QUALITY IMPROVEMENT PRACTICES: PATTERNS OF ADOPTION BY MANUFACTURING FIRMS IN NAIROBI, KENYA

BY:

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DECLARATION

I declare that this is my original work and has not been presented for a degree in any other university.

Sign: …………………………………….. Date: ………………………

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This project has been submitted for examination with our approval as university supervisors

Sign: ………………………………… Date: ………………………….

E. Akelo

DEDICATION

This project is dedicated to my Mother, for her unwavering commitment and support to the education and learning of all of her children and to my wife Annastasia N. Nthiwa for her support in the duration of my study.

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ABSTRACT

This study was conducted to investigate patterns of adoption of quality improvement practices adopted by manufacturing firms in Nairobi. The study also studied the challenges encountered in implementing the quality improvement practices among manufacturing firms. The study probed how various quality improvement practices have been adopted in the manufacturing firm and how size of the firm influences the adoption process.

To achieve the objectives of the study a descriptive survey study was undertaken where by all the quality assurance departments employees in the 700 manufacturers under Kenya Association of Manufacture were the population. The study used stratified random sampling to select 60 employees who formed the sample size. Data was collected using a semi structured questionnaires. Descriptive statistics (frequencies, percentages, mean scores and standard deviation) were used to analyse the data. Analysis of variables and correlation analysis was used to determine the patterns of adoption among the categories of firms. The data was presented in form of table and figures and enhanced by a narrative explanation to bring out salient themes.

The findings show that the firms have adopted various aspects of quality improvement which cut across the available quality improvement models. The study found that firms adopted QI practises with a view to achieve consistency in production and customer services, customer satisfaction, waste reduction; improved efficiency in production, minimization of defects in production process and quality and service improvement. The study found that the key challenges in adoption of QI practises include inadequate resources, cost of technology, inadequate investment in trainings and lack of accessible case studies to learn from. The study found no evidence of a relationship between size of the firm and patterns of adoption of quality improvement practices in the manufacturing industry.

The study recommends that there is need for documentation of quality improvement processes and increased information sharing within the firms and also with the manufacturing industry in Kenya.

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ACRONYMS AND ABBREVIATIONS

AGOA   Agreement

ANOVA   Analysis of Variables

BPR   Business Process Reengineering

COMESA   Common Market for Eastern Southern africa

DMAIC   Define Measure Analyse Improve Control

EAC   East African Community

GDP   Gross Domestic Product

KAM   Kenya Association of Manufacturers

KNBS   Kenya National Bureau of Statistics

PDSA   Plan-Do-Study-Act

QI   Quality Improvement

SPC   Statistical process control

SPSS   Statistical Package for Social Sciences

TQM   Total Quality Management

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CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The past decade has been marked by rapidly increasing global competition accompanied by rapid technological changes and product variety proliferation in varied industry sectors. This has led to a new scenario in which for industries to remain competitive, they must continuously implement best practice management principles, strategies and technologies (Carpinetti, et al., 2003). As in other industries, efforts to improve performance and competitiveness have led manufacturing firms to design and implement comprehensive quality assessment and improvement strategies or programs. These firms have to adopt operations strategies which will ensure survival in the highly turbulent and competitive markets.

Operations strategies include all major decisions about, and strategic management of: core competencies, capabilities and processes; technologies; resources; and key tactical activities necessary in any supply network, in order to create and deliver products or services and the value demanded by a customer (Lowson, 2002). Operations strategies aim at producing quality goods and services with optimum utilisation of available firm resources. Quality Improvement is one of the operations strategies adopted by manufacturing firms. The study seeks to explore the quality improvement practices adopted by manufacturing firms in Kenya with particular attention to those operating in Nairobi.

1.1. 1 Quality Improvement Practices

Quality has been defined and measured differently, largely dependent on one's viewpoint. In an excellent summary of the various definitions proposed, Sebastianelli & Tamimi (2002) identify quality as having been defined as: excellence, value, conformance to specifications, and meeting or exceeding customers' expectations (including Juran's term "fitness for use").

The manufacturing-based approach has its roots in operations and production management. Here quality is defined as conformance to specifications (Silvestro, 2001). Quality of conformance relates to the degree to which a product meets certain

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design standards. This definition has an internal focus, in contrast to the external focus of the user-based approach, and quality is considered an outcome of engineering and manufacturing practices. It is the basis for statistical quality control. Deviations from design specifications result in inferior quality and consequently increased costs due to scrap, rework or product failure (Dale, et al., 2001). This definition allows for the precise and objective measurement of quality, although it has limited applicability for services.

One of the most important themes that come up in the discussions about manufacturing is the subject of quality improvement. In manufacturing there is always need to keep improving the quality of product and services offered by the firm thus necessitating continuous improvements. Quality improvement (QI) is a management philosophy and system which involves management, staff and the whole organisation stakeholders in the continuous improvement of work processes to achieve better outcomes for the customers. It involves the application of statistical methods and group process tools to reduce waste, duplication, and unnecessary complexity in work. The goal of QI is to consistently meet or exceed the needs of customers, employees, staff, regulatory authorities and the community (Zu, 2009; Adam, et al., 2001; Wisner, 2001). According to Musyoki (2002), quality improvement as a management method seeks to develop the organization in a new way so that, in an orderly and planned fashion, "everyone at all levels can play an active role in understanding problems and the processes of work that underlie them, collecting and analyzing data on those processes, generating and testing hypotheses about the causes of flaws, and designing, implementing, and testing remedies.

Smith (2003) notes that quality improvement practices encompass all interventions aimed at ensuring better quality in the final product and service offering as well in the inputs, processes, structures and procedures in a firm. There are various examples of quality improvement practices adopted by firms. These practices cover product improvement, process improvement and people based improvement. Some of quality improvement practices include Business Process Reengineering (BPR), Total Quality Management (TQM), rapid cycle change, lean thinking, six sigma, kaizen and benchmarking. The study discusses these practices in detail in chapter two under literature review.

