring energy costs and competitive environment that has led to migration of notable manufacturers to neighbouring countries such as Ethiopia, Egypt, and South Africa among many others (Olingo, 2016) and (Wakiaga, 2017).

4.3.6 Content Analysis on Alternative Company Energy Management Practices

Respondents were asked to state any other ways in which the company can engage in energy management practices so as to enhance firm competitiveness. All respondents pointed to one

key practice-use of renewable energy sources (green energy). These included; use of solar energy, wind energy and the use of waste to generate electricity energy. The finding is consistent with the findings and recommendations of (Victoria (2007); Hartmann & Huhn, 2009; Rademaeker *et al.,* 2011; Njoroge, Zorba & Muia, 2014).

4.3.7 Intensity of Competitive Advantage (Chi-Square Goodness-of-Fit Test)

Competitive advantage on the other hand was the dependent variable of the study and it was assessed using three indicators. Table 4.11 presents the relevant result on the scale of 1 to 5 *(where 1 = Strongly Disagree, 2 = Disagree, 3 = Not Sure, 4 = Agree, 5 = Strongly Agree).*

Table 4.11: Intensity of the Independent Variable-Competitive Advantage

Test Statistics								
S/No.	Variable	SD	D	NS	A	SA	Chi-Square	df	Asymp. Sig.
1.	Lower Electricity Expenses			30	218	66	190.268[a]	2	0.000
				9.6%	69.4%	21%			
2.	Lower Petroleum Expenses			35	246	33	286.287[a]	2	0.000
				11.1%	78.3%	10.5%			
3.	Lower Production Costs			36	162	116	77.682[a]	2	0.000
				11.5%	51.6%	36.9%			
4.	Increase in sales			56	172	86	69.274[a]	2	0.000
				17.8%	54.8%	27.4%			
5.	Increase in Profits		18	40	163	93	162.306[b]	2	0.000
			5.7%	12.7%	51.9%	29.7%			
6.	Surplus funds			34	185	95	110.261[a]	2	0.000
				10.8%	58,9%	30.3%			
7.	Enables investment in product design		18	39	164	93	162.306[b]	2	0.000
			5.7%	12.4%	52.2%	29.6%			

8.	Enables investment in product quality	2 0.6%	64 20.4%	150 47.8%	98 31.2%	147.197[b]	3	0.000
9.	Enables investment in customer service	10 3.2%	53 16.9%	190 60.5%	61 19.4%	230.331[b]	3	0.000

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 104.7.

b. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 78.5.

Source: Research Data

Cost leadership: From Table 4.11, lower electricity expenses was statistically significant Chi-Square (χ^2 = 190.268[a] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether lower electricity expenses led to attaining competitive advantage among manufacturing firms, with respondents agreeing that it created competitive edge among competitors. Respondents aagreement on this cause was the highest agreed upon benefit as a result of energy management practice.

From Table 4.11, lower petroleum expenses was statistically significant Chi-Square (χ^2 = 286.287[a] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether lower petroleum expenses led to attaining competitive advantage among manufacturing firms, with respondents agreeing that it created competitive edge among competitors. Respondents aagreement on this cause was the highest agreed upon benefit as a result of energy management practice.

From Table 4.11, lower production costs was statistically significant Chi-Square (χ^2 = 77.682[a] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether lower production costs led to attaining competitive advantage among manufacturing firms, with respondents agreeing that it created competitive edge among competitors. Respondents aagreement on this cause was the highest agreed upon benefit as a result of energy management practice.

This result showed that cost leadership strategy is a key strategic competitive process that can be harnessed from the resultant benefits of energy management practices. The findings agree with Mosey (2005) who showed that energy management practices such as efficient technology are key for manufacturing firms operating under a regional integration regime in reducing costs. Mosey (2005) maintains that, the main reason why manufacturing firms

embrace technology acquisition developed externally is to allocate limited resources more effectively in order to reduce costs and gain advanced technological know-how quickly over competitors. Considering the convergent views from respondents, the results reveal that cost reductions is a fundamental competitive strategy that manufacturing firms in Kenya can harness as a result of the benefits accruing from energy management practices.

Higher Profit Margins: From Table 4.11, increase in sales was statistically significant Chi-Square (χ^2 = 69.274[a] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether increase in sales led to attaining competitive advantage among manufacturing firms, with respondents agreeing that it created competitive edge among competitors. Respondents aagreement on this cause was the highest agreed upon benefit as a result of energy management practice.

From Table 4.11, increase in profits was statistically significant Chi-Square (χ^2 = 162.306[b] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether increased profitability led to attaining competitive advantage among manufacturing firms, with respondents agreeing that it created competitive edge among competitors. Respondents aagreement on this cause was the highest agreed upon benefit as a result of energy management practice.

From Table 4.11, surplus funds was statistically significant Chi-Square (χ^2 = 110.261[a] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on firm's surplus funds led to attaining competitive advantage among manufacturing firms, with respondents agreeing that it created competitive edge among competitors. Respondents aagreement on this cause was the highest agreed upon benefit as a result of energy management practice.

This showed that higher profit margin is a second preferred key strategic competitive action that can be harnessed from the resultant benefits of energy management practices. The result agrees with the findings of Otieno (1994) which showed that automation of production increases energy management and effectiveness in the operations of the firm by increasing a firm's competitiveness and profitability within the local, regional and international markets. The most automated assembly lines ensure that manufacturing firms are efficient as possible; thus increasing their competitiveness in all markets (Eden, 1994). It further agreed with the findings of Energy management practices as argued by Mlamo (2004) showed that energy management led to higher profitability. However, in order of preference, current study findings show that employees in manufacturing companies preferred the transfer of energy efficiency gains to cost reduction strategies as opposed to firm profitability and product differentiation.

Product Differentiation: From Table 4.11, investment in product design was statistically significant Chi-Square (χ^2 = 162.306[b] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether investment in product design led to attaining competitive advantage among manufacturing firms, with respondents agreeing that it created competitive edge among competitors. Respondents aagreement on this cause was the highest agreed upon benefit as a result of energy management practice.

From Table 4.11, investment in product quality was statistically significant Chi-Square (χ^2 = 147.197[b] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether investment in product quality led to attaining competitive advantage among manufacturing firms, with respondents agreeing that

it created competitive edge among competitors. Respondents aagreement on this cause was the highest agreed upon benefit as a result of energy management practice.

From Table 4.11, investment in customer service was statistically significant Chi-Square (χ^2 = 230.331[b] at $p < 0.05$). This indicated that there was a statistically significant difference of agreement among manufacturing firms on whether investment in customer service led to attaining competitive advantage among manufacturing firms, with respondents agreeing that it created competitive edge among competitors. Respondents aagreement on this cause was the highest agreed upon benefit as a result of energy management practice.

From the findings, the study concludes that, there is a great opportunity for manufacturing companies to exploit in ensuring their products are adequately differentiated from its competitor products. This agrees with Bharadwaj and Varadarajan (1993) who showed that product quality is a source of competitiveness and improved performance in expanded markets both at national and international levels. Product differentiation allows consumers to make comparison across a greater variety of product brands from a large number of competing firms. Hence, with energy management practices, the gains can be transferred to their product differentiation strategies and become competitive at local, and external markets.

The overall assessment on energy management practices indicate that both respondents in manufacturing companies are in agreement that energy management practices yield enormous benefits that can be transferred to cost reduction strategies, profitability and product differentiation strategies as avenues for attaining competitiveness of a firm. The results revealed that cost leadership 89.3% led the list of competitive options, followed by high profit margins 83.3% and product differentiation 80.3% respectively.

4.4 Correlation Analysis

The following section presents the correlation analysis of all the study variables as per the study objectives. The relationship between energy management practices and competitive advantage was measured using energy management regulations, company energy management policy, energy efficient technology and percentage Expenses on electricity and petroleum as ratio of total revenue and the results presented in Table 4.12. Interpretation, explanations and comparison with previous studies is carried out in sections that follow:

Table 4.12: Correlation Analysis

Correlations						
		Competitive Advantage	Energy Management Regulations	Company Energy Management Policy	Energy Efficient Technology	Energy Expenses
Competitive Advantage	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	314				
Energy Management	Pearson Correlation	0.431**	1			
Regulations	Sig. (2-tailed)	0.000				
	N	314	314			
Company Energy Management	Pearson Correlation	0.192**	-0.020	1		
Policy	Sig. (2-tailed)	0.001	0.728			
	N	314	314	314		
Energy Efficient Technology	Pearson Correlation	-0.599**	-0.463**	-0.016	1	
	Sig. (2-tailed)	0.000	0.000	0.779		
	N	314	314	314	314	
Percentage Energy Expenses	Pearson Correlation	0.130*	0.386**	0.191**	-0.307**	1
	Sig. (2-tailed)	0.021	0.000	0.001	0.000	
	N	314	314	314	314	314

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

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

As shown in Table 4.12, Pearson's correlation coefficient is r = 0.431 at p = 0.05) between energy management regulations and competitive advantage. This implied that there was a moderate positive and significant correlation between energy management regulations on attaining competitive advantage. It also implied that, implementation of energy management regulations improved the competitiveness of a firm at local, national and international markets. Similar studies by IEA (2012) and UNIDO (2008) support the current results that active energy policy, management involvement, continuous energy reviews, benchmarking, target setting, and audits should be enhanced in practice of energy management initiatives (IEA, 2012) and (UNIDO, 2008). Manufacturing companies should also tap into the benefits arising from energy savings and cost reductions through energy management practices (UNIDO, 2012).

