THE RELATIONSHIP BETWEEN *KAIZEN* IMPLEMENTATION AND OPERATIONS PERFORMANCE IMPROVEMENT: THE CASE OF KENYAN MANUFACTURING FIRMS

BY

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DECLARATION

I the undersigned, declare that this research project is my original work and has not been submitted to any other institution for any examination or award.

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DEDICATION

I dedicate this work to my mother, Philomena Nderi, who has been the rock of my life.

ABSTRACT

The purpose of this study was to establish the relationship between implementation of *kaizen* and operations performance improvement in Kenyan manufacturing firms. It sought to find out the extent of *kaizen* practices implementation in these firms as well as the challenges faced by these firms in implementing *kaizen*.

A survey questionnaire was used to collect data from operations managers or their equivalents in 13 Kenyan manufacturing firms that have implemented *kaizen.* Descriptive statistics was used to evaluate the extent of implementation of *kaizen* practices and the challenges in *kaizen* implementation. Individual operations performance measures were regressed against the set of *kaizen* practices to evaluate the relationship between the two. A regression model was used to evaluate the overall relationship between *kaizen* implementation and operations performance improvement.

The results from the study show that *kaizen* practices have varying degrees of implementation in Kenyan manufacturing firms; with 5S having the greatest extent of implementation and suggestion system and TPS having the least extent of implementation. On challenges faced in *kaizen* implementation, employee attitudes and misconceptions about *kaizen* posed the greatest challenge whereas lack of management support and economic constraints posed the least challenge. Results from the regression analysis show that implementation of *kaizen* practices in Kenyan manufacturing firms is significantly related to operations performance improvement. This study has provided insights into the extent of adoption of *kaizen* in Kenyan manufacturing

firms, and provides further evidence that *kaizen* implementation is significant in enhancing operations performance improvement.

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ABBREVIATIONS

AGOA	African Growth and Opportunities Act
BPR	Business Process Reengineering
COMESA	Common Market for Eastern and Southern Africa
EAC	East African Community
EU	European Union
EPZ	Export Processing Zones
GDP	Gross Domestic Product
JIT	Just In Time
JISHA	Japan Industrial Safety and Health Association
KAM	Kenya Association of Manufacturers
KEPSA	Kenya Private Sector Alliance
KNBS	Kenya National Bureau of Statistics
QCC	Quality Control Circles
SME	Small and Medium Enterprise
SPSS	Statistical Product and Services Solution
SQC	Statistical Quality Control
TPM	Total Productive Maintenance
TPS	Toyota Production System
TQM	Total Quality Management
TQC	Total Quality Control
UK	United Kingdom
USA	United States of America
WIP	Work In Progress

INTRODUCTION

1.1 Background of the study

Many methods of improving manufacturing operations performance have been developed over the years and range from work study through operations research, lean manufacturing, *kaizen*, benchmarking and Business Process Reengineering (BPR).These methods differ from each other in how they are implemented, how the improvement should be achieved and what is to be improved. Imai (1986) introduced *kaizen* to the international audience and asserted that *kaizen* is an umbrella concept for a large number of Japanese business practices that focuses on the way people approach work. It shows how management and workers can change their mindset together to improve their productivity. While there are many strategies for management success, *kaizen* is different since it helps focus in a very basic way on how people conduct their work (Imai, 1986; 1997).

The manufacturing sector in Kenya is a major sector of growth, with its share in GDP having risen from 9.9 percent in 2002 to 11.8 percent in 2007. The manufacturing sector comprises of more than 700 established enterprises and employed over 245,000 people in 2005. The products from the sector comprises of both industrial and consumer goods from diverse industries such as agro- processing, petroleum and vegetable oil refining, iron and steel manufacturing, cement, plastics manufacturing, apparel industry and medicinal and pharmaceutical products. Kenyan manufactured exports are mainly to East Africa and COMESA markets with small quantities being sold in Europe and the USA (Kenya National Bureau of Statistics, 2012). The sector operates in a largely unfavourable business operating environment characterized by high operations cost, poor infrastructure, inadequate and expensive financing and inadequate

managerial and technical skills (Kenya Private Sector Alliance, 2005). To overcome these challenges it is prudent that manufacturing firms adopt non costly continuous improvement methodologies so as to improve their competitiveness.

1.1.1 The *Kaizen* Concept

In Japanese management, *kaizen* means "continuous improvement" involving the entire workforce from the top management to middle managers and workers. *Kaizen* means continuous improvement of productivity and quality, based on a participatory process involving the entire workforce. With no requirement for huge investment, it is a low-cost approach to productivity and quality improvement. *Kaizen* is applicable not only to the manufacturing sector but also to the service sector, public organizations, and non-profit organizations. The origin of Japan's *kaizen* movement was the quality control method imported from the USA in the post world war II period. Japan assimilated and developed this as its own management practice method which later even surpassed performance in the USA. This adapted method, which became known as *kaizen*, spread rapidly among Japanese companies including a large number of small and medium-sized enterprises. It subsequently spread overseas as Japanese business activities expanded abroad and Japanese companies began to build production networks with local companies (Schroeder & Robinson, 1991).

The *kaizen* methodology is often contrasted to the western management styles in that *kaizen* attaches importance to the workplace where actual activities are carried out and the workers in the workplace are the centre of *kaizen* activities. Although the owner and the managers are responsible for making decisions and providing guidance, the workers are the key people who make proposals for improvement and implementation thus adopting a bottom –up management

style which empowers the workers. A key characteristic of *kaizen* is that improvements come with minimum investment, since the emphasis is on minimizing waste. Generally, *kaizen* is a low-cost approach to productivity improvement because it does not require huge capital investment, expensive technology, or costly research and development since it seeks to use existing equipment and human resources in a more efficient and less wasteful, and the key goal of *kaizen* is to generate the internal capability of the targeted firm (Imai, 1986; 1997). Thus, *kaizen* is particularly suited for enterprises in low-income countries which face financial access problems (Ohno et al., 2009).

1.1.2 Kenyan Manufacturing Sector

The manufacturing sector in Sub-Saharan Africa is generally not dominant economically compared to the agriculture and service sectors. Kenya is no exception. In 2007, the contribution to GDP of the manufacturing sector in Kenya was 11.8 percent, whereas the agriculture and the service sectors accounted for 22.7 percent and 58.2 percent, respectively (World Bank, 2009). There are about 2000 fragmented manufacturing units in Kenya according to the Kenya vision 2030 report of 2007(Kenya National Bureau of Statistics, 2012) with the Kenya Association of Manufacturers (KAM) membership comprising of about 700 members.

This sector is quite diversified, and comprises of all products which in other terms are referred to as non-agricultural products as well products from agro-processing industries. The major products falling under the former are textiles and clothing, refined petroleum products, paints and varnishes, transport machinery - where assembled motor vehicles constitute the bulk of products, electrical machinery and alliances, metal products, paper and paperboard products, medicinal and pharmaceutical products, organic and non-organic chemicals, pesticides and

fertilizers, non-metallic minerals like fluorspar and soda ash, hides, skins and leather products, soaps, essential oils, perfumes and cleansing products, plastics articles, rubber products, cement, salt, wood and wood products, printing and publishing articles, non-electrical machinery and appliances, and glass products. The latter largely comprises of products from food processing, beverages and tobacco manufacturing. Although the sector is fragmented, food processing, beverages and tobacco manufacturing, refined petroleum products and textiles and clothing account for 50 percent of GDP and exports and 60 percent of formal employment (Kenya Association of Manufacturers, 2012; Kenya National Bureau of Statistics, 2012).

Kenya manufactured goods markets include domestic as well as exports. The export destinations for majority of the above products are destined for the EAC and COMESA markets mainly owing to proximity, preferential treatment, reconstruction activities and a relatively well developed manufacturing industry in Kenya compared to immediate neighbours. The other market, especially for Kenyan apparel manufacturers, is the USA. The largest industrial sector contribution to exports in 2005 was garments (74.4 percent), followed by chemicals (7.2 percent) and agro-processing (5.2 percent). In addition, 10.7 percent of national exports representing over 70 percent of EPZ output is exported to the USA under African Growth and Opportunities Act (AGOA). Locally manufactured goods comprise 25 percent of Kenya's exports. However, in the East African region, Kenyan share is only 7 percent of the $11billion market of manufactured goods with the larger percentage being dominated by imports from outside the region. This indicates that there is a huge potential to improve Kenya's competitiveness in the region by replacing external suppliers (Kenya National Bureau of Statistics, 2012; Kenya Association of Manufacturers, 2012).