With regard to patterns of adoption of quality improvement practices in relation to size of firms several authors have noted inconsistent findings. According to Wiele & Brown (2002), larger organizations will not be able to improve the quality of their products, services and processes, unless their suppliers or the second-tier suppliers also grow to higher level of quality maturity. Amongst these suppliers there are many SMEs. There is evidence (McTeer & Dale, 2001) that SMEs are no less concerned with quality than their larger company counterparts, but that they are less comfortable with the formal approaches that are often advocated as part of ISO 9000 series registration, and the introduction of TQM. On the other hand Temtime (2003) noted that quality has become the basis of global competition for all firms regardless of location and size.

Organisations encounter various challenges in implementing quality improvement practises. One of the challenges is the lack of financial and human resources to implement quality improvements successfully (Lucas and Buckley, 2009). Another challenge relates to lack of commitment among the management and employees especially when there is radical change which involving their job performance (Dale, et al., 2001). Alavi and Yasin (2008) also noted that the complexity of adopting quality improvement models which have been successful in other regions and firms into a different firm / region is also a challenge as what worked in one firm or region may not work in another. Despite these challenges, organizations are facing environmental and competitive realities that demand for the adoption and implementation of successful quality improvement practices.

1.1.2 Manufacturing Industry in Kenya

Kenya has a large manufacturing sector serving both the local market and exports to the East African region and abroad. The manufacturing industry in Kenya deals with production of agricultural products, oil refining, vehicle assembling, aluminium, steel, lead, cement and small scale consumer goods such as furniture, batteries, textile clothing, soap, cigarettes and flour among other things (World Bank, 2010).

The industry, which is dominated by subsidiaries of multi-national corporations, contributed approximately 7.65% of the Gross Domestic Product (GDP) in 2010. Several factors and recent developments are having varied effects on the

manufacturing industry in Kenya. Some of these factors include: power supply and cost challenges, increased supply of agricultural products for agro processing, favourable tax reforms and tax incentives, more vigorous export promotion and liberal trade incentives to take advantage of the expanded market outlets through AGOA, COMESA and East African Community (EAC) arrangements (KNBS, 2010).

Kenya Association of Manufacturers is an umbrella body for the firms operating in the manufacturing industry. KAM was established in 1959 as a private sector body but has evolved into a dynamic, vibrant, credible and respected business association that unites industrialists and offers a common voice for businesses. Currently it has 700 member firms involved in manufacturing in Kenya (http://www.kam.co.ke/index.php/about-us).

According to Kenya Industrial Research and Development Institute (KIRDI) Directory manufacturing firms are classified into six classes which are shown in table 1.1 and whose basis is the number of employees.

Table 1.1: Size of firms

Size of class code	Number of employees
A	5-19
B	20-49
C	50-99
D	100-199
E	200-499
F	Over 500

Source: Kenya Directory of manufactures industries, 3rd Ed. 1997.

Based on this information Ondiek (2011) classified the firms into small, medium and large categories. Firms with between 5-19 and 20-49 employees were classified as small. Firms with employees between 50-99 and 100 -199 are considered as medium whereas firms with employees over 200 are considered large.

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1.2 Statement of the Problem

One problem which has had policy makers in Kenya worrying is how to have a vibrant manufacturing sector offering competitive products. It is therefore imperative to understand the dynamics of the manufacturing industry players. Some of the firms in the sector have made varied steps in implementation of quality improvement practises. A study of such companies among others thus is an ideal study site to give insight into how a manufacturing organisation can achieve quality in its processes, operations, products and services.

The concept of quality is very broad, and is a subject yet to be covered conclusively. This is especially so in the context of developing countries such as Kenya. Most of the available studies have concentrated on the nature of quality management, and the models of quality improvement. Total Quality Management (TQM) is one of the widely studied areas both locally and globally (Leonard & McAdam, 2002; Silvestro, 2001; Omufira, 2001; Hill & Collins, 2001). Other related studies have been in Business Process Re-engineering (Iden, 2012; Ricondo & Viles, 2005), Kaizen (Brunet & New, 2003; de Haan, et al., 2001; Bessant, 2000).

Furthermore, most studies on quality improvement have been conducted in developed countries (Lucas & Buckley, 2009; Zu, 2009; Paxton, et al., 2006; Adam, et al., 2004). The subject of quality improvement has not been extensively covered by local scholars. Some of the studies on quality improvement in Kenya include Musyoki (2002) who undertook a study on the relationship between quality improvement and financial performance for commercial banks in Kenya. Odero (2003) did a case study of Kabete Training Institute and studied the Total Quality Management approach to performance improvement in diploma courses in technical training institutes. Gakure & Kithae (2011) studied the effect of quality improvement practices on micro and small enterprise performance. Kiiru (2006) studied employee perception of implementation of ISO9001 certification and process improvement in a case study of Kengen.

These studies have not covered the patterns of adoption of quality improvement practices in manufacturing sector, an area which the current study will focus. It is from this perspective that the study is conceived with an aim of understanding how

quality improvement practices vary among manufacturing firms depending on the size of manufacturing firms in Nairobi.

As illustrated from the foregoing discussion, the area of quality improvement in general, and specifically, quality improvement in the manufacturing industry has not been adequately covered by researchers. This is despite the fact that it is every firm's wish to have its products and services being of the best quality. Therefore the subject of quality improvement is a fertile area for a study in the Kenyan context.

The study sought to answer the following questions:

i) Does size of the firm determine the pattern of adoption of quality improvement practices by manufacturing firms in Kenya?

ii) What are the challenges encountered in implementation of QI practices among manufacturing firms in Nairobi?

In answering these questions the study will pay particular reference to the manufacturing firms under Kenya Association of Manufacturers operating in Nairobi.