As shown in Table 4.12, Pearson's correlation coefficient is r = 0.192 at p = 0.05) between company energy management policy and competitive advantage. This implied that there was a weak positive and significant correlation between company energy management policy in attaining competitive advantage. It also implied that, implementation of company energy management policies improved the competitiveness of a firm at local, national and international markets. The finding is consistent with the findings of (Rademaeker, Asaad, and Berg, 2011) which showed that investment and upgrading of organizational facilities led to reduction of energy used. It also agreed with the findings of International Energy Agency (2012) and United Nations Industrial Development Organization (2008) which noted that as part of company energy management initiatives, providing incentives and rewards for drivers, training employees, involving staff during networking events, reviewing case studies and providing energy management guidance materials to employees led to better practice of the better energy management initiatives. Kenya Association of Manufacturers (2015) also recognizes that major and attainable gains in energy management can be achieved through

company energy management initiatives among participating companies. Hill and Gareth (2007) states that for a company to be efficient, management practices have to be adopted by the firm so as to attain a competitive edge.

As shown in Table 4.12, Pearson's correlation coefficient is r = -0.599 at p = 0.05) between energy efficient technology and competitive advantage. This implied that there was a strong negative and significant correlation between energy efficient technologies in attaining competitive advantage. It also implied that, implementation of energy efficient technology improved the competitiveness of a firm at local, national and international markets. The finding is consistent with Hartmann and Huhn (2009) who observed that energy management in industries can be increased through customized information technology solutions and that the use of low-consumption combustion engines and energy saving technologies are also expected to be in use globally and that fuel consumption vehicles were expected to fall by 17% by the year 2010 which will all contribute to reduction in energy consumption, hence lower energy expenses (Victoria, 2007).

The finding also is supported by UNIDO (2012) which argued that technological standards, improvements and maintenance promoted reduction of electricity consumption in China by 20% and this can also be replicated in the manufacturing sector so as to enhance attainment of competitiveness in the sector. Wilkinson and Kituyi (2006) revealed that an ineffective technology leads to high production costs and thus high product price and this is evidence by the current average energy expenses which stood at 10.5% of total revenues.

As shown in Table 4.12, Pearson's correlation coefficient is r = 0.130 at p = 0.05) between energy expenses and competitive advantage. This implied that there was a weak positive and significant correlation between energy expenses in attaining competitive advantage. It also implied that, energy expenses affected the competitiveness of a firm at local, national and

international markets. The finding is supported by Willox (2012) who observed that more than 25% of firms incur high-energy expenses from (electricity, gas and other fuels) in Australia and this is not different in the manufacturing sector in Kenya. He further found that, on average 27% of companies he studied spent the equivalent of more than 2% of their sales revenue on energy, and 73% of the firms spent 2.5%. The report asserted that business expenses on energy as a percentage of turnovers increased between 2008 and 2011 and the trend was expected to continue. For the manufacturing sector in Kenya to attain and retain a competitive edge, there is need for energy management practice so as to lower the cost further. According to UNIDO (2012) high-income consumers of petroleum, electricity and related sources energy spend between 5% to 10% of their income and this is a replica of the current scenario in the Kenyan manufacturing sector, where energy expense stands at 10.5%. In this case, the study considered the expenses as of high impact which may hurt the firms' competitiveness in the long run both at local, national and international business economies (McCoy *et al*., 2014)

4.5 Multiple Regression Analysis

Table 4.13: Multiple Regression Analysis Results

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	0.669[a]	0.448	0.440	0.06428	0.448	62.606	4	309	0.000

a. Predictors: (Constant), Energy Expenses, Company Energy Management Policy, Energy Efficient Technology , Energy Management Regulations

b. Dependent Variable: Competitive Advantage

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.035	4	0.259	62.606	0.000[b]
	Residual	1.277	309	0.004		
	Total	2.312	313			

a. Dependent Variable: Competitive Advantage

b. Predictors: (Constant), Energy Expenses, Company Energy Management Policy, Energy Efficient Technology, Energy Management Regulations

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	Collinearity Statistics

		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.843	0.165		23.346	0.000		
	Energy Management Regulations	0.213	0.041	0.258	5.148	0.000	0.714	1.401
	Company Energy Management Policy	0.050	0.010	0.222	5.118	0.000	0.953	1.049
	Energy Efficient Technology	-0.158	0.014	-0.529	-10.952	0.000	0.766	1.305
	Energy Expenses	-0.013	0.003	-0.174	-3.660	0.000	0.792	1.262

Dependent Variable: Competitive Advantage

Source: Research Data

Regression Model:

The study regression Model is presented hereunder;

$$CA = 3.843 + 0.213EMR + 0.05CEMP - 0.158EET - 0.013EExps + e$$

Where: CA = Competitive Advantage, EMPs = Implementation of energy management regulations, CEMP = Implementation of energy management policy implementation, EET = Implementation of energy efficient technology and EExp = Percentage expenses on electricity and petroleum products on total revenue, e=error term/stochastic term

From Table 4.13, the regression results revealed that the variables under investigation for energy management practices had an overall effect on competitive advantage among manufacturing firms and was statistically significant at p = 0.05.

In assessing the overall relationship between implementation of energy management practices and competitive advantage among manufacturing firms, the individual energy management practices (energy management regulations company energy management policy, energy efficient technology and effect of energy Expenses) were regressed against the aggregate mean score of competitive advantage and the results presented in Table 4.13. The results showed that energy management practices had a strong explanatory power of r^2=44.8% on competitive advantage. Collinearity test (VIF of between 1.049- 1.401) were met as shown in Table 4.13. The results showed that 44.8% of variation in the attainment of competitive advantage is explained by energy management practices of a firm. This agrees with the findings of (Olingo, 2016; KIPPRA, 2016) which reported that large manufacturing companies in Kenya such as Sameer Africa, Cadbury, Eveready, Procter and Gamble, Reckitt Benckiser, Johnson and Johnson, Bridgestone, Unilever and Colgate Palmolive among others have left the Kenyan market for Egypt and South Africa, where power costs are lower.

4.5.1 Energy Management Regulations on Competitive Advantage

The first objective of the study was to determine the effect of implementation of energy management regulations on attaining competitive advantage among manufacturing firms in Kenya. The indicators of energy management regulations mean scores were used to test the first hypothesis. Respondents were also asked to indicate the extent to which energy management regulations had affected competitive advantage among manufacturing firms in Nairobi. The correlation results as shown in Table 4.12 revealed a moderate and positive relationship which showed that implementing energy management regulations has a positive

effect on competitive advantage. The correlation result was statistically significant at p = 0.05.

The aggregate mean score of competitive advantage (dependent variable) were also regressed on the aggregate mean score of implementing energy management regulations (Independent variable) and the relevant results presented in Table 4.13. The regression results in Table 4.13 revealed a statistically significant relationship at 5% significance level between energy management practices and competitive advantage (p-value = 0.05). The null hypothesis that (*H_{01}**: Implementation of energy management regulations has no significant effect on attaining competitive advantage among manufacturing firms*) was rejected since p-value was less than 5% significance level as shown in Table 4.13. The regression results showed that a one percentage increase in energy management practices led to an increase of competitive advantage by 21.3%. This change is significantly beneficial to the manufacturing sector in attaining competitive advantage.

These findings are consistent with Kiema (2014) who noted that one unit of energy saved, corresponds to a saving of three units generated. The report further indicates that in Kenya, energy costs and reliability has remained the biggest challenge to be overcome. The report also states that with the Kenya Association of Manufacturers (KAM) decision to establish Centre for Energy Management and Conservation (CEEC), gains in energy management are yet to be achieved. The Government of Kenya has also undertaken initiatives to address energy management issues. For instance, the Global Fuel Economy Initiative (GFEI) pilot study by the Energy Regulatory Commission provided recommendations and policy instruments to manage the national vehicle fleet and imports with regard to vehicle fuel economy (consumption litres per 100km), and vehicle emissions (gCO2/Km) in the country (ERC, 2014).

Though these are positive initiatives towards energy management practice, manufacturing companies in Kenya are yet to embrace the government recommendations as shown in Table 4.7, where 41.5% of the respondents were not sure if energy management regulations had been implemented. Hence, indicating lack of awareness among sector employees.