The manufacturing sector faces a myriad of challenges emanating from both the domestic and global operating environments. Globally threats include terrorism, market entry constraints in the EU and USA, effects of global financial crisis and increased global competition for locally manufactured products. Domestically the challenges include uncompetitive infrastructure and utilities, unfriendly legal & regulatory framework for business operations, cumbersome trade facilitation and administration procedures, low levels of labor and capital productivity, a constraining macroeconomic business environment, high rates of crime, insecurity and poor governance, high levels of corruption, use of obsolete technologies , an unfriendly environment for micro and small business operations, limited research and development as well as inadequate managerial, technical and entrepreneurial skills (Kenya Private Sector Alliance, 2005).The rising levels of poverty coupled with the general slowdown of the economy has continued to inhibit growth in the demand of locally manufactured goods, as effective demand continues to shift more in favour of relatively cheaper imported manufactured items. In addition, the high cost of inputs as a result of poor infrastructure has led to high prices of locally manufactured products thereby limiting their competitiveness in the regional markets and hampering the sector's capacity utilization (World Bank, 2009). These challenges are a great setback to endeavors to compete globally by these manufacturing firms. Whereas most of the challenges facing the sector need intervention at national and global levels, there are some firm level challenges that can be tackled through adoption of appropriate continuous improvement methodologies such as *kaizen.*

1.2 Statement of the Problem

The concept of *kaizen* has received much attention as a key to Japan's competitive success (Imai, 1986). In contrast to the worldwide diffusion of the concept of *kaizen*, many researchers have illustrated the difficulties for many companies outside Japan to have *kaizen* activities take root in organizations (Bateman and David, 2002; Bessant et al., 1994). The transfer of Japanese *kaizen* activities to plants overseas has been researched as a component of the studies on transfer of Japanese management practices to overseas plants. In the USA, (Abo, 1994; Kenney and Florida, 1993; Liker et al., 1999), the UK, (Elger and Smith, 2005; Oliver and Wilkinson, 1992; Saka, 2004), and China (Hong et al., 2006a, b; Taylor, 1999). These studies suggest that the implementation and influence of Japanese *kaizen* activities in overseas plants is situated in the social, economic and cultural contexts. For example Hong et al. (2006b) illustrates that it is difficult to get active participation from frontline workers in *kaizen* activities in China, and suggests that great management efforts are needed to create well suited contexts for Japanese *kaizen* activities, such as introducing an open -plan plant and office layout as well as import daily communal rituals from Japan. In fact, as the comparison of key performance indicators between Japanese, UK and USA auto-parts manufacturers by Oliver et al. (2002) shows, there is still a large gap in terms of the influences of *kaizen* activities between Japanese and western companies. This highlights the necessity to understand not only the types of *kaizen* activities in countries outside Japan, but also the extent of implementation of these *kaizen* activities in more depth and their influence on organizational performance when the social, economic and cultural aspects are put into perspective.

The Kenyan manufacturing sector is expected to play a critical role in propelling the economy to a 10 per cent growth rate, in line with the aspirations of Kenya Vision 2030 and in supporting the country's social development agenda through the creation of jobs, the generation of foreign exchange, and by attracting foreign direct investment. To meet those goals, the sector has to become more efficiency driven, raising productivity per unit of input especially of labour and capital closer to those of Kenya's external competitors (Kenya National Bureau of Statistics, 2012). To achieve these targets manufacturing firms have resorted to adoption of methodologies that aim at improving operations performance. These methodologies comprise of either continuous improvement methods such as *kaizen* or radical methods like BPR.

Although studies of the relationships between *kaizen* implementation and organizational performance on countries outside Japan such as Australia (Chapman et al, 1997), Sweden (Lindeberg and Berger, 1997) and the UK (Oliver and Wilkinson, 1992) have been conducted, little is known on why there exists differences in the relationships between *kaizen* implementation and operations performance improvement between Japanese companies and companies in Africa and Kenya in particular. The central research question for this study is, "what is the relationship between *kaizen* implementation and operations performance improvement in Kenyan manufacturing firms?"

1.3 Research Objectives

The central research objective for this study was to establish the relationship between *kaizen* implementation and operations performance improvement in Kenyan manufacturing firms. The specific objectives of this study were to:

i. Determine the extent of implementation of *kaizen* techniques or practices by Kenyan manufacturing firms.

ii. Determine the extent to which implementation of *kaizen* has contributed to operations performance improvement in Kenyan manufacturing firms.

iii. Establish the challenges faced by Kenyan manufacturing firms in implementing *kaizen*, in the context of the economic, social and cultural environment that they operate in.

1.4 Value of the Study

This study will contribute to enhancing the existing knowledge on *kaizen* by providing knowledge and insights into the adoption of *kaizen* by Kenyan manufacturing firms. It will further provide evidence as to whether implementation of *kaizen* has relationships with operations performance improvement in Kenyan manufacturing firms.

The findings from this study will appropriately enlighten the manufacturing fraternity in Kenya on the available low-cost *kaizen* practices/techniques that can be used to improve their operations efficiency and effectiveness. These practices and techniques can be adopted either individually or as a set of practices.

The findings from this study may further aid firms in their policy formulation regarding adoption of continuous improvement methodologies. The relationships between *kaizen* implementation and operations performance improvement will appropriately guide policy formulators on which *kaizen* techniques are most appropriate for adoption in their firms.

LITERATURE REVIEW

2.1 Introduction

This chapter covers the review of literature on the various aspects of *kaizen* as a continuous improvement methodology in firms. The chapter highlights the understandings of various authors on the concept of *kaizen* as well as the unanimously accepted principles or features of *kaizen.* A description of the most common *kaizen* implementation techniques/practices are covered in this chapter. Presented also is a summary of theoretical and empirical findings from authors on the influences of various *kaizen* techniques/practices on a variety of operations performance dimensions in different parts of the world as well as the challenges associated with *kaizen* implementation.

2.1.1 The Concept of *Kaizen*

The term "kaizen" is a derivative of two Japanese ideograms, "kai," meaning change, and "zen,"meaning good or for the better (iSixSigma LLC, 2004). Another definition of the Japanese meaning of *kaizen* is "to take apart and put back together in a better way" (Minton, 1998). The popular meaning is continual, incremental improvement of all aspects of a company (Imai, 1986). *Kaizen* is the Japanese word for improvement or "change for the better" carrying the connotation in industry of all the activities which take place in the Japanese workplace to enhance the operations and environment. The phrase "change for the better" implies any change that results in improvement which could be quality or other factors that customers or an organization judges to be of value such as innovation, ease of use, on time delivery, durability, operations flexibility, customer satisfaction and low cost (Zimmerman, 1991).

In its direct translation, *kaizen* simply means "improvement", without any concept of time frames. On the other hand, the term *kaizen* used in management means the creation of a system, which enables continuous and sustainable improvement for an organization. Since global competition calls for never ending improvement, the goal of *kaizen* activities is not static and always has to be shifted to a higher level (Ohno, 1988).

Kaizen has two definitions, the broader and the narrower definition. The broader definition of *kaizen* encompasses various production and quality management tools under the umbrella of the *kaizen* philosophy. On the other hand, the narrower definition is improvement of the workplace ("*gemba"*) derived from proposals from the workers on the basis of QCC and a suggestion system (Imai, 1986; Fujimoto, 1999; Fukui et al., 2003; Liker, 2004). This study adopted the broader definition of *kaizen.*

Kaizen is closely associated with but not identical to the idea of Quality Circles and TQM Lillrank and Kano (1989), and resonates with many recent ideas in management from the knowledge management and more specifically the development and communication of knowledge as asserted by Nonaka and Takeuchi (1995), to the balanced scorecard on the continuous monitoring of a wide range of processes (Kaplan and Norton, 1996). Imai (1986) noted that the concept is "so deeply ingrained in the minds of both managers and workers that they often do not even realize that they are thinking *kaizen*". He further presents *kaizen* as a pervasive global program which subsumes TQM, JIT and TPM.

2.1.2 Principles/Features of *Kaizen*

Kaizen as a methodology promotes process-oriented thinking because processes must be improved before improved results are obtained. Moreover *kaizen* is people-oriented, being

directed at people's efforts and assumes that improvement in people's attitudes and efforts are more likely to produce improved results in the long run than mere result-oriented thinking (Imai, 1986). Even though most writers have emphasized different features of *kaizen* there is almost a unanimous agreement on the following key features:

Kaizen is continuous in nature which signifies the embedded nature of the practice and its never ending journey towards quality efficiency and effectiveness in all activities. Yeo *et al.* (1995) describes the viewpoints of various traditional quality management gurus on the concept of 'zero defects' and 'do it better each time' that these strategies are the important ways to improve quality continuously. 'Zero defects' represents continuous improvement over quality by detection of defects. A phrase 'do it better each time' strategy is associated with constant, conscious and committed efforts to reduce process variation. They conclude that continuous improvement is the most important way to manage business through these strategies. Although many firms have achieved process improvement through implementation of continuous improvement programmes, the initial improvement is easily eroded back to the pre-improvement level (Bateman and David, 2002). *Kaizen* is however longer than process improvement in terms of time frame of activity. Ohno (1988) argues that improvement through *kaizen* is both eternal and infinite, implying that improvement processes are implemented continuously.

It is incremental in nature. Cheser (1998) explains that *kaizen* is based on making small changes on a regular basis thus reducing waste and continuously improving productivity, safety, and effectiveness. *Kaizen* is participative and thus entailing the involvement of the workforce. Deniels (1995) argues that the way to achieving fundamental improvement on the shop floor is by enabling operators to establish their own measures, to align business strategies and use them

to drive their *kaizen* activities. He further argues that operators are the experts and once they realize that they are the ones to solve their problems, then they only need some direction from top management. Wickens (1990) emphasizes the contribution of teamwork, flexibility and quality to the concept of *kaizen*. He emphasizes that teamwork and commitment do not come from involving the representatives of employees, but from direct contact and communication between the individual and his boss. Liker (2004) noted that the concept of *kaizen* is a kind of corporate culture that supports continual organizational learning.

The successful implementation of *kaizen* requires management support emphasizing the need for leadership and top management support in *kaizen* activities. Imai (1986) asserts that *kaizen* is a continuous improvement process involving everyone, managers and workers alike. Broadly defined, *kaizen* is a strategy to include concepts, systems and tools within the bigger picture of leadership involving people culture, all driven by the customer. Aoki (2008) found out that the actions of managers on the shop floor are always watched by workers and that these actions are able to give workers the legitimacy to engage in *kaizen* activities. He asserts that managers must show a lot of self-discipline if they want the workers to show the same self-discipline.

Effective measurement of *kaizen* performance is important for successful implementation of *kaizen*. Doolen et al. (2008) describes the variables that are used to measure the impact of *kaizen* activities on human resource. These variables include attitude toward *kaizen* events, skills gained from event participation, understanding the need for *kaizen*, impact of these events on employee, impact of these events on the work area, and the overall impression of the relative success of these events. The business performance measures used include lead time, floor space, WIP,

Cycle time, productivity, on-time delivery rate and defect rate (Martin, 2004; Cresswell, 2001; Bane, 2002).