1.3 Objectives of the Study

The general objective of the study will be to investigate the quality improvement practices used by manufacturing firms in Nairobi.

The study will seek to achieve the following specific objectives;

i) To establish the patterns of adoption of quality improvement practices adopted by manufacturing firms in Nairobi.

ii) To establish challenges encountered in implementing the quality improvement practices among manufacturing firms in Nairobi.

1.4 Value of the Study

The proposed study is expected to be useful to various stakeholders. First the study will be important to the manufacturing firms' management and owners. This is because the study will illuminate on the ways in which manufacturing as well as firms

in other sectors can improve quality of their products and services. The study will also inform organisations on practices which can be successfully adopted to improve quality of products and service offerings.

Secondly the study will be useful to the management of firms as it will provide insight on the factors either facilitating or hindering the adoption of quality improvement practices.

The study will also be important to scholars interested in the subject of quality improvement in Kenyan firms. The study will lay the foundation for future studies in this subject.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents the relevant literature review on relevant topics under the study. The literature review is structured as follows. The study begins by discussing reasons for quality improvement. The study then discusses various quality improvement practices adopted under various models.

2.2 Need for Quality Improvement

As the expectations of customers grow day by day, it is important for a business to continually improve the quality of the products and services it has to offer. High standards do not just happen by chance; it evolves over some time as a result of implementation of specific processes and experience (Govindaraju, et al., 2001). Organizations can improve and secure their future by engaging in a process of continual improvement and adopting new processes of conformity assessment (Tannock & Saelem, 2007).

One of the benefits of quality improvement is increased productivity. Quality improvement leads to increased productivity due to reduced errors and defects. Improved productions processes and systems also help improve productivity (Mandal, et al., 2000). Quality improvement also leads to better customer service as it seeks to meet the expectations of both the internal and external customers. Another benefit is

improved employee morale. This is because quality improvement does not focus on apportioning blame for errors but rather seeks solutions to such errors (Silvestro, 2001). Quality improvement also leads to increased revenue as a result of better products and customer satisfaction. Certification issued in recognition of quality improvement in a firm also makes their products more marketable (Leonard & McAdam, 2002).

Quality improvement thus is very essential to firms that want to improve their consumer base and subsequently their return on investment. Consumers are concerned about the safety of products they buy as well the efficiency of equipment they purchase. Attaining relevant certifications and improving service delivery in a firm can do the trick, leading to continued business success (Wisner, 2001).

2.3 Quality Improvement Practices

Numerous approaches to management of quality have been suggested and utilised, in order to help companies improve efficiency and competitiveness through improvement of quality. The study discusses quality improvement practices adopted and implemented under seven key models of quality improvement.

2.3.1 Total Quality Management (TQM)

TQM is defined as an integrated, corporately-led programme of organizational change designed to engender and sustain a culture of continuous improvement based on customer oriented definitions of quality (Leonard & McAdam, 2002). TQM was developed by the US statistician Deming in Japan in the 1950s and became more prominent outside Japan from the late 1980s and has been widely used in manufacturing sector since then (Trisolini, 2002). It has been suggested that TQM was in part a reaction by Deming to Taylor's 'Scientific Management' of the 1910s and 1920s and its perceived emphasis on profit-driven management rather than on quality.

There are few analytical or comprehensive definitions of TQM and the approaches tend to be defined by a list of characteristics held to be essential for their implementation. Indeed authors such as Shojania & Grimshaw (2005) argue that in

practice TQM have become not so much specific interventions as more general approaches to improving quality: different organisations use different approaches under an overall heading of TQM.

One of the key principles of TQM is the importance of measurement: data is a key tool to analyse variability in work processes and outputs. A range of tools is used in TQM including statistical process control (SPC), cause and effect diagrams and the Plan-Do-Study-Act cycle (Lilford, et al., 2003). TQM has continued to evolve over the past two decades and have seen many changes in its emphasis. Much of the effort has been on understanding the TQM practices that lead to superior quality and overall business performance (Feng, et al., 2006).

QI under TQM programme result in new organizational structures, new operational processes and new quality policies. Implementation of these policies can, however, be extremely difficult, because employees may not comply with them. The study of employee compliance is therefore vital in the practice of TQM; however, despite its importance, it seems to have received little research attention. For quality improvement under a TQM programme to be successful, the commitment to total quality needs to embrace the whole workforce, which must be encouraged to participate actively in the search for continuous quality improvement (Leonard & McAdam, 2002).

2.3.2 Business Process Reengineering (BPR)

In the standard definition of business process reengineering (BPR), BPR is said to be the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed (Iden, 2012; Ricondo & Viles, 2005). Classical BPR emerged in the United States in the 1990s.

BPR emphasises radical rethinking: starting afresh and designing processes afresh from the ground up. The key question is 'Why do we do what we do at all?'. Then, if a process or stage in a process adds no discernible value, it is removed. BPR, as originally conceived, is an 'all or nothing' approach which eschews incremental changes that leave basic structures and processes intact. Despite some common

themes, like a strong focus on the customer, its proponents argue that it cannot be equated with other quality improvement programmes (e.g. TQM) which aim for incremental improvement of existing processes (Valentine & Knight, 2003).

Other key themes of BPR include the belief that change is driven from the top by a visionary leader who sets the direction for the requisite radical rethinking. In BPR there is the principle that organisations should be arranged around key processes, not around specialist functions. Thirdly under BPR there is the conviction that tasks and functions are aggregated and narrow specialists are replaced by multi-skilled workers in self-managed teams which are collectively responsible for designing work processes and delivering performance (Hill & Collins, 2001).

QI practices under BPR in organizations seek to change the entire organization as opposed to making changes in departments. QI under BPR is a top-down and strategic driven process led by senior management with the objective of achieving radical performance improvement over a short term. According to Chow-Chua and Goh (2000), an effective implementation of QI under BPR is measured in terms of business performance such as ROI, profitability, market share and cost reduction.