4.5.2 Company Energy Management Policy on Competitive Advantage

The second objective of the study sought to determine the effect of implementation of company energy management policy on attaining competitive advantage among manufacturing firms.

The correlation results as shown in Table 4.12 revealed a weak and positive relationship which showed that implementing energy management regulations has a positive effect on competitive advantage. The results was statistically significant at p = 0.05. The aggregate mean score of competitive advantage among manufacturing firms (dependent variable) were regressed on the aggregate mean score of implementing company energy management policy (independent variable) and the relevant research findings are presented in Table 4.13.

The regression results revealed a statistically significant relationship between company energy management policy and competitive advantage at (p-value = 0.05). The null hypothesis that (H_{02}*: Implementation of company energy management policy has no significant effect on attaining competitive advantage among manufacturing firms)* was therefore rejected at p = 0.05. The regression results showed that a one percentage increase in energy management practices led to an increase of competitive advantage by 5%. This change is significantly beneficial to the firm. From the regression results, the study therefore rejected the null hypothesis;

Previous studies support training and sensitization on energy management practices as a key aspect in ensuring an organization achieves its energy management goals (Kamath & Sinha, 2014). In addition, Kiema (2014) notes that one unit of energy saved, corresponds to a saving of three units generated. Backlund *et al.* (2012) also argues that a gradual practice of energy management leads to a reduction of operating costs and increases competitiveness and productivity of the company. As such, Kenyan firms needs to fully establish and implement company energy management practices as part of its strategic plans and decisions (Hartmann & Huhn, 2009). Training employees, information sharing, incentives and benchmarking are some of the company measures which if implemented improve firm competitiveness through enhancing energy management practices (Bennett, 2001).

4.5.3 Efficient Technology on Competitive Advantage

The third objective was to examine the effect of implementation of energy efficient technology on attaining competitive advantage among manufacturing firms. The correlation results as shown in Table 4.12 revealed a strong and negative relationship which showed that implementing energy management regulations had a negative effect on competitive advantage. The finding was statistically significant at $p = 0.05$.

In testing, the null hypothesis three (H_{03}) aggregate mean scores of competitive advantage were regressed on those of indicators of energy efficient technology and the relevant research findings are presented in Table 4.13. The regression results revealed that there was statistically significant relationship between energy efficient technology and competitive advantage among manufacturing firms at 5% significance level (p-value = 0.05). From the above regression results, the study therefore rejected the null hypothesis that: *H_{03}: Implementation of energy efficient technology has no significant effect on attaining competitive advantage among manufacturing firms*. The regression results showed that a one

percentage increase in energy efficient technology led to a 15.8% decrease on competitive advantage This change is significantly not beneficial to the firm; hence the study concluded that energy efficient technology affects the competitiveness of a firm negatively. The study therefore argues that technology investment required huge financial investment which erodes the firm's competitiveness in the short run. As such, investment in efficient technology should be carried out with caution by considering the cost implication to the firm. On the other hand investment in efficient technology also does not guarantee benefit if the users of such technology do not adhere to manufacturers requirements and may not guarantee the firm any competitive benefit.

The findings disagreed with the findings by UNIDO (2012) which supported the improvement of technological standards and maintenance of company equipment, apparatus and machines in order to promote reduction of electricity consumption and hence reduction on cost. However, the current study argued that such investment should be considered cautiously in terms of cost implication to the firm, because some technologies require huge financial investment. The study further argued that benefits from such initiatives create additional energy for supply and reduction of energy expenses; however the cost factor becomes an impediment for manufacturers in developing economies such as Kenya. Therefore, Kenyan manufacturers in their quest to improve its competitive processes should weigh in the financial implication to the firm which may erode any effort in attaining competitiveness. It is also important to note that the findings by Wilkinson and Kituyi (2006) revealed that ineffective technology leads to high production costs and thus high product price. As such, companies in considering cost factor, can reduce such costs by adopting efficient technologies in their production systems and processes especially in Kenya.

In such cases, the Kenya Association of Manufacturers (KAM) decision to establish Centre for Energy Efficiency and Conservation (CEEC), gains in energy management are yet to be achieved and manufacturing firms can continually enhance implementation of energy management practices. Previous studies also show that investment in energy management measures in fuel is significant since such a programme generates greater macroeconomic benefits – more jobs and greater growth (Lewis *et al.,* 2013).

Studies by Friedmann *et al.* (2008) also reported that the use of low-energy technologies, reduction of wattage in electricity bulbs and lamps such as LED were some of the energy management practices that manufacturing firms can institute. Energy management practices, as noted by NEED (2012) include the use of technology that requires less energy to perform the same function. Energy management practices can also be attained through policy guidelines, and training of users on efficient technology usage.

4.5.4 Energy Expenses on Competitive Advantage

The fourth and final objective was to assess the percentage cost of petroleum and electricity Expenses on attaining competitive advantage among manufacturing firms. The correlation results as shown in Table 4.12 revealed a weak and negative relationship which showed that energy expenses had a negative effect on competitive advantage. The finding was statistically significant at $p = 0.05$.

From the Table 4.13, the regression results revealed that energy Expenses on electricity and petroleum had an overall significant relationship with competitive advantage at 5% significance level (p-value = 0.0001). From the regression results, the study therefore rejected the null hypothesis at p-value = 0.05 and concluded that there was a statistically significant effect of energy Expenses on competitive advantage among manufacturing firms. The

regression results showed that a one percentage increase in energy expenses led to a 1.3% decrease on competitive advantage and vice versa. Hence, the study concluded that increase in energy expenses affect the competitiveness of a firm negatively and decrease in energy expenses increased competitiveness of a firm.

The average energy expenses as shown in Table 4.9 by manufacturing companies in Nairobi were high and stood at 10.5% of total revenues. With such high energy expenses, manufacturing companies are at risk of losing the gains that otherwise would have been transferred to other competitive strategies so as to attain competitiveness among rival firms.

Energy management practices also enable a company to reduce their energy cost as a proportion of total cost. This highlights the need for energy management practices in the manufacturing sector. McKane (2011) as cited by IEA (2012) and the Retail Industry Leaders Association report (2013) as cited by Jamieson and Hughes (2013) argued that the practice of energy management has a pay-back period of 3 years with reduction on energy consumption costs of between 10%-30%. Kenyan firms thus need to enhance its energy management practices if they are to enjoy the resultant benefits and thus lead them in attaining a competitive edge.

In addition, the study results also agree with those from Australia by Willox (2012) who showed that more than 25% of manufacturing firms incur high energy expenses from (electricity, gas and other fuels). He further found that, on average 27% of companies he studied spent the equivalent of more than 2% of their revenues on energy, and 73% of the firms spent 2.5%. The report asserted that expenses on energy as a percentage of turnovers increased between 2008 and 2011 and the trend was expected to continue. This is consistent with the current study findings with an average consumption of 10.5% which causes a significant reduction on revenues. The report further showed that in Kenya, energy costs and

reliability has remained the biggest challenge to be overcome. In contrast, this study also shows that manufacturing companies in Nairobi spend a high percentage of its income on energy as compared to the manufacturing companies in developed countries that have embraced the use of technology and have implemented energy management practices (Hartmann & Huhn, 2009; Victoria, 2007; Willox, 2012).

4.6 Summary of Hypothesis Tests

Table 4.14: Summary of Results for Hypothesis Testing

Hypothesis	Test criteria	Level of significance	Conclusion
H_{01}: Implementation of energy management regulations has no significant effect on attaining competitive advantage among manufacturing firms.	$p \leq 0.05$ Reject H_{01} if $p \leq 0.05$	$p = 0.0000$	H_{01} Rejected
H_{02}: Implementation of company energy management policy has no significant effect on attaining competitive advantage among manufacturing firms.	$p \leq 0.05$ Reject H_{02} if $p \leq 0.05$	$p = 0.000$	H_{02} Rejected
H_{03}: Implementation of energy efficient technology has no significant effect on attaining competitive advantage among manufacturing firms.	$p \leq 0.05$ Reject H_{03} if $p \leq 0.05$	$p = 0.0000$	H_{03} Rejected
H_{04}: Energy Expenses on electricity and petroleum has no significant effect on attaining competitive advantage among manufacturing firms.	$p \leq 0.05$ Reject H_{04} if $p \leq 0.05$	$p = 0.0000$	H_{04} Rejected

Source: Research Data

4.7 Discussion on Energy Management Practices on Competitive Advantage

The following section provides discussion based on the results organized according to the objectives of the study. The researcher conceptualized a framework derived from the existing energy management practices literature and empirically tested the relationships among the variables.

The effect of implementation of energy management regulations on attaining competitive advantage among manufacturing firms in Kenya:

Correlation results showed that there was a moderate and positive statistically significant association between implementing energy management regulations and competitive advantage as shown in Table 4.12 ($r = 0.431$ at $p = 0.05$). Results from the regression analysis as shown in Table 4.13 showed that the effect of implementing energy management regulation was statistically significant at 5% significance level (p – value = 0.05), as shown in Table 4.13. As such, the study concluded that practising energy management practices increases the chances of attaining competitive advantage by 21.3%. Similarly reduction of energy management practices also reduces competitiveness of a firm by 21.3%. This implied that competitive advantage among manufacturing firms in Nairobi largely depended on energy management regulations implementation.