Effective regular training is necessary for effective implementation of *kaizen* in any organization. In TPM (a *kaizen* practice) implementation, various authors have stressed the contribution of training towards performance improvement (Ahmed et al., 2005; Ireland and Dale, 2006; Sharma et al., 2006; Tsarouhas, 2007). Therefore, understanding maintenance as a strategic decision can eliminate any potential of equipment deterioration, failures, breakdowns and stoppages. In order to enable employee participation, training and education should be provided sufficiently through proper and well-structured programs. The elements of training are very important in any organization and thus training plays an important role in minimizing the negative effect of system complexity on manufacturing system performance (Guimaraes et al., 1999).

2.2 *Kaizen* Techniques/Practices

There are a large number of related and often overlapping techniques and practices that belong to the *kaizen* methodology. They include 5S, *kaizen* events, 5 why's, Total Preventive Maintenance (TPM), Just-In-Time (JIT) System, Suggestion System, *kaizen* costing, Quality Control Circles (QCC) or Quality Circle (QC), Total Quality Management (TQM), Toyota Production System (TPS), *kanban* system, elimination of the seven kinds of wastes, and poke-yoke (error proofing). This study focused on 5S, *kaizen* events, 5 why's, Total Preventive Maintenance (TPM), Just-In-Time (JIT) Systems, Suggestion System and Total Quality Management (TQM), as they are considered the major distinct techniques/practices. Imai (1986, 1997); Fujimoto (1999); Fukui et al. (2003); Liker (2004) have all emphasized the need to use these techniques for improvement of operational performance.

5S is one of the *kaizen* practices and is described as a philosophy and checklist for good housekeeping to achieve greater order, efficiency and discipline in the workplace. Osada (1991) argues that, it is a system that aims at reducing waste and optimizing productivity and quality through maintaining an orderly workplace and using visual cues to achieve more consistent operational results. It further aims at embedding the values of organizational neatness, cleaning, standardization and discipline in the workplace in its existing configuration. Chapman (2005) indicates that 5S is systematic and organic for lean production, a business system for managing and organizing manufacturing operations that requires less human effort, space, capital and time to make products with fewer defects. Gapp et al., (2008) links 5S to aspects of Japanese management approaches like TQM, JIT or TPM which are aligned to an integrated management system rather than a simple management tool or technique. TPS is by far the most well-known example of how the 5S principles were applied in practice to be effective in the TQM journey (Shingo, 1982; Floyd, 1997). The 5S pillars are sort (*seiri*), set in order (*seiton*), shine (*seiso*), standardize (s*eiketsu*) and sustain (*shitsuke*).

Kaizen event is another *kaizen* practice and it refers to a focused and structured continuous improvement project, using a dedicated cross functional team to address a targeted work area to achieve specific goals in an accelerated time frame (usually one week or shorter). *Kaizen* event team members apply low-cost problem solving tools and techniques to rapidly plan and often implement improvements in a target work area. Melnyk et al.(1998) describes seven characteristics that distinguish *kaizen* events from other process improvement approaches and they include; it is a self contained short term (3-5 days) intervention with a clearly defined finite life (Cuscela, 1998; Sheridan, 1997), the scope of a *kaizen* event is on part of a specific value stream (Laraia et al., 1999), *kaizen* events are low capital interventions whose focus is on

improving existing processes rather than implementing solutions that require investment in new technology (Sheridan, 1997), they are team based, comprising of employees from targeted work area and support functions such as engineering, purchasing and production, *kaizen* events are action oriented with the teams given authority to implement solutions as they are developed, without additional direct approval from management (Minton, 1998; Oakeson, 1997; Sheridan, 1997), most *kaizen* event goals are measurable with common metrics including productivity lead times, set-up times, floor space defect rate, percent on-time delivery (Kosandal and Farris,2004) and finally *kaizen* events are designed to create a cycle of continuous improvement.

The 5-why's technique is a fact-based and structured approach to problem identification and correction that focuses not only on reduction of defects but also in eliminating them. It is captivated in the motto "when you find a problem ask why five times", so as to find the deepest root cause of the problem. The 5-why's analysis is commonly used in lean manufacturing which is an extension of the ideas of JIT. Taiichi Ohno, the father of TPS was an avid proponent of the 5 why's technique as a tool for root cause problem solving (Alukal, 2007).

TPM is a maintenance system that is focused on prevention of machine breakdowns. It is normally implemented through practices such as "autonomous maintenance". "Autonomous maintenance" refers to activities designed to involve operators in maintaining their own equipment independent of the maintenance department. It consolidates the preventive and predictive maintenance approaches with an emphasis on employee participation and it integrates preventive maintenance, condition-based maintenance and predictive maintenance activities. Kutucuoglu et al. (2001) asserts that reliable equipment is regarded as the main contributor to the performance and profitability of manufacturing systems, especially in a dynamic and challenging

environment. TPM is a resource-based maintenance management system which focuses on improving equipment effectiveness, productivity, workplace safety and environmental issues, and eliminating production losses (Kutucuoglu et al. 2001).

JIT is a production system aimed at eliminating non-value adding activities of all kinds and achieving a lean production system flexible enough to accommodate fluctuations in customer orders. JIT includes practices aimed at reducing or eliminating waste along the value streams such as lot size reduction, cycle time reduction, quick changeover and production process reengineering (Shah and Ward, 2003). A *kanban* system is subsumed by JIT and it refers to a communication tool in the JIT production and inventory control system, developed at Toyota. A *kanban* (signboard) is attached to a given number of parts and products in the production line, instructing the delivery of a given quantity. When the parts have all been used, the *kanban* is returned to its origin where it becomes an order to produce more. Elimination of the seven kinds of waste is also subsumed by JIT and these wastes emanate from overproduction, waiting time at the machine, waste in transportation of units, waste in processing, waste in holding inventory, waste in motion and rejects (defectives), (Ohno, 1988; Imai, 1997). TPS is the philosophy which organizes manufacturing and logistics at Toyota, including interaction with suppliers and customers. It focuses on the elimination of waste and defects at all points of production including inputs, process and final output (delivery) (Ohno, 1988). Ebrahimpour and Schonberger (1984) suggest that JIT would help solve many of the problems companies face in developing countries and that its basic simplicity makes it particularly well suited for use in these countries.

A suggestion system is the method by which the ideas and suggestions of employees are communicated upwards through the management hierarchy to achieve cost savings or improve

product quality, workplace efficiency, customer service, and working conditions. Examples range from simply placing suggestion boxes in common areas, to implementing formal programs with committees reviewing ideas and rewards given for successful adoption of those ideas. Nemoto (1992) argues that the self initiative of workers to participate in *kaizen* activities through voicing matters concerning their work processes plays an important role in *kaizen* activities. Ohno (1988) emphasized the importance of communication between different functions while using the 5 why's analysis for root cause analysis.

TQM represents a number of management practices, philosophies and methods to improve the way an organization does business, makes its products, and interacts with its employees and customers. QCC activities function as an integral part of TQM. QCC is a small group of workers who collectively find problems, discuss alternative remedies, and propose a solution. QCCs voluntarily perform improvement activities within the workplace, as part of a company-wide program of mutual education, quality control, and self-development and productivity improvement. TQM subsumes poke yokes or error proofing techniques and the latter refers to a system of eliminating defects being the results of inaccuracy. In addition, QCC and use of error proofing techniques are quality management programs and literature suggests that these programs are practices within a TQM approach (Ahire et al., 1996; Rahman and Bullock, 2005).

2.3 Knowledge, Skills and Attitudes (KSA) Framework

Kaizen practices attempt to impact business performance, as well as human resource outcomes (such as employee attitudes, knowledge, and skills). To holistically evaluate a *kaizen* event, both business performance and human resource outcomes must be measured and evaluated. The business performance measure used include lead time, floor space, WIP, Cycle time,

productivity, on-time delivery rate and defect rate (Vasilash,1997; Redding, 1996; Martin, 2004; Cresswell, 2001; Bane, 2002; Bradley and Willet ,2004). The human resource impact of *kaizen*, however, is rarely measured directly (Kosandal and Farris, 2004; Miller, 2004). The knowledge, skills and attitudes (KSA) framework from the industrial and organizational (I/O) psychology literature is used to operationalise human resource outcomes. Muchinsky (1997) defines knowledge as "body of information necessary" for the employee to perform tasks; skill refers to the "psychomotor abilities" needed to perform tasks with "ease and precision;" and attitude refers to the "cognitive capabilities" required to perform the required tasks (for example, the desire to perform the given activity).

The KSA framework is operationalized using six variables with corresponding measured attribute that can be assessed quantitatively. The first variable, employee attitude, provides a measure of participant effect toward lean activities, with a specific emphasis on the principle of *kaizen*. The second variable, impact on work area, measures perceptions of the impact of *kaizen* activities on the work environment. Impact on participant measures perceptions of the impact of *kaizen* activities on the participant's own work performance. The fourth variable, skill, provides a measure of the extent to which participants felt they obtained new job skills as a result of being involved in the *kaizen* event. Understanding the need for change, the fifth variable, measures perceptions of the need for change in the work area targeted in the event. The sixth and final variable, understanding the need for *kaizen*, provides a measure of the perceived need for *kaizen* activities (Doolen et. al., 2008).