Evans (2004) noted that it is hard to implement BPR as it involves radical overhaul of all systems in an organisation as it makes enormous demands on managers and their skills. Cost cutting and head chopping is the very easy part of the exercise. The difficult part is to change the company forever. And change of that order is a human, not technical, endeavour.

2.3.3 Rapid Cycle Change

Rapid cycle change is based on Langley's Model for Improvement which asks three questions: What are we trying to accomplish? How will we know that a change is an improvement? What changes can we make that will result in improvement? These questions are put into action by front-line staff through Plan-Do-Study-Act cycles (PDSAs), which provide a framework for repeated short-cycle small-scale tests of change linked to reflection. PDSA cycles have been widely used in the initiatives promoted particularly in quality improvement collaboratives. They enable low-risk tests of change based on the proposals of front line staff and may therefore encourage

useful staff engagement in quality improvement. As yet, however, there is only limited evidence in the peer-reviewed literature in terms of changes in outcome or practice patterns from the rapid cycle change approach and quality improvement collaboratives. It is likely that ongoing work at various sites will begin to address these evidence gaps.

The rationale for PDSA comes from systems theory and the concept that systems are made up of interdependent interacting elements and are therefore unpredictable and non-linear: small changes can have large consequences. Short-cycle, small-scale tests, linked to reflection, are seen as helpful because they enable health care teams to learn on the basis of action and its observed effects (Iles & Sutherland, 2001). The approach is also valuable because the changes are not imposed: front line staff members are closely involved in determining the problems and in suggesting and testing out potential solutions. This bottom-up approach increases the likelihood that staff will 'own' the changes, a key requirement for successful organisational change (Greenhalgh, et al., 2004).

The rapid cycle change model is similar to TQM in that it is systematic and data driven, but unlike TQM it places less attention on flowcharting processes and extensive measuring: rapid cycle change calls for sufficient data to be collected to know if the change has resulted in an improvement (Meisel, et al., 1998). Changes are tested on a small scale, permitting experimentation and discarding unsuccessful tests (a typical pattern might be testing a change with one practitioner and one patient in a single clinic – then moving on to three, then five and so on). It is argued that in contrast to large scale once-and-for-all implementation of grand designs (which often fail), numerous small cycles of change can successfully accumulate into large effects; for example, an intensive care unit could improve quality by working on a series of cumulative and linked PDSAs in different aspects of care at the same time (Berwick, 2001).

In contrast to large-scale approaches, PDSA changes are small (therefore controlling risk and disruption), take minimal time, and require little financial investment (in staff terms), with the majority of staff needing little formal training to proceed. PDSA changes are also advantageous as they are designed in context to fit that particular set

of local circumstances: they therefore meet one of the key criteria for sustainable organisational change (Dopson & Fitzgerald, 2005; Grol & Wensing, 2005).

2.3.4 Lean Thinking

'Lean thinking' was developed by Toyota in the 1950s based largely on the work of Deming. The Toyota Production System aimed to achieve waste reduction and efficiency while simultaneously improving product quality and led to Toyota increasing its competitive edge by using fewer employees to produce more cars with fewer defects (Westwood & Silvester, 2006).

The principles behind the Toyota Production System have led to a set of ideas that are commonly grouped under the rubric 'lean thinking' (or sometimes just 'lean'), although the variants are not an exact application of the Toyota model. The core idea in lean thinking is the need to provide what the internal or external customer wants such as to provide 'value' to the customer, with minimal wasted time, effort and cost. Those actions or processes which do not create value need to be identified and modified or eliminated (showing strong similarities with BPR approaches). Removing any 'waste', it is claimed, will lead to additional capacity and hence enhanced performance (Papadopoulos, 2011).

Lean thinking QI practices emphasises streamlining processes to provide what the internal or external customer wants with minimal wasted time, effort or cost. Lean thinking uses a range of tools to identify core processes and to develop them so that the system flows efficiently. These tools include: 5S or CANDO (a series of five steps to enable workforce teams to look at the environment they work in and to start to identify the blocks in current processes e.g. lack of supplies, defective equipment). The 5S are: Seiri (clearing up); Seitori (arranging); Seiso (neatness); Shitsuke (discipline) and Seiketsu (ongoing improvement). 5S-CANDO is a set of activities for reducing friction and making the workplace safer (Bateman & David, 2002). Lean thinking also uses rapid improvement events or kaizen (five day intensive workshops to analyse current processes and identify changes needed) and value stream mapping (analysing current processes to generate ideas for process redesign). Lean thinking also uses other quality improvement tools such as Plan-Do-Study-Act rapid change cycles, Six Sigma in analysing processes and redesigning them (Hicks, 2007).

2.3.5 Benchmarking

After a critical analysis of various definitions Anand & Kodali (2008) describe benchmarking as a continuous analysis of strategies, functions, processes, products or services, performances, etc. compared within or between best-in-class organisations by obtaining information through appropriate data collection method, with the intention of assessing an organisation's current standards and thereby carry out self-improvement by implementing changes to scale or exceed those standards.

The benchmarking process is divided into four stages, namely planning, analysis, action and review. The first two phases fall under the external applications (amongst companies) and the last two, internal applications (in each company). Planning lays the foundation and is critical to implementing a successful benchmarking project. It involves the complete understanding of the existing internal processes and measurements. The analysis phase involves analyzing the benchmarking data to identify and understand the practices which best contribute to the subject's strengths. Hence, the company could determine current performance gap. In the integration phase, the company develops goals and integrates them into the benchmarking process to obtain significant performance improvements. Finally, the action phase needed to achieve the goal is decided in the integration phase. Pervious studies failed to set up a quantitative measurement to address the benchmarking process (Chen, 2002).