This is in agreement with the propositions of Kiema (2014) who showed that one unit of energy saved, corresponds to a saving of three units generated as a result of implementation of energy management practices and that in Kenya, energy costs and reliability has remained the biggest challenge to be overcome.

Effect of implementation of company energy management policy on attaining competitive advantage among manufacturing firms Kenya.

Correlation results as shown in Table 4.12 showed that there is a weak and positive correlation between effect of implementing energy management regulations and competitive advantage. The result was statistically significant at 5% significance level. Results from regressions analysis showed that company energy management policy had a significant effect on competitive advantage among manufacturing firms in Nairobi as shown in Table 4.13. The effect of implementing energy management policy on competitive advantage among manufacturing firms in Nairobi was significant at 5% significance level (p-value = 0.05).

The finding is supported by the Kenya Association of Manufacturers (KAM) decision to establish Centre for Energy Efficiency and Conservation (CEEC) as a fundamental step towards managing energy usage in firms. However, gains in energy management are yet to be achieved. The National Environmental Policy (2013) also recognizes Kenya as being dependent largely on Electricity and Petroleum sources of energy. As such, there is need for the country to be energy efficient; "the country's energy policies must ensure a robust and efficient energy system that is secure and sufficient." This therefore promotes industrial competitiveness and economic growth, with the aid of energy management policy implementation by relevant firms.

Effect of implementation of energy efficient technology on attaining competitive advantage among manufacturing firms Kenya.

The correlation results as shown in Table 4.12 revealed a strong and negative relationship which showed that implementing energy management regulations had a negative influence on competitive advantage. However, the result was statistically significant at p = 0.05. The

regression results from Table 4.13 showed that energy efficient technology had a significant negative effect on competitive advantage among manufacturing firms and was statistically significant at significant at 5% (p=0.05).

The finding was supported with the findings of Friedmann *et al.* (2008) which reported that the use of low-energy technologies, reduction of wattage in electricity bulbs and lamps such as LED were some of the energy management practices that manufacturing firms can institute. Energy management practices, as noted by NEED (2012), include the use of technology that requires less energy to perform the same function. Energy management practices in the manufacturing sector can also be attained through policy guidelines, and training of users. It should also be noted that implementation of energy management technologies may not guarantee energy management results, because it is dependent on how the user will responsibly operate and manage the technology (Barton & Kraus, 1985). However, the study argues that manufacturing companies should evaluate the effect of high cost technologies before committing company resources since the findings shows that it may lead to reduced competitiveness, because most energy efficient technologies are capital intensive. In addition, the study notes that the acquisition of energy efficient technologies may also not lead to competitiveness if the users are not willing to adhere to manufacturer's guidelines or if there is lack of training on its use.

Effect of energy expenses on attaining competitive advantage among manufacturing firms in Kenya.

The correlation results as shown in Table 4.12 revealed a weak and negative relationship which showed that energy expenses had a negative effect on competitive advantage. However, it was statistically significant at p = 0.05. Regression results revealed that energy expenses on electricity and petroleum products had overall negative significant effect on

competitive advantage and was statistically significant at 5% (p-value = 0.05) as shown in Table 4.13.

The study results agreed with Australian study by Willox (2012) argues that more than 25% firms incur high-energy expenses from (electricity, gas and other fuels). He further found that, on average 27% of companies he studied spent, the equivalent of more than 2% of their sales revenue on energy, and 73% of the firms spent 2.5% and this is true in the manufacturing sector. The report asserted that business Expenses on energy as a percentage of turnovers increased between 2008 and 2011 and the trend was expected to continue. The current study opines that, with increase in energy expenses, the efforts of attaining competitive advantage is hindered and the country may continue witnessing closure or migration of manufacturing firms to other economies, hence leading to job loss and reduction of gross domestic product gains.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The chapter provides summary discussions of the study results, conclusions and the recommendations made from the findings of the study based on the study objectives. The following section presents summary, conclusion and recommendations of the study findings based on the respective study objective.

5.2 Summary

The following sub-section presents summary of the study findings based on the study results as per the objectives:

5.2.1 Energy Management Regulations on Competitive Advantage

The first objective of the study was to determine the effect of implementation of energy management regulations on attaining competitive advantage among manufacturing firms in Kenya. The significant positive relationship between energy management regulations and competitive advantage implied that implementing energy management regulations had a significant influence on competitive advantage among manufacturing firms in Nairobi (Table 4.13). This showed that manufacturing firms stands to benefit competitively if they implement energy management practices in their firms.

These results are in agreement with International Project Management Office (OGPI) (2013) which argues that Kenya is yet to establish an Energy Research Institute or Energy research labs that can carry out energy use and energy management studies. This therefore puts the country at risk of not attaining its energy management initiatives despite the presence of

energy management policy and institutions mandated to promote the same. On the same note the government of Kenya has planned to set minimum energy management standards for certain machines and to increase awareness of energy management and related technologies so as to improve organizational energy management practices. However, this is yet to be realised fully as a pivotal strategy in enhancing energy management practices among the manufacturing firms in Kenya.

The Kenya Association of Manufactures has taken up the role of promoting energy management practices through the Centre for Energy Efficiency and Conservation and has been providing training and energy audits on energy management to manufacturers in Kenya. It also oversees the yearly Energy Management Awards (EMA), which recognizes major and attainable gains in energy management, energy and cost reductions among participating companies (Laurea, 2015). If the government support is not realized, then the manufacturers may not realize anticipated organizational performance and manufacturers will continue shifting base to other countries (Olingo, 2016).

5.2.2 Company Energy Management Policy on Competitive Advantage

The second objective of the study sought to determine the Effect of implementation of company energy management policy on attaining competitive advantage among manufacturing firms. The regression results from Table 4.13 reveal statistically significant relationship at 5% significance level between company energy management policy and competitive advantage p-value = 0.05. It is important to note that training and sensitization on energy management practices is a key aspect in ensuring an organization achieves its energy management goals (Kamath & Sinha, 2014). However, majority of organizations in Kenya are yet to fully sensitize its staff on the significant benefits of energy management initiatives, especially in the small manufacturing firms (Henri *et al.,* 1999). This is also supported by

International Energy Agency (2012) and United Nations Industrial Development Organization (2008) who revealed that that providing incentives and rewards for drivers, training employees, involving staff during networking events, reviewing case studies and providing energy management guidance materials to employees supports the promotion of better energy management initiatives.

Kenyan manufacturing firms should provide incentives and rewards for drivers, training employees, involving staff during networking events, reviewing case studies and providing energy management guidance materials to employees supports the promotion of better energy management initiatives. In additions, a vibrant energy policy, management involvement, continuous energy reviews, benchmarking, target setting, and audits should be enhanced as some of the practical strategies in enhancing energy management initiatives (IEA, 2012) and (UNIDO, 2008).

5.2.3 Energy Efficient Technology on Competitive Advantage

The third objective was to examine the effect of implementation of energy efficient technology on attaining competitive advantage among manufacturing firms. The regression results from Table 4.13 revealed that there was a statistically significant effect of implementing energy efficient technology on competitive advantage among manufacturing firms p-value = 05. This is supported by the findings of Friedmann *et al.* (2008) who reported that the use of low-energy technologies, reduction of wattage in electricity bulbs and lamps such as LED were some of the energy management practices that manufacturing firms can institute to reduce energy costs. Energy management practices as noted by NEED (2012), include the use of technology that requires less energy to perform the same function and if manufacturing companies are to implement such technologies, and then the resultant benefits can significantly improve competitive advantage for their firms. However, in Table 4.10, chi

square test revealed that the practice of energy efficient technology does not contribute to competitive advantage at p = 0.05 as well as results in Table 4.12 and Table 4.13 where the coefficients were negative. As such, it tends to disagree with Friedmann *et al.* (2008) finding which noted that there are great advantages that can be derived from implementing an energy efficient technological firm. It should be concluded that energy efficient technology can be adopted but employee apathy and negligence can render the technology inefficient.

Energy management practices can also be attained through policy guidelines, and training of users. As such, if the Kenyan firms can strive to invest in such technologies, then the resultant benefits are significant in reducing Expenses, production costs and enhance differentiation strategies. However, energy management in industries can be increased through customized information technology solutions. As such, related innovative information technology software can be applied by industrial related firms so as to monitor its consumptions and usage. In addition, the use of renewable energy such as solar is expected to also increase exponentially by the year 2020 and Kenyan manufacturing firms should tap into this opportunity.