2.4 *Kaizen* and Manufacturing Operations Performance Improvement

Studies that have focused on Japanese manufacturing techniques have all illustrated the importance of *kaizen* in improvement of organizational performance (Liker, 2004; Ohno, 1988; Womack and Jones, 1996; Womack et al, 1990). Manufacturing Operations performance management is characterized by four key distinct performance dimensions which include; cost/productivity, time/speed, operations flexibility and quality. Others include creativity, innovation and customer satisfaction (De Toni and Tonchia, 2001). These four distinct classes of performance dimension coincide with the four basic components of cost, quality, speed and flexibility by which the manufacturing strategy of a firm is generally expressed (Ward et al., 1995). These manufacturing performance dimensions determine the market competition focused on "price", "product" and "place" (Corbett and van Wassenhove, 1993).

Kaizen events attempt to impact business performance as well as human resource outcomes. Reported business performance improvements resulting from *kaizen* events appear to vary from moderate improvement (25-50 per cent), to significant improvement (75-100 per cent) to orders of magnitude improvement (greater than 100 per cent) (Cuscela, 1998; Sheridan, 1997). *Kaizen* events that generate short term performance improvements may provide impetus that the organizational change literature purports is necessary for creating employee commitment to a given performance improvement strategy (Keating et al.,1999; Kotter,1995).

Some of the purported human resource outcomes of *kaizen* event are increased employee knowledge of the need for improvement in the organization (Butterworth, 2001; Tanner and Roncarti,1994), increased employee knowledge of the principles, tools ,techniques of continuous improvement, development of problem solving skills (McNichols et al.,1999), promotes

teamwork in an organization, proficiency in lean manufacturing tools (Mika, 2002), positive influence in employee attitudes, anecdotal reports indicate increased levels of employee enthusiasm (David, 2000; Heard,1997; Kumar and Harms, 2004; Rusiniak, 1996; Wittenberg, 1994), increased employee liking for their daily work (Minton, 1998).Anecdotal reports also suggest that employees appear to like *kaizen* events (Hasek, 2000), to find them fun (Bicheno, 2001), and to enjoy providing input to the improvement process (Kleinsasser, 2003). Doolen et al. (2008) further suggests that *kaizen* events are positively related to human resource outcomes such as sustained performance improvement or employee enthusiasm as well as contribute to achievement of a firm's business objectives. Such outcomes are purported to create an organizational culture focused on longer–term continuous improvement (Laraia et al., 1999; Melnyk et al., 1998; Sheridan, 1997).

It has been found that companies that employ TPS lean based production techniques such as 5-Why's analysis have benefitted among others in reduced lead times, just-in-time management, decreased costs, leveled production, continuous flow production, increased job satisfaction for employees, higher productivity, lower inventories and higher quality levels (Kasul and Motwani, 1997). Murugaiyaiah et al. (2010) found out that 5-why's analysis can be used in elimination of defects and wastes and the concept can be further extended to other manufacturing aspects such as improvement of overall equipment efficiency, breakdowns, time loss and customer complaints. He further showed that sound understanding of the manufacturing operations and extensive explorations of all possible solutions reduces non-value-adding activities or waste using the 5-why's analysis. In addition, it was also evident that inexpensive or zero cost solutions could be implemented to eliminate waste or defects. Elimination of waste in manufacturing firms through adoption of lean strategies such as *kaizen* can result in a 50 percent reduction in human

effort, manufacturing space, tool investment and product development time and a 200-500 percent improvement in quality (Zayko et al, 1997). Huson and Nanda (1995) found that after JIT adoption, firms reduced the labor content in facilities, increased inventory turnover, and enhanced earnings.

5S has been associated with better performance in many studies of world class manufacturing (Sakakibara et al., 1997; Shah and Ward, 2003). In Japan, Hirano (1995), and in western countries (Hartmann, 1992; Willmott, 1994) showed that some companies have enhanced their competitiveness through the combined application of TPM and 5S. (Kumar et al., 2006) shows that the 5S system helps to increase productivity by reducing idle time in some processes and also ensuring the health and safety of some employees in an Indian SME. Adoption of 5S provides an organization with a platform that with little effort allows the organization to satisfy various international standards with minimal costs. (Morienes et al., 2010) further reveals that the introduction of 5S is linked to performance in terms of productivity and quality.

Recently, because of the applicability of its overall approach to decision making, 5S has expanded its application onto Environmental Management Systems (EMS) to assist in achieving sustainability (Bicheno, 2004; Tice et al., 2005). A primary objective of practicing 5S is to maximize the level of workplace health and safety in conjunction with increased productivity. JISHA (1999) showed that the development and evolvement of 5S between 1945 and 1998 led to a reduction in the frequency of work incidents. Osada (1991) reiterates that among the benefits of implementing 5S in an organization pillar wise are: orderliness (*seiri* and *seiton*) leads to maximization of efficiency and effectiveness by reducing people's workload and human errors through simplifying processes; cleanliness (*seiso* and *seiketsu*) leads to maximizing effectiveness

by contributing to a healthier life, safety and wellbeing as well as enhancing transparency and discipline (*shitsuke*) contributes positively through training and education to enhance the level of morale which leads to increased quality of work/life and work standards.

TPM can lead to improvements in quality, cost, delivery and flexibility (Cua et al., 2001; Seth and Tripathi, 2005; Seth and Tripathi, 2006). Autonomous maintenance and planned maintenance programmes can potentially reduce costs in the manufacturing environment through operator involvement in daily maintenance. The contributions of autonomous maintenance and planned maintenance enable the production operator to run the equipment effectively, thus also preventing deterioration (Nakajima, 1989). Autonomous maintenance can not only enable manufacturing companies to reduce the cost of manufacturing, but also can contribute to a better quality product being produced as there are no disruptions to production or failure of equipment. In addition, (Jantan et al., 2003) concluded that the extent of TPM implementation (autonomous maintenance and planned maintenance) has a positive and significant effect on organizational performance.

In Bangladesh, *kaizen* was piloted for the jute sector in "The Study on Potential Sub-sector Growth for Export Diversification." After six months, four model companies achieved an average of 11% production growth in their spinning sections and machine stoppage reduced by 45.7%. In their weaving sections, the result was a 13.4% increase in production and a 23.5% reduction in stoppage (JICA & Unico International Corporation, 2009).

The findings of a study done in Tunisia on the effect of *kaizen* in some selected manufacturing firms found that, the number of companies that were able to achieve numerically expressible quality/productivity improvement using existing machinery and equipment was 9 out of 14

companies (64%) in the electrical and electronic sector, and 4 out of 13 (31%) in the food processing sector. For example, 8 companies achieved at least 20% higher productivity, 3 of which raised productivity by at least 50%; another company cut its nonconformity rate from around 20% to 0%, while another company reduced die replacement times from 110 minutes to 70 minutes (Kikuchi, 2008).

In Kenya, reports indicated that *kaizen* interventions have often resulted in 50-70% reductions in throughput time, 50-100% increases in productivity, 20-40% savings in manufacturing costs, 40-60% reductions in quality errors, and 50% releases of space, as well as significant improvements in team spirit and morale (Kenya Association of Manufacturers, 2012). In general, *Kaizen* provides the channel through which employees contribute to the development of their company.

2.5 Challenges to implementation of *Kaizen*

Many studies note that, in both Japan and abroad, especially in the cases of American and European companies, leadership is the single most important factor for successful implementation of *kaizen* (Imai, 1986; Kaplinsky, 1995). This implies that it is possible to apply *kaizen* in countries with different socio-cultural contexts but that application must be conducted under proper leadership and with adjustments that reflect the uniqueness of the targeted society. Shah and Ward (2003) argues that larger firms enjoy larger financial and human resources as well as economies of scale hence have better conditions for implementation of new techniques in their firms as compared to small or medium sized firms.

On transferability of *kaizen* across cultures, there are views that question the general applicability of *kaizen* to developing countries. They argue that most developing countries face the problem of weak human resources. Continuous improvement requires a seamless extension of training and

skills development to the entire workforce. However, in a country with low literacy, it is difficult for firms to implement such a training system for the entire workforce (Kaplinsky, 1995). Ebrahimpour and Schonberger (1984) argue that a lower skilled workforce represents the only obstacle to successful JIT implementation in developing countries and that this could be overcome through employee training.

Short-terminism, the lack of upward mobility, and inattention to details of the workers in general may also add to difficulties in implementation of *kaizen*. Furthermore, in societies where the hierarchical structure is deeply rooted, it may not be easy to introduce a participatory mechanism in which all workers are encouraged to contribute actively to process and product improvements. Gapp et al. (2008) showed empirically that an environment of worker participation is required if the benefits of 5S are to be reaped. In addition, managers' misconceptions about continuous improvement are common sources of difficulty in *kaizen* implementation, since they often expect instant results, whereas in reality it takes time before the benefits of *kaizen* become visible (Karsten and Pennink, 2007). In such circumstances, even if managers know the concept and tools, translating these ideas into practices and internalizing *kaizen* as a company-wide movement remains a very complex task.

Aoki (2008) found out that lack of organizational capabilities that facilitate an incremental organization-wide innovation greatly hindered implementation of *kaizen* in Chinese firms. These capabilities include capabilities that facilitate cross-functional communication, that which encourages worker's self initiative and those that discipline workers (shop- floor based) so that they conform to *kaizen* standards. Researchers who recognize the effectiveness of Japanese work practices state that Japanese companies have developed capabilities that make their workers or

work teams learn and improve their work processes independently (Kenney and Florida, 1993; Koike,1994). On-the-job training (OJT) plays a critical role in creating such capabilities. Employees in Japanese companies experience various kinds of jobs through the OJT, which helps to reduce social distance between different categories of the workforce (Lam, 2000). In this perspective, it is organizational capabilities which facilitate communication among diverse people that allow Japanese companies implement incremental organization-wide innovation successfully. This affirms the view that successful implementation of *kaizen* is largely influenced by an organization's ability to develop these capabilities (Aoki, 2008).