Adoption of QI practices under benchmarking requires an organization to clearly understand its own processes. Once an organization clearly understands its own processes, the author then progresses to the task of deciding the type of benchmarking to be undertaken, i.e.: internal; competitive; functional; generic. Quality improvement practices based on benchmarking focus on roles, processes or strategic issues in seeking best practice and helps identify those features or areas which are critical to the success of an organization. According to Anand & Kodali (2008), the QI practices adopted under benchmarking by an organisation should be clear and basic, emphasising logical planning and organisation and establishing a protocol of behaviour and outcomes.

According to Magd (2008), benchmarking has truly revolutionized the culture of businesses in the West and the way with which it is organized, managed and run. This is very evident when one looks at the number of conferences being organized, the formation of clubs, associations and the launch of journals and magazines specifically devoted to the subject of benchmarking. However this is not so in developing countries as firms continue to see each other as rivals and not as partners (Diebäcker, 2000). There is also lack of trust to enable sharing of information as is the case in the developed nations (Miguel, et al., 2012). Magd (2008) found that data comparability, and lack of resources (time and money) was cited as reasons why firms in Egypt did not embrace benchmarking.

2.3.6 Six Sigma

Six Sigma is the newest of the five approaches: it has been used in industries since 1980 and is widely used in the manufacturing industry. The term is said to derive from the physicist Shewhart's observation in the 1920s that three sigma (standard deviations) from the mean is the point where a process requires correction; Six Sigma is therefore used to denote 'perfection' and is usually defined for practical purposes as achieving a rate of only 3.4 defects per million (Wears, 2004; Young, et al,. 2004).

Six Sigma aims to eliminate defects and reduce variation in a processes in order to improve output and outcomes from the system (Westwood & Silvester 2006). The key methods to achieve this are statistical tools and analysis to identify the root cause of variation. Six Sigma identifies two causes of variation: 'common' or 'chance' causes that result in minor fluctuations in the data, and 'special' or 'assignable' causes that result in the data showing an unusual pattern (compared to that normally displayed by chance causes) and to which a cause can be assigned (Naslund, 2008; Taylor & Shouls, 2008). In Six Sigma, the aim is primarily to address the second type of variation (i.e. special or assignable causes of variation), although if a process has a significant amount of common variation which is inherently unstable, then action may be needed to change the process itself (Naslund, 2008).

A crucial differentiator of Six Sigma from other quality improvement methods is intensive technical training and coaching by experienced so-called 'master black belts' (Proudlove, et al., 2008). Six Sigma offers a structured approach to get to the

root causes of problems using the DMAIC methodology (Define Measure Analyse Improve Control). Statistical process control (SPC) is a key tool used in Six Sigma; SPC can also be used independently of a Six Sigma approach. SPC uses statistically based rules to interpret any unusual patterns in plotted data of events or other system parameters. SPC charts enable retrospective analysis of the state of the process, but also prospective analysis that allows dynamic monitoring to detect any shifts in the process (Taylor & Shouls, 2008). In health care quality improvement, SPC control charts can be used to visualise and analyse organisational processes over time to determine whether the process is stable and predictable or whether there is unwarranted variation (Thor, et al., 2007). Interventions can then be designed to address the variation. Six Sigma also uses other tools like the 'theory of constraints': a step by step process to examine bottlenecks in a system (Hines, et al., 2004; Young, et al., 2004).

Over time, Six Sigma has developed and undergone significant changes. It initially applied in the manufacturing sector but has now spanned over service and financial sectors (Aghili, 2009). Antony (2007) grouped these changes into three generations. The first generation of Six Sigma (1987-1994) was focused on reduction of defects and saw success with Motorola. The second generation (1994-2000) was concentrated on cost reduction and was adopted by companies such as General Electric, Du Pont and Honeywell. The third generation (2000 onwards) is oriented to creating value for the customers and the enterprise itself and finds its application within companies like Posco and Samsung. This is more oriented to service and commercial business processes including transactional systems quality, which takes into account delivery times, customer waiting time to receive services, inventory service levels, etc.

2.3.7 Kaizen

Kaizen is the Japanese word for improvement, carrying the connotation in industry of all the uncontracted and partially contracted activities which take place in the Japanese workplace to enhance the operations and the environment. Kaizen epitomises the mobilisation of the workforce, providing the main channel for employees to contribute to their company's development. In isolation, the concept seems simple: "with every pair of hands, you get a free brain" (Bessant, 2000). There

are close comparisons to be drawn between kaizen and ideas of past research in industrial relations, starting from Elton Mayo and the Human Relations school of Maslow, McGregor, Argyris and Herzberg. Various writers emphasise different key features, but many focus on three key notions. The first is that kaizen is continuous – which is used to signify both the embedded nature of the practice and also its place in a never-ending journey towards quality and efficiency. Secondly that kaizen is usually incremental in nature, in contrast to major management initiated reorganisations or technological innovation such as the installation of new technology or machinery. Thirdly, kaizen is participative, entailing the involvement and intelligence of the work force, generating intrinsic psychological and quality of work-life benefits for employees (Brunet & New, 2003).

Kaizen is closely associated with but not identical to the idea of Quality Circles and TQM, and resonates with many recent ideas in management from knowledge management of Nonaka and Takeuchi to the balanced scorecard of Kaplan and Norton. De Haan, et al. (2001) comment on the importance of kaizen to Japanese production control mechanisms. Kaizen needs to be distanced from the more recent Western development, kaizen blitz, whereby management involves employees in re-engineering brainstorming sessions (Brunet & New, 2003).

Kaizen requires the development of firm-specific human capital at the point-of-entry through on-the-job training, job rotation and cross-functional training (Storz, 2008). Then, kaizen involves the participation and commitment of all employees from top management to front-line workers who first recognize and accept the existence of problems and who work in teams and as peers in identifying possible improvement areas. The empowerment of even the lowest-skilled workers is aimed at making decisions at the lowest possible level by those most affected by change. A high level of trust with a no-blame culture is necessary to make the suggestion system viable and base improvements on facts and data rather than opinions. The focus is on reducing waste and sustaining the gains once waste has been removed, therefore calling for incremental and evolutionary change rather than revolutionary alterations (Van Scyoc, 2008).