The use of low-consumption combustion engines and energy saving technologies are also expected to be in use globally and that fuel consumption vehicles are expected to fall by 17% by the year 2010, yet Kenyan manufactures are yet to invest in the new breed of vehicles and equipment's (Hartmann & Huhn, 2009) and (Victoria, 2007). It should also be noted that Backlund *et al.* (2012) states that a gradual practice of energy management leads to a reduction of operating costs and increases competitiveness and productivity of the company and this is so in the Kenya's situation.

5.2.4 Energy Expenses on Competitive Advantage

The fourth and final objective was to assess the effect of energy expenses on attaining competitive advantage among manufacturing firms in Kenya. The study results from Table 4.9 showed that firm expense on electricity and petroleum product as a percentage of firm revenue was high at 10.5%. Table 4.13 revealed that energy Expenses had overall negatively statistically significant relationship with competitive advantage at 5% significance level (p-value = 0.05). This implied that an increase in energy expenses led to a decrease in competitive advantage and vice versa.

The study results are supported by an Australian study by Willox (2012) who found that more than 25% firms incur high energy expenses from (electricity, gas and other fuels). He further found that, on average 27% of companies he studied spent the equivalent of more than 2% of their sales revenue on energy, and 73% of the firms spent 2.5%. The report asserted that business expenses on energy as a percentage of turnovers increased between 2008 and 2011 and the trend was expected to continue and this can be noted from the Kenyan manufacturing firms who are spending an average of 10.5% of their sales revenue on energy expenses (as shown in Table 4.9). However, due to projected increase of electricity and fuel prices (KPMG, 2014) energy costs will increase and this will decrease firm competitiveness at both local, national and globally. It should also be noted that by the year 2020, the price of oil per barrel will have increased to 110USD/barrel and with such occurrence; supply is likely to surpass demand.

The phenomenon is likely to affect most companies and economies negatively in terms of production and operating costs. In this case, companies need to focus on energy management practices so as to gain greater competitiveness (IEA, 2008) as cited by (Hartmann & Huhn, 2009). This is because Energy management practice promotes an increase in profitability for

firms (Cooper, 2014). Manufacturing companies should also tap into the benefits arising from energy savings and cost reductions through energy management practices (UNIDO, 2012).According to Rademaeker *et al.* (2011) companies that practice energy management are likely to increase its production by a 22% and are 2.7 times more likely to increase investments than other organizations (Johnson, 2013). The current study notes that these investments can be made to the companies' competitive strategies.

5.3 Conclusions

Based on the overall study results obtained from the study results, the study concludes that there is a positive significant relationship between energy management practices in attaining competitive advantage among manufacturing firms. The dimensions of energy management practices (Energy Management Regulations, Company Energy Management Policy, Energy Efficient Technology and Energy Expenses) have a significant effect on competitive advantage and that there is need for deliberate, concerted effort by the manufacturing firms in enforcing energy management practices themselves so as to attain firm competitiveness and reduce the risk of business closure or migration to other countries (Olingo, 2016; Wakiaga, 2017).

The multiple linear regression results showed that implementing energy management practices had a 44.8% explanatory power on competitive advantage among manufacturing firms in Nairobi. The result was also statistically significant at 5% significance level (p-value = 0.05) as shown in Table 4.13. Company Energy Management Policies showed that there is need for progressive improvement on the practice of energy management.

Based on the study findings therefore, the study concluded that energy management regulations, company energy policies, energy efficient technology and energy expenses

contribute significantly to the attainment of competitive advantage among manufacturing firms in Kenya with an explanatory power of 44.8% explained by energy management practices in the attainment of competitive advantage. KAM (2017) during its annual energy management awards is consistent with the study findings by noting that organizations with policies for energy management saved on energy costs and, more importantly, improved its industry competitiveness. UNIDO (2008) in its studies in Brazil and United States of America made a definite revelation that companies in countries with an emerging and rapidly expanding industrial sector have a particular opportunity to increase their competitive advantages by practicing best energy management practices from firm inception rather than retrofitting the practices during the growth stages of a business life cycle. Manufacturing firms in Kenya should therefore strife to improve on the implementation of energy management so as to reduce its overall energy Expenses and consequently improve its competiveness at the local, national and the international business environment.

The study further concluded that manufacturing companies were not utilizing the literacy strength among their staff as shown in Table 4.5. 70.4% of the employees had a minimum of university education while the rest 29% had a minimum of certificate qualification. This implied that at least all employees in the sector had a Kenya Certificate of Primary Education (KCPE) or Certificate of Primary Education (CPE) certificate indicating that there exists an opportunity in the ease of sharing information with the staff on energy management practices, which can easily be done using available media modes such as email, notices, memos, and social media platforms. In doing so, employees are able to understand with minimum guidance from company management of energy management experts or officers.

The study also concluded that with a youthful employee population with 74.9% of the employees between ages 20-39 years. The study concludes that with such energetic employee

base, the sector can enhance information training, since such an energetic human resource are known to exhibit low level of rigidity to change as opposed to the older employee base during moments of change when the company is introducing and enforcing energy management practices (Tishman *et al.*, 2012). High energy expenses also which is at 10.5% of firm revenue, is a negating factor to the attainment of competitive advantage among manufacturing firms. There is need for enhanced energy management practices so as to reduce the expenses and transfer the cost reduction benefits in attaining competitive advantage in other strategic areas of the company.

The study further concludes that there is also a high rate of turnover among the youthful employees as shown in Table 4.3. The study argues that with 67.5% of the employees having worked for the firm during a period of 0-4years, there is a possibility that the company's lose them within a short span of time (4years) to other sectors of firms. This presents a challenge to the manufacturing firms, because they deserve retain its employees for longer periods of more than 5 years so that it can boost its efforts of an informed workforce continued practice of energy management practices through organizational knowledgeable team effort.

5.4 Recommendations

5.4.1 Policy Recommendations

The implication of the study findings links the theoretical suggestions and research findings. The study was founded on the resource-based theory, knowledge-based theory and transient theory. Resource-based theory postulates that a firm's internal environments are the strength in harnessing the use of resources and attainment of competitive advantage. The proponents of this theory note that firm's competencies are a critical component in utilization of firm resources. In is on this premise that the study recommends that continued employee

awareness is carried out at firm level and support from government at the government level. The ability of a firm to efficiently utilize its energy resources is a fundamental business strategy in attaining competitive advantage through distinctive competencies among its human resources. As such, Government should closely work with the Kenya Association of Manufactures and Manufacturing firms in boosting its efforts in implementing energy management practices in the manufacturing sector through stakeholder participation within the industry.

The knowledge-based theory claims that human knowledge is key and should be a treasured resource for any firm. As such, as shown in Table 4.5, there is a great opportunity for the manufacturing firms to utilize its literate workforce (70.4% with university qualification) in information sharing and implementation of energy management practices. The study recommends that this will decreases the use of energy resources significantly when energy management know-how of its employees is enhanced. This is because there is a strong explanatory power (44.8%) of energy management practices on competitive advantage as shown in Table 4.13. The high energy expenses of 10.5% in the manufacturing sector as shown in Table 4.9 shows the need for enhanced practice of energy management so as to reduce this cost to lower levels of less than 3% which is considered appropriate (Singh, 1995). An energy management activity-related capability enables the manufacturing sector firms to improve its competitiveness through the benefits of energy management benefits of increased profitability, product differentiation and lower energy expenses. As such, The company managers should sensitize its employees through capacity building on the existing energy management practices.

The transient theory makes an assumption that since the current business environment is evolving, opportunities continuously arise that can enable a firm to leverage competitive

advantage. The current study recommends that energy management practices are also evolving with newer technologies and innovations being released, hence the need for a dynamic change of tactic in ensuring that the firm continuously adopts energy management endeavors that leads to enhanced business strategies geared towards attaining competitive advantage, through reduction in energy expenses, more profits, and product differentiation competitive strategies. With evolving technologies, there is need for the government to provide tax incentives and rebates on energy efficiency equipment, machinery and motor related appliances so as to motivate manufacturing companies to invest on them. This will reduce energy consumption and hence energy expenses, thus promoting the attainment of competitive advantage.

5.4.2 Recommendations for Further Research

While this study produced meaningful results, it was subject to several limitations that in turn provided avenues for further research. First, the study focused only on the direct and indirect effects of energy management practices on attainment of competitive advantage. In view of this, the study recommends that future studies can be conducted on the moderating effects of competitive advantage such as the macro-environmental factors such as Inflation and Taxation.

Secondly, the study focused on all manufacturing firms in Nairobi providing an average energy expense of 10.55 of total revenues. However, there is need to study the difference in energy expenses by firm size (small, medium and large firms) so as to establish if there is difference in their energy expenses and the practice of energy management abilities. In addition, there is also need for future studies to collect actual firm's expenses and not estimates as is the case in the current study. In such a case, longitudinal studies should be carried out.