Summary:

The review of literature shows that the implementation of *kaizen* practices contributes to improvement of operations performance in manufacturing firms. However, successful implementation of these practices is also influenced by the economic and socio-cultural environments that the respective firms operate in. These economic and socio-cultural factors pose challenges to successful implementation of *kaizen* in firms and consequently the influence that *kaizen* implementation has on operations performance improvement. In this perspective, this research paper attempts to answer the research question, "what is the relationship between *kaizen* implementation and operations performance improvement in Kenyan manufacturing firms?"

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the steps and approaches that were used in executing the research study. This chapter comprises of the research design, population under study, data collection instruments and the data analysis methods that were employed in the study.

3.2 Research Design

A cross sectional survey was conducted among operations managers or their equivalents in Kenyan manufacturing firms that have adopted the *kaizen* methodology to evaluate the relationships between *kaizen* implementation and operations performance improvement. The appropriateness of this study design was advised from the study's aim of establishing the relationships between implementation of *kaizen* and operations performance improvement in Kenyan manufacturing firms at a particular point in time.

3.3 Population and Sampling

In this study, the unit of analysis was the firm, and the target population was the manufacturing firms in Kenya that have adopted the *kaizen* methodology in their operations. Kaizen Institute, an international private consultant group that specializes in the *kaizen* methodology, lists twenty four manufacturing companies in Kenya as their clients and who have implemented *kaizen* (Kaizen institute, 2012). These firms formed the target population of this study. The sampling design used for this study was a census. The appropriateness of this choice of this design was compelled by the relatively small number of known manufacturing firms that have adopted *kaizen* in Kenya.

3.4 Data collection methods and instruments

Self administered questionnaires which were delivered by email were used for data collection. The questionnaire comprised of a five-point Likert scale that collected the respondents' responses to both operational performance elements as well as for *kaizen* techniques/practices quantitatively through closed-ended questions. To operationalise the human resource outcomes, a Knowledge, Skills and Attitude (KSA) framework traced from the industrial and organizational psychology literature was used. This framework was chosen because it aligns well with the human resource benefits of *kaizen* implementation as found in literature. The study targeted operations managers or their equivalents, who had considerable experience with *kaizen* practices and techniques in operations functions of the manufacturing firms. This was aimed at ensuring accuracy and authenticity of the information provided for the study.

3.5 Data analysis

Descriptive statistics was used for data analysis with Statistical Product and Services Solution (SPSS) being used to aid the analysis. The use of descriptive statistics in data analysis was due to its appropriateness in finding out the basic features of the study data and hence aid in realization of the research objectives. Regression analysis was done separately for the individual operations performance measures (dependent variables) against the set of *kaizen* techniques (independent variables). In addition, a regression model was used to evaluate the overall relationship between *kaizen* implementation and operations performance improvement.

Regression Model

$$(OP)_i = \beta_0 + \beta_i(KZ)_i + \varepsilon \quad \text{..... (1)}$$

Where:

OP = Operational Performance Index for the i^{th} firm (i = 1, 2, 3…13)

KZ = *Kaizen* Implementation Index for the i^{th} firm (i = 1, 2, 3…13)

β_0 , β_i = are regression constants

ε = standard error

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DATA ANALYSIS, RESULTS AND DISCUSSION

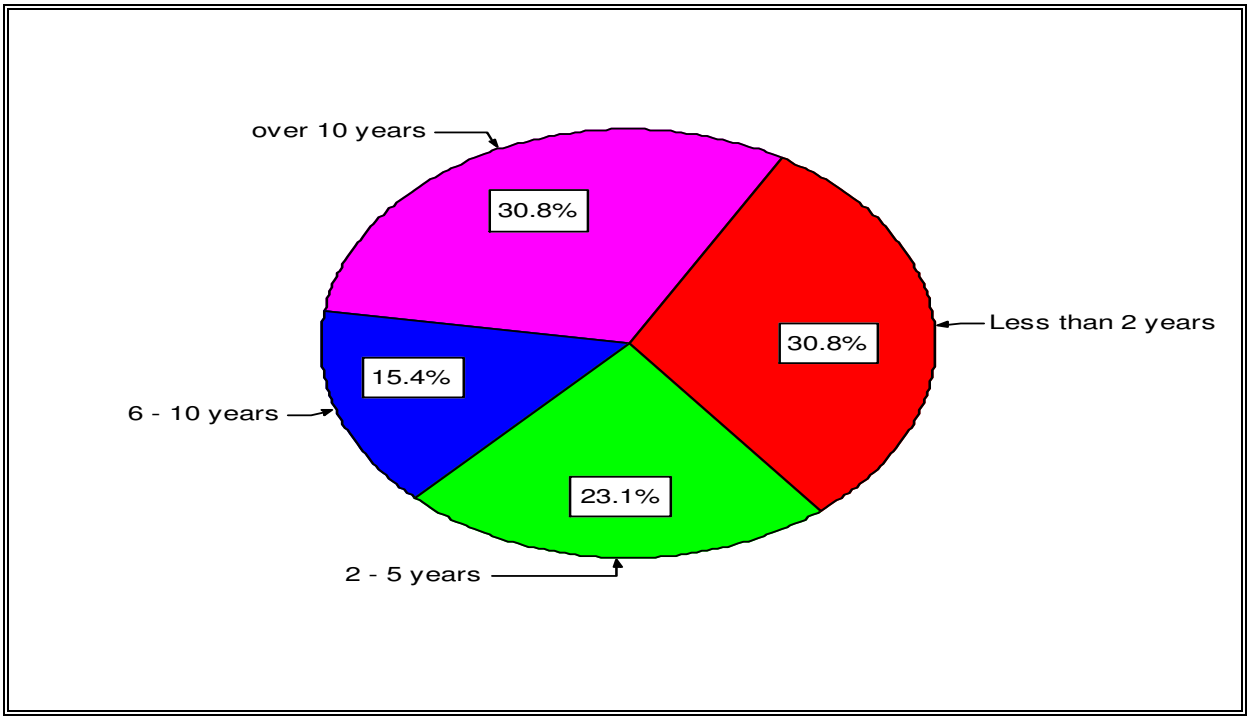
4.1 Introduction

This chapter presents the results of data analysis which are presented in tables and graphs, and discussion on the findings of the study. From the 24 administered questionnaires, 13 were filled by the respondents and were used for this analysis. This represents a response rate of 54.2% which was a relatively good rate. The chapter covers the profile of the respondent companies, extent of *kaizen* practices implementation, descriptive statistics on operations performance improvement due to *kaizen* practices implementation, *kaizen* implementation and human resource outcomes, regression analysis on the relationship between *kaizen* implementation and operations performance improvement and challenges to implementation of *kaizen*.

4.2 Respondent companies profile information

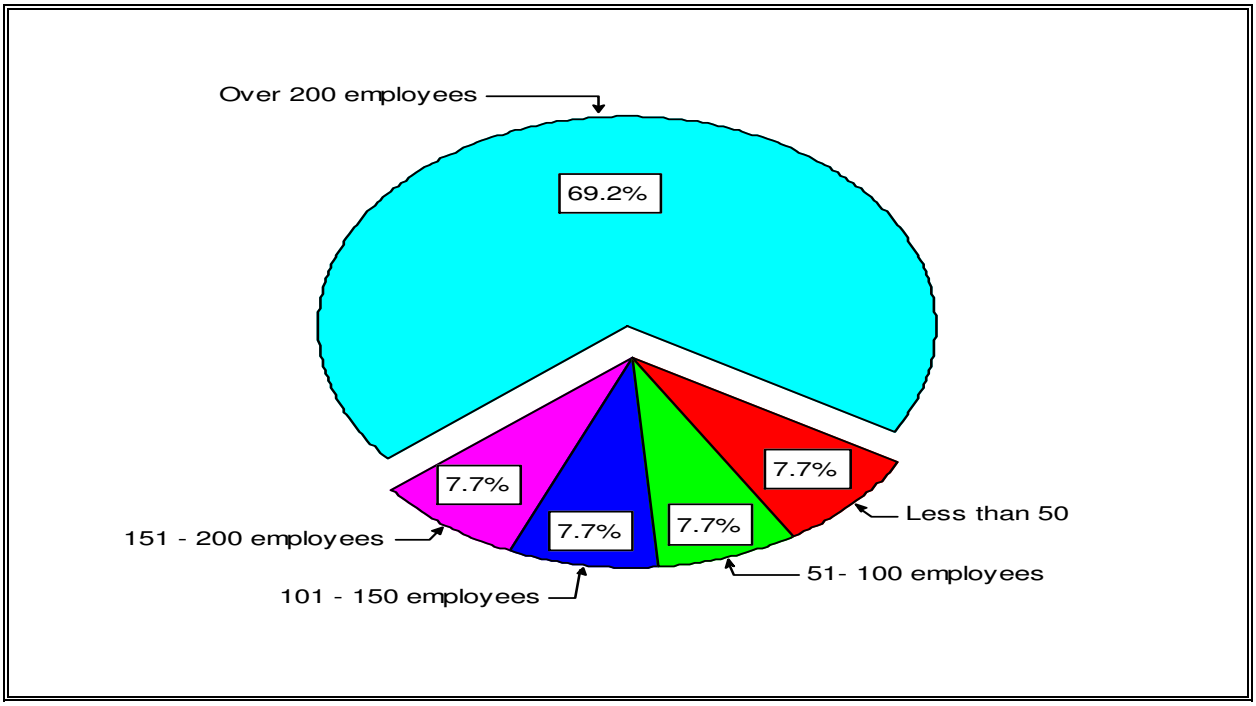
As figure 4.21 shows the majority of the respondents (69.2%) had worked in their companies for at least two years thus ensuring accuracy and authenticity of the information provided for the study.