As it emerges in the foregoing discussions there are many different models on how to go about improving the quality of your business' products or services. Although they

processes are sometimes different, the end goal is always the same; happier customers or clients. Product improvement, process improvement, and people based improvement are all characteristics of quality improvement. There have been many different approaches to reaching better quality products and services over the years. Different organizations have used different proponents in hopes to reach small, medium and large gains. Each approach has its own successes and failures. The common differentiators between success and failure include, but are not limited to the following: commitment, knowledge, expertise to guide improvement, scope of change and improvement desired, and adaption to enterprise cultures. Managers of organizations should carefully research which method to adopt (Alavi & Yasin, 2008).

Business culture and the people that make up the culture are important factors to consider when choosing an approach to quality improvement. It is important for managers and employers to comprehend that any change within a business takes time to put into operation correctly, gain recognition by the employees, and become stabilized as an adequate practice amongst the organization. This process is often referred to as change management. When implementing new changes within an organization, it is important to allow time for the change to grow and success to happen. When a change is implemented and growth is not measured, the change was not yet truly successful (Smith, 2003).

When an organization looks to change their culture, these changes take longer due to the fact that they have to overcome the resistance of the employees. It has been suggested that organizations should make smaller improvements throughout time rather than making huge changes all at once when aiming for quality improvement. It is usually when an organization is in crisis that making changes works the best because the employees know that something needs to be changed in order for the organization to proceed and be successful. It should still be done in a well, thought out manner (Lucas & Buckley, 2009).

According to Kim and Nakhai, (2008) quality improvement will always measure where a company's products and services stand and how to make them better at a more reasonable cost. The specific aim is not to point blame at certain individuals, but to prevent errors from happening within an organization. Activities associated

with improving quality can be very accommodating. Although it may be challenging for organizations to figure out the defects in their systems, it will be very rewarding in the end when the organization moves toward success. Quality improvement is a great way for organizations to brainstorm together and think outside of the box. Managers should always want to see better production numbers with suitable quality.

2.4 Challenges Facing Adoption of Quality Improvement Practices

There are a number of challenges encountered in the process of adopting and implementing quality improvement practices in organisations. One of these challenges is the lack of management and employee commitment. In organisations employees are known to be resistant to change; this scenario is complicated when there is lack of commitment from the management team. It becomes nearly impossible to successfully implement quality improvement practices when such a situation exists (Lucas & Buckley, 2009).

Another challenge encountered in the adoption and implementation of quality improvement is the issue of inadequate resources. Adoption of QI requires financial and capable workforce in addition to having in place the right infrastructure. Inadequacy in these resources makes it difficult for an organisation to achieve the objectives of quality improvements. Most organisations do not have the appropriate infrastructure required for the adoption of quality improvement and this has to be aligned with the needs of the quality improvement practice to be adopted (Dale, et al., 2001).

Another challenge which stakeholders have to contend with in quality improvement is the issue of high-customer expectations. In recent years, quality of products and services has become a very important issue. With increased awareness and the emergence of consumerism, customers have become highly demanding and take an important role in the firms' decision making process. They have begun to challenge the efficiency and effectiveness of products and services given by firms. With new communication tools such as online forums and the social media the bar has been raised in quality matters and the firms have to ensure they do not receive negative product/service appraisals. Alavi & Yasin (2008) noted that the complexity of adopting quality improvement models which have been successful in other regions

and firms into a different firm is also a hindrance to adoption of QI. Despite these challenges organizations are facing environmental and competitive realities that demand for the adoption and implementation of successful quality improvement practices.

2.5 Size of the Firm and Adoption of Strategies

The traditional focus of the strategic management literature has been the large corporation and relatively little attention has been devoted to the small firm. However, the decline of large scale manufacturing and the resurgence of the small business sector have led to a renewed interest in the mechanisms by which small firms compete and grow (Bishop & Megicks, 2002). Typically, analysis of the small firm has involved utilising frameworks and concepts initially developed for large firms whilst recognising the limitations of these frameworks within the small firm context (Lee, et al., 2001). In particular, many contributions have adapted the classical, rational model of strategic planning that has been a dominant strand in the general strategy literature (O'Gorman, 2000). This approach argues that the appropriate strategies for any firm can be deduced on the basis of logical, formal analysis utilising a range of prescribed tools, techniques and processes (Lynch, 2000). Bishop & Megicks (2002) notes that the strategic management model is just as useful to small and entrepreneurial companies as it is to large business organisations although the strategic decision-making process may need a few adjustments.

According to Aranda (2002) the relationship between operations strategy and firm's size is supported by the contingency theory according to which environmental and structural contingencies make some strategies more effective than others. Therefore, if firm's size is a clear structural contingency, it should influence operations strategy in some way. Aranda (2002) found that there was a significant relationship between operations strategy and size in consulting engineering firms. Small firms tend to follow customer-oriented operations strategies, medium firms tend to follow process-oriented operations strategies and larger firms tend to follow service-oriented operations strategies.

In the same breadth several authors have claimed that there exits a relationship between firm size and the adoption of quality improvement strategies (Gupta &

Whitehouse, 2001; Sohal, et al., 2001). In this regard, Meredith (2003) has reported that some improvement practices thrives only in large firms because large firms: have product-line depth and breadth to exploit such strategies fully, are able to afford the often extreme expense of strategy adoption and are likely to have the skills and human resources it takes to understand, implement and manage these strategies.