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Appendix 1: Letter of Introduction

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TO ALL RESPONDENTS

RE: INTRODUCTORY LETTER

I am a postgraduate student at Kabarak University pursuing a Doctor of Philosophy in Strategic Management. I kindly request to be allowed by your esteemed firm to carry out a survey in your organization titled, **"Effect of Energy Management Practices on Attaining Competitive Advantage among Manufacturing Firms in Kenya: A Case of Selected Manufacturers in Nairobi County".** Please note that all information provided will be confidential and solely used for the purpose of this study. However, this questionnaire is filled under one's free will and any person is free to decline participation at any time. Please find attached, requisite permit/documentation permitting me to commence data collection.

At the end of the study, the company will also be presented with the findings of this study, if it so wishes to. In addition, I will also be working with research assistants who will be assisting me in this endeavour.

I look forward to your kind cooperation

Yours faithfully,

Henry Kiptum Yatich

Appendix 2: Questionnaire on Energy Management Practices

The objectives of the study are as indicated below:

i. To determine the effect of implementation of energy management regulations on attaining competitive advantage among manufacturing firms in Kenya.
ii. To determine the effect of implementation of company energy management policy on attaining competitive advantage among manufacturing firms in Kenya.
iii. To examine the effect of implementation of energy efficient technology on attaining competitive advantage among manufacturing firms in Kenya.
iv. To assess the effect of energy expenses on attaining competitive advantage among manufacturing firms in Kenya.

Section A: Respondent's Demographic Characteristics

Please tick (✓) appropriately within the provided brackets and/or write the appropriate answers in the space provided.

1. What is your gender?
   Male ( )
   Female ( )
2. How long have you worked in the company?
   0-4 years ( )
   5-9 years ( )
   Above 10 years ( )
3. Which department do you belong in?
   Management ( )
   Other Staff ( )
4. What level of education have you attained?
   Degree ( )
   Diploma/Cert ( )

Section B: Energy Sources

Indicate by ticking (✓) appropriately the energy types used by the company: 1=Strongly Disagree (SD), 2=Disagree (D), 3=Not Sure (NS), 4=Agree, 5=Strongly Agree

Type of Energy Source		**SD**	**D**	**NS**	**A**	**SA**
i)	Electricity					
ii)	Petroleum Products					
iii)	Wood					
iv)	Solar					

Section C: Machines and Equipment Operated by the Firm

Indicate by ticking (✓) appropriately: 1=Strongly Disagree (SD), 2=Disagree (D), 3=Not Sure (NS), 4=Agree, 5=Strongly Agree

Type of Machinery/Equipment		**SD**	**D**	**NS**	**A**	**SA**
i)	Motor-Driven Equipment & Machines					
ii)	Electronic Machines					

<u>Section D: Energy Management Regulations Implementation-Energy Regulatory Commission</u>

In the table below, indicate by ticking appropriately in the boxes provided, the energy practices adopted by the Company. 1=Strongly Disagree (SD), 2=Disagree (D), 3=Not Sure (NS), 4=Agree, 5=Strongly Agree

ERC Policy Implementation		**SD**	**D**	**NS**	**A**	**SA**
i)	The company is a member of Energy Regulatory Commission (ERC) and has adopted the Energy Management Regulations of 2012					
ii)	The company has filed its own documented energy efficiency policy with Energy Regulatory Commission					
iii)	The company has an Energy Officer that keeps					

	monthly and annual electricity, and fuel cost records					
Energy Audits		**SD**	**D**	**NS**	**A**	**SA**
iv)	The company has carried out at least one energy audit					
v)	The company has at least submitted one energy report to Energy Regulatory Commission					
Energy Investment Plan						
vi)	The company has developed and submitted its energy management investment plan to Energy Regulatory Commission.					
vii)	The company reviews its energy management investment plan					
Energy Conservation Measures		**SD**	**D**	**NS**	**A**	**SA**
viii)	The company has prepared and submitted an energy management implementation report to ERC					
ix)	The company has been audited and received compliance from Energy Regulatory Commission					

Section E: Company Energy Management Policy Practices

In the table below, indicate by ticking (✓) appropriately in the boxes provided, the energy practices adopted by the Company. 1=Strongly Disagree (SD), 2=Disagree (D), 3=Not Sure (NS), 4=Agree, 5=Strongly Agree

Reminders & Notices:						
		SD	**D**	**NS**	**A**	**SA**
i)	The company has placed notices, reminders and has taught employees to turn OFF unnecessary lights, equipment and machines.					
Training and Awareness Campaigns:						
		SD	**D**	**NS**	**A**	**SA**
ii)	Employees are trained on responsible energy usage					
iii)	The company benchmarks its energy efficiencies					

	practices with other firms					
iv)	The company frequently reviews and analyses data on energy use					
Repairs and Maintenance:						
		SD	**D**	**NS**	**A**	**SA**
v)	The company carries out frequent check-ups on its motor-powered equipment and machines.					
vi)	The company has invested in insulations of heaters, and moulding machines					
Government Initiatives						
		SD	**D**	**NS**	**A**	**SA**
vii)	The company gets tax relief for energy efficiency practices/initiatives					
viii)	The government sends energy efficiency auditors to conduct energy efficiency audits					
Company Targets:						
		SD	**D**	**NS**	**A**	**SA**
ix)	The company has put in place energy reduction targets					

Section F: Energy Efficiency Technology

In the table below, indicate by ticking (✓) appropriately in the boxes provided, the energy practices adopted by the Company. 1=Strongly Disagree (SD), 2=Disagree (D), 3=Not Sure (NS), 4=Agree, 5=Strongly Agree

Investment in Energy Efficient Technology						
		SD	**D**	**NS**	**A**	**SA**
Investment in Efficient Technology:						
i)	The company motor-powered equipment has low energy consumption rating					
ii)	The company purchases electronic equipment that has low energy consumption rating					
iii)	The company purchases motor-powered machines					

	that has low energy consumption rating					
iv)	The company has installed lighting system that uses less energy power.					
Automation of Technology:						
v)	The company lighting system is automated.					
vi)	Installation of heating systems that are automated					
vii)	Installation of ventilating and cooling systems are automated					
viii)	The company electricity system is electronically monitored					
ix)	Company buildings are designed to allow natural light use during the day					

Section G: Percentage Energy Expenses of Electricity and Petroleum

Answer the following question by ticking (✓) appropriately that which applies to you.

		10-50 employees	More than 50 employees
1.	How many people are employed in the firm?	☐	☐

Expenses:

For the following question, kindly provide percentage estimates ONLY

2.	Annual percentage Expenses on Energy: Example: **Percentage Expenses=** *Total Electricity Expenses *100* *Total Revenue* *and* *Total Petroleum Expenses *100%* *Total Revenue*	2012 _____ 2012 _____	2013 _____ 2013 _____	2014 _____ 2014 _____	2015 _____ 2015 _____

Is there any other investment in energy management practice?

_____

_____

Section H: Competitive Advantages Arising from Energy Management Practices

Indicate by ticking *(✓)* appropriately the benefits of energy efficiency? Please tick one of the choices given.

KEY: SA-Strongly Agree, A- Agree, U-Undecided, DA-Disagree, SD-Strongly Disagree

Cost Leadership		**SD**	**D**	**NS**	**A**	**SA**
i)	Practicing energy management leads to lower electricity expenses					
ii)	Practicing energy management leads to lower petroleum expenses					
iii)	Practicing energy management leads to lower production costs					
Higher Profit Margins						
		SD	**D**	**NS**	**A**	**SA**
i)	Energy management practices leads to increase in sales					
ii)	Energy management practices leads to increase in profits					
iii)	Energy management practices leads to surplus funds					
Product Differentiation						
		SD	**D**	**NS**	**A**	**SA**
i)	Energy management benefits enables the company to improve its product design					
ii)	Energy management benefits enables the company to improves its product quality					
iii)	Energy management benefits enables the company to improve customer service					
Energy Management Practice as a Competitive Tool		**SD**	**D**	**NS**	**A**	**SA**
i)	Energy management practices should not be used as a competitive strategy					

Annex A: Letter of Authorization-Kabarak University

INSTITUTE OF POSTGRADUATE STUDIES & RESEARCH
Private Bag-20157 **Tel: 0773265999**
Kabarak, Kenya
Email:directorpostgraduate@kabarak.ac.ke **www.kabarak.ac.ke**

26th May 2016

Ministry of Education, Science and Technology
National Commission for Science, Technology and Innovation.
9th Floor, Utalii House,
P.O Box 30623-00100.
NAIROBI

Dear Sir/Madam

SUBJECT: RESEARCH BY GDB/M/1229/09/12- YATICH KIPTUM HENRY

The above named is a Doctoral student at Kabarak University in the School of Business. He is carrying out a research entitled "Assessment of Energy Management Practices on Sustaining Competitive Advantage Among Manufacturers: A Case of Selected Manufacturing Firms in Nairobi, Kenya"

The information obtained in the course of this research will be used for academic purposes only and will be treated with utmost confidentiality.

Please provide the necessary assistance

Thank you.