Figure 4.2.1 Response to the number of years respondents have worked in their companies



These results shown in figure 4.22 show that majority of the respondent companies that have implemented *kaizen* are large companies representing 69.2 % of the respondents where size of company is viewed in terms of the number of employees. This may imply that large companies are more likely to implement *kaizen* practices than small companies due to the benefits of economies of scale and better economic abilities than small companies.

Figure 4.2.2 Response to the number of employees in the respondent companies



These results in Table 4.2.1 show that from the companies that responded in the study, 38.5% of the respondents were from the metal and allied sector. Plastics and rubber sector was second with 23.1 % while others had 15.4%.

Table 4.2.1 Sectoral representation of respondent companies

Sector	**Percent**
Chemical and allied	7.69
Food and beverages	7.69
Metal and allied	38.46
Plastics and rubber	23.08
Paper and board	7.69
others	15.38
Total	**100**

4.3 Extent of *Kaizen* practices/activities implementation

The results in Table 4.3.2 show that 5S had the highest extent of implementation with a mean of 4.15, *Kaizen* events and 5 whys was second with a mean of 4.08. The *kaizen* practice with least extent of implementation was Suggestion System and Toyota Production System (TPS) with a mean of 3.00. 5S may have gotten the highest due to its simplicity in implementation .The results of the responses on extent of implementation of these practices are shown in Table 4.3.1 and 4.3.2 below.

Table 4.3.1 Survey responses on the extent of implementation of *kaizen* practices

	Minimal	**Fairly low**	**Average**	**Fairly high**	**Great Extent**
	%	**%**	**%**	**%**	**%**
5S	-	15.4	-	38.5	46.2
Kaizen events	7.7	-	15.4	30.8	46.2
5 WHY's	7.7	-	15.4	30.8	46.2
Suggestion System	23.1	-	53.8	-	23.1
Total Preventive Maintenance (TPM)	7.7	7.7	38.5	23.1	23.1
Total Quality Management (TQM)	7.7	-	38.5	38.5	15.4
Just in Time (JIT)	7.7	7.7	46.2	23.1	15.4
Quality Control Circles	7.7	7.7	7.7	69.2	7.7
Kanban System	7.7	7.7	46.2	15.4	23.1
Kaizen Costing	7.7	23.1	30.8	23.1	15.4
Toyota Production System	7.7	30.8	30.8	15.4	15.4
Lean Production	7.7	-	61.5	7.7	23.1
Poke-Yoke (error proofing techniques)	15.4	23.1	30.8	-	30.8

Table 4.3.2 Means of responses on the extent of implementation of *kaizen* practices

Kaizen Practice	Mean
5S	4.15
Kaizen events	4.08
5 WHY's	4.08
Suggestion System	3.00
Total Preventive Maintenance (TPM)	3.46
Total Quality Management (TQM)	3.54
Just in Time (JIT)	3.31
Quality Control Circles	3.62
Kanban System	3.38
Kaizen Costing	3.15
Toyota Production System	3.00
Lean Production	3.38
Poke-Yoke(error proofing techniques)	3.08

4.4 Operations performance improvement by *kaizen* practices implementation

Results from descriptive statistics in Table 4.4.1 shows that, the operation performance measure which is influenced most by implementation of *kaizen* practices is lowering of inventory levels with a mean of 4.23. This is followed closely by improvement in overall productivity and elimination of waste with a mean of 4.15.The operations performance measure that was least influenced by implementation of *kaizen* practices was increased environmental sustainability with a mean of 3.46. This implies that Kenyan manufacturing companies that implement *kaizen* would benefit most in their inventory management.

Table 4.4.1 Means of responses on improvement of operations performance by *kaizen* practices

Operations performance measure	Mean
Improvement in product quality	4.00
Lower inventory levels	4.23
Improvement in overall productivity	4.15
Reduction in lead time	3.92
Reduction in processing time	3.85
Continuous flow production	4.08
Improved equipment efficiency	4.08
Increased environmental sustainability	3.46
Improved health and safety standards	3.85
Improved maintenance practices	4.08
Elimination of waste	4.15
Overall manufacturing flexibility improvements	3.54
Cost improvements e.g materials, labour	3.92
Enhanced competitiveness	3.85

4.5 *Kaizen* implementation and human resource outcomes

From the descriptive analysis in Table 4.5.1 at least 77 % of all the respondents agreed that *kaizen* had positive human resource outcomes in employee attitude in all the four items that characterize attitude as per the Knowledge, Skills and Attitude (KSA) framework that was used in the study. The greatest impact on attitude was on employees' preference to be part of *kaizen* activities in the future with a mean of 4.85. The results are shown in Table 4.5.2. This implies that participating in *kaizen* activities has a positive impact on employee attitudes and companies could greatly improve their workers' attitudes by having them participate in *kaizen* activities.

Table 4.5.1 Responses on influence of *kaizen* activities on employees' attitude

	Strongly Disagree	Disagree	Undecided	Agree	Strongly agree
	%	%	%	%	%
Kaizen activities have increased my interest in work	-	15.4	7.7	23.1	53.8
I like being part of continuous improvement activities	-	-	-	30.8	69.2
Kaizen activities have motivated me to perform better	-	7.7	15.4	30.8	46.2
I would like to be part of *kaizen* activities in the future	-	-	7.7	-	92.3

Table 4.5.2 Means of responses on influence of *kaizen* activities on employees' attitude

	Mean
Kaizen activities have increased my interest in work	4.15
I like being part of continuous improvement activities	4.69
Kaizen activities have motivated me to perform better	4.15
I would like to be part of *kaizen* activities in the future	4.85

The analysis in Table 4.5.3 shows that four of the five items that characterize the impact of *kaizen* on work area as per the Knowledge, Skills and Attitude (KSA) framework that was used in the study, had at least 70% of the respondents agreeing that *kaizen* impacted their work area positively. The highest mean of 4.69 was on *kaizen* being relevant to the work area. The respective means are tabulated in Table 4.5.4. *Kaizen* activities having a positive effect on the work environment scored the lowest with only 54% of the respondents in agreement and a mean of 3.77.This implies that companies could greatly improve their work areas by having their employees participate in *kaizen* activities.

Table 4.5.3 Responses on the influence of *kaizen* activities on employees' work area

	Strongly Disagree	Disagree	Undecided	Agree	Strongly agree
	%	%	%	%	%
Kaizen activities have improved the performance of this area	15.4	-	7.7	23.1	53.8
Overall, *kaizen* activities have helped people in this area work together to improve performance	7.7	7.7	15.4	7.7	61.5
Kaizen activities have had a positive effect on this work environment	7.7	-	38.5	15.4	38.5
This work environment has improved measurably as a result *kaizen*	7.7	-	7.7	38.5	46.2
Kaizen is relevant to this work area	-	-	7.7	15.4	76.9

Table 4.5.4 Mean of responses on the influence of *kaizen* activities on employees' work area

	Mean
Kaizen activities have improved the performance of this area	4.00
Overall, *kaizen* activities have helped people in this area together to improve performance	4.08
Kaizen activities have had a positive effect on this work environment	3.77
This work environment has Improved measurably as a result *kaizen*	4.15
Kaizen is relevant to this work area	4.69

The analysis on Table 4.5.5 shows that all the items that characterize the impact of *kaizen* on participant as per the knowledge, skills and attitude (KSA) framework that was used in the study, had at least 77% of the respondents agreeing that *kaizen* impacted *kaizen* participants positively. Table 4.5.6 shows that the participants' usage of skills gained from related *kaizen* training had the highest mean of 4.46. This implies that companies that allow their employees participate in *kaizen* activities are likely to have more productive employees, employees who understand their work better and better skills utilization by these employees.

Table 4.5.5 Responses on the influence of *kaizen* activities on participant

	Strongly Disagree	Disagree	Undecided	Agree	Strongly agree
	%	%	%	%	%
I have used the skills I gained from *kaizen* related training	7.7	-	-	23.1	69.2
Kaizen activities have helped me better understand my work	7.7	-	-	30.8	61.5
I have become more productive as a result of my involvement in *kaizen*	-	-	23.1	30.8	46.2

Table 4.5.6 Mean of responses on the influence of *kaizen* activities on participant

	Mean
I have used the skills I gained from *kaizen* related training	4.46
Kaizen activities have helped me better understand my work	4.38
I have become more productive as a result of my involvement in *kaizen*	4.23

The analysis on Table 4.5.7 shows that all the items that characterize the impact of *kaizen* on employee skills as per the Knowledge, Skills and Attitude (KSA) framework that was used in the study, had at least 77% of the respondents agreeing that *kaizen* impacted *kaizen* employee skills positively. Table 4.5.8 shows that employees' abilities to communicate new ideas about improvements in a work area due to their participation in *kaizen* activities had the highest mean of 4.54. This implies that companies whose employees participate in *kaizen* activities have the benefit of skills improvement.

Table 4.5.7 Responses on the influence of *kaizen* activities on employee skills

	Strongly Disagree	Disagree	Undecided	Agree	Strongly agree
	%	%	%	%	%
I can communicate new ideas about improvements to this work area as a result of my participation in *kaizen* activities	-	-	15.4	15.4	69.2
I have gained new skills as a result of my participation in *kaizen* activities	7.7	-	7.7	30.8	53.8
I am able to measure the impact of changes made to this area	7.7	-	7.7	38.5	46.2
I am comfortable working with others to identify improvements in this work area	7.7	-	15.4	23.1	53.8

Table 4.5.8 Mean of responses on the influence of *kaizen* activities on employee skills

	Mean
I can communicate new ideas about improvements to this work area as a result of my participation in *kaizen* activities	4.54
I have gained new skills as a result of my participation in *kaizen* activities	4.23
I am able to measure the impact of changes made to this area	4.15
I am comfortable working with others to identify improvements in this work area	4.15

These results shown on Table 4.5.9 shows that all the items that characterize the impact of *kaizen* on knowledge as pertains to understanding the need for change as described in the knowledge, skills and attitude (KSA) framework that was used in the study, 92.3 % of the respondents agreed that *kaizen* impacted understanding the need for change positively. Table 4.5.10 shows that understanding on what is meant by continuous improvement had the highest mean of 4.85. This implies that companies whose employees participate in *kaizen* activities are likely to understand and embrace change better.