2.6 Summary of the Literature Review

Several issues emerge from the literature reviewed. The discussions bring out the various benefits of QI in organisations. The discussions also show that there are various approaches / models which an organisation can adopt in its path to quality improvement. From the foregoing discussions it also emerges that majority of scholarly works on quality improvement have been conducted in contexts which are different from the Kenyan context. It is thus imperative to conduct the current study to be able to fill the knowledge gap which exists in local scholarly work collection. The study also will be ground breaking as it will compare the QI adoption patterns in the three categories- small, medium and large manufacturing firms. This will shed light on whether size determines the adoption of QI practices in manufacturing firms.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Introduction

This section discusses the methodology used in acquiring and synthesizing the study data. The elements discussed are; research design, target population, sample and sampling technique, research instruments, validity, reliability, data collection procedures and techniques.

3.2 Research Design

A descriptive research design of a survey type was used to answer the question what is the pattern of quality improvement practices put in place by manufacturing firms in Nairobi in relation to size of the firms, Kenya.

The goal of the survey research was to collect data representative of the population. The information gathered from the survey was used to generalize findings drawn from the sample back to the population, within the limits of random error.

3.3 Population

This study sought to get an insight into the patterns of adoption of quality improvement practices by firms in the manufacturing industry in Nairobi. The population of this study was the 700 manufacturing firms who are members of KAM and which have offices in Nairobi. To get information about the quality improvement practices the most suitable respondents were the employees in the quality assurance department. These employees were thus the respondents in the study.

3.4 Sampling Design

The study used stratified random sampling to get the desired sample. The study used the number of employees to determine the size of the firm. The following sampling frame was used.

Table 3.1: Sampling Frame

Size	No. of firms	Sample size
Small Firms	334	10X2
Medium Firms	319	10 X2
Large Firms	47	10 X2
Total	**700**	**60**

The study thus used random sampling to pick 10 firms from each category. The researcher administered questionnaires to quality assurance division/department employees in these 30 firms. To reduce personal biases, the study had two respondents from each firm. This added up to 60 respondents.

3.5 Data Collection Methods

The researcher used primary data in this study. The data was both qualitative and quantitative. Qualitative data sought to describe the qualities / characteristics of the subjects of the study. Quantitative data was used to show trends of the subjects of the study. Primary data was collected first hand from employees of the quality assurance divisions. The researcher used a questionnaire to collect the primary data from the respondents. The primary data was efficient to the research because it is reliable and accurate.

The questionnaire had three sections. The first section was covering the general information on the firm and the respondents. The second section covered the quality improvement practices adopted by the manufacturing firms as per their size. The third section gathered information on the challenges facing adoption of QI by manufacturing firms. The researcher personally administered the questionnaires to the respondents with the help of research assistants.

3.6 Data Analysis Procedures

This study used quantitative and qualitative methods of data analysis. To ensure easy analysis, the questionnaire items were coded according to each variable of the study to

ensure the margin of error was minimized and ensure accuracy during analysis. Data was analyzed using descriptive statistics. The descriptive statistics utilized in the study included frequencies and percentages. The analysis was done with the help of Statistical Package for Social Sciences (SPSS) program. Coded data was used to generate frequencies such as mean scores and percentages. The descriptive statistics gave the characteristics of the QI practices adopted and the challenges encountered in the adoption process. Analysis of Variables (ANOVA) and correlation analysis was used to determine the patterns of adoption among the categories of firms. The results were presented using tables and pie charts to give a clear picture of the research findings at a glance.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter focuses on data analysis, interpretation and presentation of the data collected in the study. The purpose of the study was to investigate the quality improvement practices used by manufacturing firms in Nairobi. The study targeted a sample of 30 manufacturing firms with two respondents from each firm of which 48 responses were obtained. To show the relationship between variables, data was presented in form of tables and charts.

4.2 Background information

In this section, the research sought to find out the personal characteristics of respondents who took part in the study; this includes information such as gender, age, education level and duration of service/ years worked in the firm. The results are presented below.

4.2.1 Gender of the Respondents

The study began by looking at the gender distribution of the respondents and the results are shown in figure 4.1.
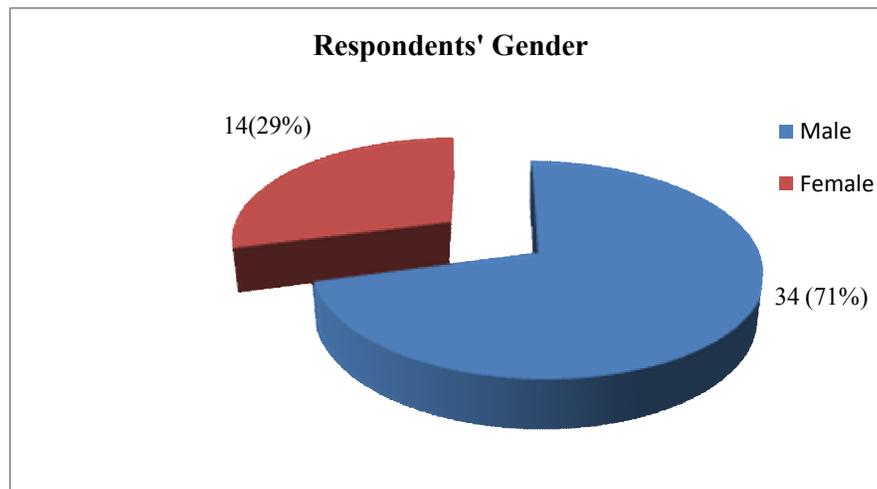
Figure 4.1: Gender of the Respondents

The study shows that majority (71%) of the respondents were male while 29% were female. The results imply that the quality assurance departments are dominated by men. The results however show that the voices of women are represented in the study.