Yours Faithfully,

KABARAK UNIVERSITY POSTGRADUATE STUDIES & RESEARCH DEPT 26 MAY 2016 PRIVATE BAG - 20157, KABARAK

DR. MOSES THIGA
AG. DIRECTOR POSTGRADUATE STUDIES & RESEARCH

Kabarak University Moral Code
As members of Kabarak University family, we purpose at all times and in all places, to set apart in one's heart, Jesus as Lord. (1Peter 3:15)

Annex B: Research Permit-(NACOSTI)

THIS IS TO CERTIFY THAT:
MR. HENRY KIPTUM YATICH
of KABARAK UNIVERSITY, 1165-30100
ELDORET,has been permitted to conduct
research in *Nairobi County*

on the topic: *ASSESSMENT OF ENERGY MANAGEMENT PRACTICES ON SUSTAINING COMPETITIVE ADVANTAGE AMONG MANUFACTURERS: A CASE OF SELECTED MANUFACTURING FIRMS IN NAIROBI, KENYA*

for the period ending:
27th June,2017

.....
Applicant's Signature

Permit No : NACOSTI/P/16/50446/11682
Date Of Issue : 27th June,2016
Fee Recieved :Ksh 2000

.....
Director General
National Commission for Science, Technology & Innovation

CONDITIONS

1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit
2. Government Officers will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice

REPUBLIC OF KENYA

NACOSTI

National Commission for Science, Technology and Innovation

RESEARCH CLEARANCE PERMIT

Serial No. A 9766

CONDITIONS: see back page

Annex C: Acknowledgements: Government Agencies

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone +254-20-2213471, 2241349,3310571,2219420
Fax:+254-20-318245,318249
Email:dg@nacosti.go.ke
Website: www.nacosti.go.ke
when replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No.

NACOSTI/P/16/50446/11682

Date:

27th June, 2016

Henry Kiptum Yatich
Kabarak University
Private Bag - 20157
KABARAK.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Assessment of energy management practices on sustaining competitive advantage among manufacturers: A case of selected manufacturing firms in Nairobi, Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for the period ending **27th June, 2017.**

You are advised to report to **the Principal Secretaries of selected Ministries, the Chief Executive Officers of selected Government Agencies, the County Commissioner and the County Director of Education, Nairobi County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

OFFICE OF THE PRINCIPAL SECRETARY RECEIPT ACKNOWLEDGED 14 JUL 2016 MINISTRY OF ENERGY & PETROLEUM

THE KENYA ASSOCIATION OF MANUFACTURERS
P. O. Box 30225, 00100 Nairobi G.P.O.
Tel: 3746005/7/21/22/3741634
Fax: 3746028/3746030

THE KENYA ASSOCIATION OF MANUFACTURERS RECEIVED 14 JUL 2016

Copy to:

The Principal Secretaries
Selected Ministries

The Chief Executive Officers
Selected Government Agencies.

The County Commissioner
Nairobi County.

COUNTY COMMISSIONER
NAIROBI COUNTY
P. O. Box 30124-00100, NBI
TEL: 341666

The County Director of Education
Nairobi County.

CITY DIRECTOR OF EDUCATION
NAIROBI
13 JUL 2015
MINISTRY OF EDUCATION
Box 74629, NAIROBI.

Annex D: Map of Nairobi County

Source: Google Maps, 2017

Annex E: Plagiarism Report

EFFECT OF ENERGY MANAGEMENT PRACTICES ON ATTAINING COMPETITIVE ADVANTAGE AMONG MANUFACTURING FIRMS IN KENYA: A CASE OF SELECTED MANUFACTURERS IN NAIROBI COUNTY

ORIGINALITY REPORT

12%	11%	5%	5%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.shh.fi Internet Source	1%
2	scotch-whisky.org.uk Internet Source	<1%
3	www.weglobalnetwork.org Internet Source	<1%
4	www.fypower.org Internet Source	<1%
5	industrial-energy.lbl.gov Internet Source	<1%
6	cdkn.org Internet Source	<1%
7	extranet.cccco.edu Internet Source	<1%
8	chuka.ac.ke Internet Source	<1%

Annex F: List of Companies Selected

S/No	Company	Sector
1.	Chandaria	Wood
2.	Lyons Maid	Food and Beverage
3.	Tropical Heat	Food and Beverage
4.	Osho	Chemicals and Allied
5.	Treadsetters	Rubber and Plastics
6.	Chania Feeds	Animal Feeds
7.	Frigoken Company Ltd	Food and Beverage
8.	Mbachu Wood Product	Timber, Wood and Furniture
9.	Kartasi Brand	Paper and Board Sector
10.	Sustainable Management Services	Multinationals, ICT, Service and Consultancy
11.	Mayfeeds-Maycorn	Animal feeds
12.	Kenblest	Food and Beverage
13.	Elgon Kenya Ltd	Agricultural
14.	Carbacid	Energy Electrical and Electronics
15.	Glass Distributors Aluminum World	Building and Construction
16.	Woodquip Industries Ltd	Timber, Wood and Furniture
17.	Elgokenya	Fresh Produce
18.	Pinnacle Ltd	Multinationals, ICT, Service and Consultancy
19.	Kevian	Food and Beverage

Annex G: Publications

International Journal of Economics Commerce and Management

IJECM

ijecm.co.uk

ISSN 2348-0386
Rochester, Kent, United Kingdom

Date: 04/11/17

To,

YATICH KIPTUM HENRY

Department of Management, Mount Kenya University, Kenya

RONALD K. CHEPKILOT

Institute of Postgraduate Studies, Kabarak University

AQUILARS M. KALIO

Department of Economics, Egerton University, Kenya

JOEL K. KOIMA

Department of Bio Informatics, Kabarak University, Kenya

Subject: Acceptance of research papers for final publication in IJECM.

Dear Author(s),

Your papers entitled **ED511-146: THE EFFECT OF COMPANY ENERGY MANAGEMENT POLICIES ON ATTAINING COMPETITIVE ADVANTAGE AMONG MANUFACTURING FIRMS IN KENYA: A CASE OF SELECTED MANUFACTURERS IN NAIROBI, COUNTY** and **ED511-160: RE-THINKING ENERGY EFFICIENT TECHNOLOGY IN SUSTAINING COMPETITIVE ADVANTAGE, AMONG MANUFACTURERS IN DEVELOPING ECONOMIES** are accepted for final publication in Vol. 5, Issue 11 (15th Nov 2017 issue) of International Journal of Economics, Commerce and Management.

Regards

Emeritus Professor Dr. Malcolm Christopher
Chief Editor

Impact Factor: 0.656 (GIF), 4.109 (SJIF)

Indexing: Ulrich's ProQuest, ECONIS, Index Copernicus, EconBiz, ScienceCentral, Electronic Journal Lib, ZDB, EyeSource, Wildau, RoMeo, AcademicKeys, ResearchBib, JourInformatics, Journal Guide, World Cat, NewJour, J-index, CiteFactor, Scientific Journal, Advanced Science Index, Google Scholar

Library Listing: Saxon State and University Library, Hochschule Hannover University, Virtual Library E. Europe, TFH Library, Clausthal University of Technology, WZB Berlin Social Science Library

Annex H: Chi-Square Frequencies for Energy Management Regulations

Member of ERC & Implementation of Energy Management Regulations of 2012			
	Observed N	Expected N	Residual
Strong Disagree	2	62.8	-60.8
Disagree	25	62.8	-37.8
Not Sure	178	62.8	115.2
Agree	96	62.8	33.2
Strongly Agree	13	62.8	-49.8
Total	314		
Has Documented Policy with ERC			
	Observed N	Expected N	Residual
Disagree	44	78.5	-34.5
Not Sure	140	78.5	61.5
Agree	82	78.5	3.5
Strongly Agree	48	78.5	-30.5
Total	314		
Has Energy Officer & Keeps Records of Energy Consumptions			
	Observed N	Expected N	Residual
Strong Disagree	11	62.8	-51.8
Disagree	24	62.8	-38.8
Not Sure	138	62.8	75.2
Agree	117	62.8	54.2
Strongly Agree	24	62.8	-38.8
Total	314		
Carried At least One Energy Audit			
	Observed N	Expected N	Residual
Disagree	62	78.5	-16.5
Not Sure	92	78.5	13.5
Agree	113	78.5	34.5
Strongly Agree	47	78.5	-31.5
Total	314		
Submitted Audit Report to ERC			
	Observed N	Expected N	Residual
Disagree	88	78.5	9.5
Not Sure	85	78.5	6.5
Agree	92	78.5	13.5
Strongly Agree	49	78.5	-29.5
Total	314		
Developed & Submitted Energy Management Investment Plan			
	Observed N	Expected N	Residual
Strong Disagree	7	62.8	-55.8

Disagree	33	62.8	-29.8
Not Sure	99	62.8	36.2
Agree	130	62.8	67.2
Strongly Agree	45	62.8	-17.8
Total	314		