Table 4.5.9 Responses on the influence of *kaizen* activities on knowledge - understand need for change

	Strongly Disagree	Disagree	Undecided	Agree	Strongly agree
	%	%	%	%	%
I understand what is meant by continuous improvement	-	-	7.7	-	92.3
I understand the need for continuous improvement in this area	-	-	7.7	15.4	76.9
I understand my role in continuous improvement	-	-	7.7	23.1	69.2

Table 4.5.10 Responses on the influence of *kaizen* activities on knowledge -understand need for change

	Mean
I understand what is meant by Continuous improvement	4.85
I understand the need for continuous improvement in this area	4.69
I understand my role in continuous improvement	4.62

The analysis on Table 4.5.11 shows that all the items that characterize the impact of *kaizen* on knowledge as pertains to understanding the need for *kaizen* as described in the Knowledge, Skills and Attitude (KSA) framework that was used in the study, 92.3 % of the respondents agreed that *kaizen* impacted understanding the need for *kaizen* positively. Table 4.5.12 show that understanding what *kaizen* is had the highest mean of 4.77. This implies that companies whose employees participate in *kaizen* activities are likely to understand the need for *kaizen* better and be more proactive in its implementation.

Table 4.5.11 Responses on the influence of *kaizen* activities on knowledge- understand need for *kaizen*

	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
	%	%	%	%	%
I understand how *kaizen* can be applied to this work	-	-	7.7	23.1	69.2
I understand the objectives of implementing *kaizen*	-	-	7.7	30.8	61.5
I understand my role in *kaizen*	-	-	7.7	15.4	76.9
I understand what *kaizen* is	-	-	7.7	7.7	84.6

Table 4.5.12 Mean of responses on the influence of *kaizen* activities on knowledge-understand need for *kaizen*

	Mean
I understand how *kaizen* can be applied to this work	4.62
I understand the objectives of implementing *kaizen*	4.54
I understand my role in *kaizen*	4.69
I understand what *kaizen* is	4.77

4.6 *Kaizen* implementation and operations performance improvement

The regression analysis done using data from 13 respondent companies that had implemented *kaizen* practices in their organizations showed that there is a positive relationship between implementation of *kaizen* practices and all the operations performance measures improvement as indicated by the values of R. The results also show a strong correlation between the dependent and the independent variables as shown by the values of R^2.The results of this analysis are shown in Table 4.6.1.

Table 4.6.1 Relationship between *kaizen* practices implementation and operations performance improvement

Operations performance measure	R	R^2	Adjusted R^2
Improvement in product quality	0.883	0.779	0.759
Lower inventory levels	0.846	0.717.	0.691
Improvement in overall productivity	0.748	0.560	0.520
Reduction in lead time	0.882	0.777	0.757
Reduction in processing time	0.860	0.739	0.715.
Continuous flow production	0.889	0.791	0.771
Improved equipment efficiency	0.900	0.809	0.792
Increased environmental sustainability	0.705	0.497	0.452
Improved health and safety standards	0.784	0.615	0.580
Improved maintenance practices	0.877	0.769	0.748
Elimination of waste	0.873	0.762	0.740
Overall manufacturing flexibility improvements	0.856	0.733	0.708
Cost improvements e.g. materials, labour	0.822	0.676	0.647
Enhanced competitiveness	0.916	0.838	0.824

To establish the overall relationship between *kaizen* implementation and operations performance, a regression model was used. Reliability analysis of operations performance index showed a Cronbach's alpha value of 0.9795 whereas that of *kaizen* implementation index was 0.9566 which is above the threshold value of 0.6, thus showing that these constructs are reliable (Nunnally, 1978).

REGRESSION RESULTS

Table 4.6.2 Regression Model Summary

Mo	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig.F Change
1	0.941 (a)	0.886	0.876	4.90490	0.886	85.421	1	11	0.000

a Predictors: (Constant), *Kaizen* implementation index

The regression analysis done using data from 13 companies that had implemented *kaizen* in their organizations shows that there is a positive relationship between implementation of *kaizen* and operations performance improvement as indicated by the value of R. The results also show a strong correlation between the dependent and the independent variables as shown by the values of R^2.

4.7 Challenges to implementation of *kaizen*

The results in Table 4.7.2 shows the greatest challenge to *kaizen* implementation was employee attitudes and misconceptions about *kaizen* with a mean of 2.85. This was followed closely by insufficient participation by workers with a mean of 2.83. Similarly the least challenge to implementation of *kaizen* was lack of management support and economic constraints with means of 1.77 and 1.92 respectively. This implies that successfully implementation of *kaizen* is dependent on how well an organization is able to manage capabilities concerning employee attitudes, misconceptions about *kaizen*, and ensuring sufficient participation by workers in *kaizen* activities.

Table 4.7.1 Survey responses on the challenges faced in *kaizen* implementation

Challenge	Not at all	Fairly low	average	Fairly high	Great Extent
	%	%	%	%	%
Economic (financial constraints)	30.8	46.2	23.1	-	-
Lack of management support or leadership	61.5	7.7	23.1	7.7	-
Ineffective training	23.1	46.2	7.7	15.4	7.7
Employee attitudes (e.g. commitment, innovativeness)	-	53.8	23.1	7.7	15.4
Ineffective *kaizen* performance measures	46.2	23.1	15.4	7.7	7.7
Insufficient participation by workers	8.3	41.7	16.7	25.0	8.3
Ineffective communication systems	30.8	46.2	15.4	7.7	-
Organization structure	7.7	69.2	15.4	-	7.7
Misconceptions about *kaizen*	7.7	38.5	30.8	7.7	15.4
Others	40.0	40.0	-	20.0	-

Table 4.7.2 Means of responses on the challenges faced in *kaizen* implementation

Challenge	Mean
Economic (financial constraints)	1.92
Lack of management support or leadership	1.77
Ineffective training	2.38
Employee attitudes (e.g. commitment, innovativeness)	2.85
Ineffective *kaizen* performance measures	2.08
Insufficient participation by workers	2.83
Ineffective communication systems	2.00
Organization structure	2.31
Misconceptions about *kaizen*	2.85
Others	2.00

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In this chapter a summary of the study findings is covered, conclusions of the study, recommendations of the study, recommendations for policy and practice, limitations of the study as well as suggestions for further research.

5.2 Summary

Using data collected from 13 Kenyan manufacturing firms that have implemented *kaizen*, this study examined the extent to which *kaizen* practices have been adopted by Kenyan manufacturing firms and the relationships between implementation of these practices and operations performance improvement. The study further examined the relationship between *kaizen* activities and the resultant human resource outcomes on the employees of these firms, as well as the challenges that manufacturing firms encounter in *kaizen* implementation. Descriptive statistics was used to evaluate the extent of implementation of *kaizen* practices and the challenges in *kaizen* implementation. Individual operations performance measures were regressed against the set of *kaizen* practices to evaluate the influence of the latter on the former. A regression model was used to evaluate the overall relationship between *kaizen* implementation and operations performance improvement.

Descriptive statistics showed that, 5S is implemented to the greatest extent, followed by *kaizen* events, 5 whys, QCC, TQM, TPM, *kanban* system, lean production , JIT, *kaizen* costing and poke yoke. TPS and suggestion system were implemented to the least extent. The great extent of 5S implementation may be attributed to its simplicity in implementation as it aims at using visual cues to achieve more consistent operational results (Osada, 1991). *Kaizen* events high extent of

implementation may be attributed to its ability to impact both business performance as asserted by Cuscela (1998) as well as human resource outcomes (Laraia et al., 1999; Melnyk et al., 1998; Sheridan, 1997).

On operations performance improvement due to *kaizen* implementation, the greatest extent of influence was on reduction of inventory levels, followed by improvement in overall productivity, elimination of waste, improvement in continuous flow production, improvement in equipment efficiency, improved maintenance practices, product quality improvements, reduction in lead time, cost improvements, reduction in processing time, improvement in health and safety standards, enhanced competitiveness, improvement in overall manufacturing flexibility with increased environmental sustainability having had the least influence from *kaizen* implementation. These results that show that *kaizen* implementation influences operations performance measures positively are in congruence with the findings on the effect of *kaizen* on operations performance in Tunisia on selected firms Kikuchi (2008), as well those found in a pilot study in Bangladesh in the jute sector (JICA & Unico International Corporation, 2009). These findings are also consistent with Kenyan reports on the results of *kaizen* interventions (Kenya Association of Manufacturers, 2012).

On the influence of *kaizen* on human resource, the greatest extent of influence was on knowledge as relates to understanding the need for change as well as understanding the need for *kaizen,* followed by influence on employee attitudes, skills and impact on participants. Impact on work area had the least extent of influence from *kaizen* activities. Overall *kaizen* implementation had a positive effect on all the human resource attributes described in the knowledge, skills and attitude (KSA) framework. These findings are consistent with both

empirical and theoretical findings of various studies on *kaizen* (Doolen et al., 2008; Butterworth, 2001; McNichols et al., 1999; David, 2000; Kenya Association of Manufacturers, 2012).

The greatest challenge to implementation of *kaizen* was employee attitudes and misconceptions about *kaizen.* This was followed by insufficient participation by workers, ineffective training, organization structure, ineffective *kaizen* performance measures, ineffective communication systems and others. Economic constraints and lack of management support posed least extent of challenge in *kaizen* implementation in the respondent firms. These results are consistent with findings by Aoki (2008) on organizational capabilities that facilitate *kaizen* implementation, Karsten and Pennik (2007) on the difficulties of misconceptions about *kaizen* in its implementation as well as Kaplisky (1995) on the importance of training and skills development in implementation of continuous improvement methodologies such as *kaizen*. Additionally, economic constraints posing a lesser challenge to *kaizen* implementation is consistent with arguments that *kaizen* is a low cost approach to process improvements and it starts with the people (Imai, 1986).

Results from the regression analysis show that implementation of *kaizen* practices in Kenyan manufacturing firms is significantly related to operations performance improvement. Correlation analysis further shows that there is a strong positive correlation between implementation of *kaizen* and operations performance improvement. The results of this study are consistent with the results reported by Cua et al. (2001), Shah and Ward (2003) and Jayram et al. (2008), according to which, lean practices contribute substantially to the operating performance improvement of manufacturing plants.

5.3 Conclusions

This study sought to establish the relationship between *kaizen* implementation and operations performance improvement in Kenyan manufacturing firms. The findings from the study show that there is a strong positive relationship between *kaizen* implementation and operations performance improvement. This implies that companies that implement *kaizen* are likely to improve their operations performance.

The study also aimed at establishing the extent to which *kaizen* techniques have been implemented by Kenyan manufacturing firms. The study findings show that 5S has the greatest extent of implementation and suggestion system and TPS had the least extent of implementation. Overall most of the practices were well implemented in the companies that have adopted *kaizen.*

The study's other objective was to determine the challenges that are encountered by Kenyan manufacturing companies in implementation of *kaizen.* The findings show that the challenge that hindered *kaizen* implementation most was employee attitudes and misconceptions about *kaizen* whereas those that posed least challenge was lack of management support followed by economic constraints.

This study has provided insights into the extent of adoption of *kaizen* practices in Kenyan manufacturing firms, and provides further evidence that *kaizen* implementation is significant in enhancing operations performance improvement and positively impacts human resource outcomes.

5.4 Recommendations

This study proposes some recommendations for both policy and practice and they include: there is need for manufacturing firms in Kenya to adopt *kaizen* practices for the purposes of improving their operations performance as this will give them a competitive edge in the global market.

The government should get involved through well designed programs in promotion of lean practices such as *kaizen* as they lead to increased productivity and better utilization of resources most of which are scarce in the developing countries. This can be achieved by the government giving support to organizations like JICA and *kaizen* institute which are involved in promoting Japanese lean practices worldwide.

The limited adoption of *kaizen* by many firms in Kenya, both manufacturing and service firms is mainly due to the limited knowledge on *kaizen* and its effectiveness by the Kenyan population. This scenario should be reversed by having *kaizen* promotion and sensitization activities across all sectors of the economy by all industry players including public and private sector through sect oral organizations such as KAM and KEPSA and the government through the concerned ministries.

5.5 Limitations of study

This study had several limitations. First was the low response rate which can be attributed to the difficulties encountered in getting companies to respond to the questionnaires which were sent through email. The target respondents were operational managers or their equivalents and this cadre of people take time to respond to questionnaires due to their busy work schedules.

The second limitation of the study was that it purely depended on the questionnaire responses for data collection. It was thus not possible to get in-depth information about *kaizen* in these organizations, but would have been possible if other methods were used such as interviews and review of texts. To this effect the results are only true to the extent of information provided by the respondents.

5.6 Suggestions for further research

This study focused on *kaizen* implementation in Kenyan manufacturing firms only. However *kaizen* is applicable in all sectors of a country including the service sector, government organizations and non- governmental organizations.

The researcher proposes that a more detailed study be carried out on the manufacturing sector in Kenya using more in-depth data collection methods involving collection of both primary and secondary data, and evaluate of the impact of *kaizen* on the business performance of these manufacturing organizations.

The researcher further proposes that a study be carried out to establish the relationships between *kaizen* implementation and operations performance in Kenyan service firms or other non manufacturing organizations so that it can be established whether there are benefits of implementing *kaizen* in these organizations.

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APPENDIX 1

Data Collection Instrument (Questionnaire)

This is a research aimed at understanding the ***Relationship between Kaizen Implementation and its Effect on Operational Performance Improvement in your organization.*** There are no wrong or right answers and the results are confidential and strictly for academic use. Your honest participation in this survey will be highly appreciated.

Part A. Company profile

Company name_____

What products does your company manufacture _____

Please indicate your position within the company: _____

Please tick the appropriate box describing your company:

1. How long have you been working in this company?

Less than two years	Two to five years	Six to ten years	More than ten years

2. Total number of employees

Less than 50 employees	Between 51 and 100 employees	Between 101 and 150 employees	Between 151 and 200 employees	More than 200 employees

3. Please tick the sector in which your firm belongs and the type of product you manufacture.

Sector	**Tick**	**Type of products**
Chemical and Allied		
Energy, Electrical and Electronics		
Food and Beverages		
Metal and Allied		
Mining and Construction		
Motor vehicle and Accessories		
Paper and Board		
Pharmaceutical and Medical Equipment		
Plastics and Rubber		
Textile and Apparels		
Others		

Part B. *kaizen* Techniques /Practices

To what extent (on a scale of 1-5) are the following practices/activities (Items 1-13) implemented in your company?

Kaizen practices implementation scale ranging from **MINIMAL (1)** to **A GREAT EXTENT (5)**

KAIZEN PRACTICE	**SCALE**				
	1	**2**	**3**	**4**	**5**
5S					
Kaizen events/*kaizen* workshop					
5 WHY's					
Suggestion System					
Total Preventive Maintenance (TPM)					
Total Quality Management (TQM)					
Just in Time (JIT)					
Quality Control Circles					
Kanban System					
Kaizen Costing					
Toyota Production System					
Lean Production					
Poke-Yoke(error proofing techniques)					

Part C. Operations performance

To what extent (on a scale of 1-5) have the following operational performance dimensions been improved by *kaizen* practices.

Operational performance dimension measure ranging from **MINIMAL (1)** to **GREAT EXTENT (5)**

OPERATIONS PERFORMANCE MEASURE	**SCALE**				
	1	**2**	**3**	**4**	**5**
Improvement in product quality					
Lower inventory levels					
Improvement in overall productivity					
Reduction in lead time					
Reduction in processing time					
Continuous flow production					
Improved equipment efficiency					
Increased Environmental Sustainability					
Improved health and safety standards					
Improved maintenance practices					
Elimination of waste					
Overall manufacturing flexibility improvements					
Cost improvements e.g. materials, labour					
Enhanced competitiveness					

Human Resource Outcomes

To what extent (on a scale of 1-5) have these human resource attributes been influenced positively by kaizen activities ranging from **STRONGLY DISAGREE (1)** to **STRONGLY AGREE (5)**

VARIABLE	MEASURED ATTRIBUTE	SCALE				
		1	2	3	4	5
Attitude	*Kaizen* activities have increased my interest in work.					
	I like being part of continuous improvement activities					
	Kaizen activities have motivated me to perform better					
	I would like to be part of kaizen activities in the future					
Impact on work area	*Kaizen* activities have improved the performance of this					
	Overall, *kaizen* activities have helped people in this area work together to improve performance					
	Kaizen activities have had a positive effect on this work environment					
	This work environment has improved measurably as a result *kaizen*					
	Kaizen is relevant to this work area					
Impact on participant	I have used the skills I gained from kaizen related training					
	Kaizen activities have helped me better understand my work					
	I have become more productive as a result of my involvement in *kaizen*					
Skills	I can communicate new ideas about improvements to this work area as a result of my participation in kaizen activities					
	I have gained new skills as a result of my participation in *kaizen* activities					
	I am able to measure the impact of changes made to this area					
	I am comfortable working with others to identify improvements in this work area					
Knowledge-understand need for change	I understand what is meant by continuous improvement					
	I understand the need for continuous improvement in this area					
	I understand my role in continuous improvement					
Knowledge-understand Need for kaizen	I understand how *kaizen* can be applied to this work					
	I understand the objectives of implementing *kaizen*					
	I understand my role in *kaizen*					
	I understand what *kaizen* is					

[Source: Doolen et. al, 2008]

Part D*:* Challenges to Implementation of *kaizen*

On a scale of 1-5 to what extent have these factors contributed to the challenges of implementation of *kaizen* in your firm. *Kaizen* implementation challenges measures ranging from **NOT AT ALL (1)** to **GREAT EXTENT (5)**

CHALLENGE	SCALE				
	1	**2**	**3**	**4**	**5**
Economic (financial constraints)					
Lack of management support or leadership					
Ineffective training					
Employee attitudes (e.g. commitment, innovativeness)					
Ineffective *kaizen* performance measures					
Insufficient participation by workers					
Ineffective communication systems					
Organization structure					
Misconceptions about *kaizen*					
Others					

APPENDIX 2

Kenyan manufacturing firms that have implemented *Kaizen*

1. Basco Products(Kenya) Limited
2. Bidco Oil Refineries Limited
3. Blowplast Limited
4. Booth Extrusions Limited
5. Comcraft Kenya Limited.
6. Cook 'n' Lite Limited
7. Chloride Exide Limited
8. Dodhia Packaging Limited
9. Eveready East Africa Limited
10. Finlays Kenya Limited
11. Haco Tiger brands Limited
12. Insteel Africa Limited
13. Kaluworks Limited
14. Mabati Rolling Mills Limited
15. Pardini Limited
16. Sanpac Africa Limited
17. Shumuk Aluminium Industries
18. Signode Packaging Systems Limited
19. Spin Knit Dairy Limited
20. Synresins Limited
21. Tetrapak KenyaLimited
22. Thermopak KenyaLimited
23. Unga Limited
24. Vita foam Limited

[Source: kaizen.com]