Reviews its Energy Management Investment Plan

	Observed N	Expected N	Residual
Strong Disagree	12	62.8	-50.8
Disagree	22	62.8	-40.8
Not Sure	152	62.8	89.2
Agree	127	62.8	64.2
Strongly Agree	1	62.8	-61.8
Total	314		

Prepared and Submitted Energy Management Implementation Report

	Observed N	Expected N	Residual
Disagree	57	78.5	-21.5
Not Sure	139	78.5	60.5
Agree	106	78.5	27.5
Strongly Agree	12	78.5	-66.5
Total	314		

Firm Audited and Awarded Compliance Certificate

	Observed N	Expected N	Residual
Strong Disagree	23	62.8	-39.8
Disagree	23	62.8	-39.8
Not Sure	149	62.8	86.2
Agree	94	62.8	31.2
Strongly Agree	25	62.8	-37.8
Total	314		

Annex I: Chi-Square Frequencies for Company Energy Management Policy

Notices & Reminders on Energy Conservations Actions

	Observed N	Expected N	Residual
Not Sure	56	104.7	-48.7
Agree	172	104.7	67.3
Strongly Agree	86	104.7	-18.7
Total	314		

Employees are Trained on Energy Efficiency Measures

	Observed N	Expected N	Residual
Strong Disagree	1	62.8	-61.8
Disagree	2	62.8	-60.8
Not Sure	53	62.8	-9.8
Agree	170	62.8	107.2
Strongly Agree	88	62.8	25.2
Total	314		

Company Benchmarks With Other Firms

	Observed N	Expected N	Residual
Disagree	22	78.5	-56.5
Not Sure	13	78.5	-65.5
Agree	165	78.5	86.5
Strongly Agree	114	78.5	35.5
Total	314		

Firm Reviews and Analyses Data on Energy Use

	Observed N	Expected N	Residual
Disagree	57	78.5	-21.5
Not Sure	72	78.5	-6.5
Agree	151	78.5	72.5

Strongly Agree	34	78.5	-44.5
Total	314		

Frequent Check-ups on Motor-Powered Equipment and Machines

	Observed N	Expected N	Residual
Disagree	66	78.5	-12.5
Not Sure	39	78.5	-39.5
Agree	181	78.5	102.5
Strongly Agree	28	78.5	-50.5
Total	314		

Investment in Insulation & Mouldings

	Observed N	Expected N	Residual
Strong Disagree	12	62.8	-50.8
Disagree	80	62.8	17.2
Not Sure	95	62.8	32.2
Agree	115	62.8	52.2
Strongly Agree	12	62.8	-50.8
Total	314		

Company Gets Tax Relief for EE Practices

	Observed N	Expected N	Residual
Strong Disagree	2	62.8	-60.8
Disagree	68	62.8	5.2
Not Sure	116	62.8	53.2
Agree	116	62.8	53.2
Strongly Agree	12	62.8	-50.8
Total	314		

Received Energy Auditors

	Observed N	Expected N	Residual
Strong Disagree	1	62.8	-61.8
Disagree	56	62.8	-6.8
Not Sure	73	62.8	10.2
Agree	150	62.8	87.2
Strongly Agree	34	62.8	-28.8
Total	314		

There are Energy Reduction Targets

	Observed N	Expected N	Residual
Strong Disagree	24	62.8	-38.8
Disagree	56	62.8	-6.8
Not Sure	60	62.8	-2.8
Agree	139	62.8	76.2
Strongly Agree	35	62.8	-27.8
Total	314		

Annex J: Chi-Square Frequencies for Energy Efficient Technology

Motor-powered equipment has low energy consumption rating

	Observed N	Expected N	Residual
Disagree	67	78.5	-11.5
Not Sure	53	78.5	-25.5
Agree	132	78.5	53.5
Strongly Agree	62	78.5	-16.5
Total	314		

Electronic equipment that has low energy consumption rating

	Observed N	Expected N	Residual
Not Sure	208	104.7	103.3
Agree	90	104.7	-14.7
Strongly Agree	16	104.7	-88.7
Total	314		

Motor-powered machines that has low energy consumption rating

	Observed N	Expected N	Residual
Strong Disagree	19	62.8	-43.8
Disagree	56	62.8	-6.8
Not Sure	179	62.8	116.2
Agree	57	62.8	-5.8
Strongly Agree	3	62.8	-59.8
Total	314		

Company lighting system uses less energy wattage

	Observed N	Expected N	Residual
Disagree	179	78.5	100.5
Not Sure	44	78.5	-34.5
Agree	53	78.5	-25.5
Strongly Agree	38	78.5	-40.5
Total	314		

Company lighting system is automated

	Observed N	Expected N	Residual
Strong Disagree	17	62.8	-45.8
Disagree	61	62.8	-1.8

Not Sure	109	62.8	46.2
Agree	91	62.8	28.2
Strongly Agree	36	62.8	-26.8
Total	314		

Installation of heating systems that are automated

	Observed N	Expected N	Residual
Strong Disagree	17	62.8	-45.8
Disagree	61	62.8	-1.8
Not Sure	109	62.8	46.2
Agree	91	62.8	28.2
Strongly Agree	36	62.8	-26.8
Total	314		

Installation of ventilating and cooling systems are automated

	Observed N	Expected N	Residual
Strong Disagree	14	62.8	-48.8
Disagree	55	62.8	-7.8
Not Sure	140	62.8	77.2
Agree	81	62.8	18.2
Strongly Agree	24	62.8	-38.8
Total	314		

Company electricity system is electronically monitored

	Observed N	Expected N	Residual
Disagree	99	78.5	20.5
Not Sure	55	78.5	-23.5
Agree	136	78.5	57.5
Strongly Agree	24	78.5	-54.5
Total	314		

Company buildings designed to allow natural light use

	Observed N	Expected N	Residual
Disagree	35	78.5	-43.5
Not Sure	60	78.5	-18.5
Agree	151	78.5	72.5
Strongly Agree	68	78.5	-10.5
Total	314		

Annex K: Frequencies for Competitive Advantage

Lower Electricity Expenses			
	Observed N	Expected N	Residual
Not Sure	30	104.7	-74.7
Agree	218	104.7	113.3
Strongly Agree	66	104.7	-38.7
Total	314		
Lower Petroleum Expenses			
	Observed N	Expected N	Residual
Not Sure	35	104.7	-69.7
Agree	246	104.7	141.3
Strongly Agree	33	104.7	-71.7
Total	314		
Lower Production Costs			
	Observed N	Expected N	Residual
Not Sure	36	104.7	-68.7
Agree	162	104.7	57.3
Strongly Agree	116	104.7	11.3
Total	314		
Increase in sales			
	Observed N	Expected N	Residual
Not Sure	56	104.7	-48.7
Agree	172	104.7	67.3
Strongly Agree	86	104.7	-18.7
Total	314		
Enables investment in product design			
	Observed N	Expected N	Residual
Disagree	18	78.5	-60.5
Not Sure	39	78.5	-39.5
Agree	164	78.5	85.5
Strongly Agree	93	78.5	14.5
Total	314		
Surplus funds			
	Observed N	Expected N	Residual
Not Sure	34	104.7	-70.7
Agree	185	104.7	80.3
Strongly Agree	95	104.7	-9.7
Total	314		
Enables investment in product design			
	Observed N	Expected N	Residual
Disagree	18	78.5	-60.5

Not Sure	39	78.5	-39.5
Agree	164	78.5	85.5
Strongly Agree	93	78.5	14.5
Total	314		

Enables investment in product quality

	Observed N	Expected N	Residual
Disagree	2	78.5	-76.5
Not Sure	64	78.5	-14.5
Agree	150	78.5	71.5
Strongly Agree	98	78.5	19.5
Total	314		

Enables investment in customer service

	Observed N	Expected N	Residual
Disagree	10	78.5	-68.5
Not Sure	53	78.5	-25.5
Agree	190	78.5	111.5
Strongly Agree	61	78.5	-17.5
Total	314		

Annex L: Homogeneity Test

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Energy Management Regulations	Equal variances assumed	5.014	.026	-1.254	312	.211	-.01877	.01497	-.04822	.01069
	Equal variances not assumed			-1.407	100.837	.162	-.01877	.01334	-.04523	.00769
Company Energy Management Policy	Equal variances assumed	31.274	.000	-.874	312	.383	-.04801	.05491	-.15605	.06002
	Equal variances not assumed			-1.095	121.359	.276	-.04801	.04384	-.13480	.03877
Energy Efficient Technology	Equal variances assumed	1.152	.284	7.264	312	.000	.27972	.03851	.20395	.35549
	Equal variances not assumed			8.381	105.187	.000	.27972	.03338	.21354	.34590
Percentage Energy Expenses	Equal variances assumed	18.899	.000	-1.426	312	.155	-.24391	.17105	-.58046	.09265
	Equal variances not assumed			-1.220	74.989	.226	-.24391	.19998	-.64229	.15447

Source: Research Data