4.2.2 Age of the Respondents

The study sought to find the age distribution of the respondents and results are illustrated in figure 4.2.
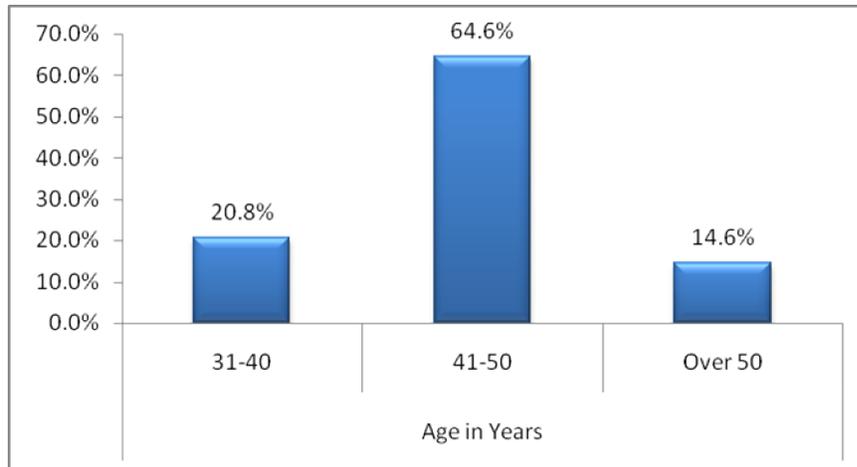
Figure 4.2 Respondents Age

The study shows that majority of the respondents (64.6%) were between 41-50 years of age while 20.8% were between 31-40 years of age. On the other hand, 14.6% of the respondents revealed that they were over 50 years of age. The results imply that the findings do not have an age bias as the respondents are fairly distributed across all age groups.

4.2.3 Respondents Education Level

The study also sought to find out the education levels of the respondents and the results are shown in figure 4.3.
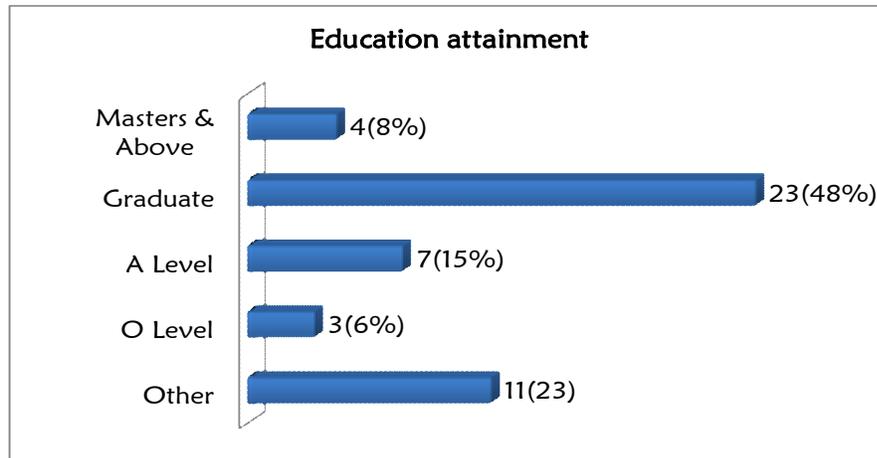
Figure 4.3 Respondents Education Level

The study established that 48% of the respondents were bachelors degree graduates while 8% had attained a masters degree and above. The results also show that 15% had education up to A Level certificate while 13% had attained O level education. The results also show that 23% revealed that they had other qualifications such as higher National Diplomas and Diplomas.

The results imply that the respondents were qualified, knowledgeable on the organisation operations and had the ability to express themselves properly on matters which were under investigation.

4.2.4 Duration of service

The study also sought to find out the duration of the respondents in the firm and in the manufacturing industry.

Table 4.1 Duration of Service in Industry and Firm

Duration of Service	In the Industry		In the firm	
	Frequency	**Percent**	**Frequency**	**Percent**
0-5	5	10	7	15
6-10	8	17	12	25
11-15	13	27	12	25
16-20	9	19	8	17
Over 21	13	27	9	19
Total	**48**	**100**	**48**	**100**

The study found that 10% had worked in the industry for less than 5 years while rest 90 had been in the industry for at least six years. On the other hand, 15% of the respondents revealed that they had worked in the firm for less than 5 years while rest 85% had worked in the firm for at least six years. The results imply that the respondents were well versed with the operations in the industry as well as their firms as majority of them had spent at least six years in the industry and their respective firms.

4.2.5 Annual Turnover

The study sought to find out the annual turnover of the surveyed firms and the results are presented in table 4.2.

Table 4.2 Firms Annual Turnover

	Frequency	Percent
Up to 50 million	17	35
51-500 million	15	31
501-1 billion	6	13
1.1 -5 billion	10	21
Total	**48**	**100**

According to 35% of the respondents, their firms had an annual turnover of up to 50 million while 31% revealed that their firms had a turnover of 51-500 million. On the other hand 13% of the respondents revealed that their firms had an annual turnover of 501-1 billion while 21% had an annual turnover of 1.1 to 5 billion. The results show that the firms were distributed across the sizes as per the sample design. The results complement the categorisation of the firms by number of employees.

4.3 Quality Improvement Practices

The study sought to get insight into the QI practices adopted by firms and the findings are presented in this section.

4.3.1 Quality Management Model

Here, the study sought to find out which quality management model had been adopted by the sampled firms. The results are as shown in table 4.3 below.

Table 4.3 Quality Management Models Adopted

	YES		NO	
Quality Management Model:	F	%	F	%
Kaizen	6	13	42	87
TQM	9	19	39	81
BPR	-	-	48	100
Lean Thinking	18	38	30	62
Benchmarking	9	19	39	81
Six Sigma	23	48	25	52

The study found out that of the most firms had adopted Six Sigma; this was revealed by 48% of the respondents while 38% of the respondents revealed that they used Lean Thinking model. On the other hand, 19% of the respondents revealed that they used TQM and benchmarking respectively while 13% revealed that their firms had adopted various aspects of the Kaizen model.

The findings can be explained by authors such as Westwood & Silvester (2006), who argued that Six Sigma is popular with manufacturing industry as it was designed to eliminate defects as well as wastes and ensure customer satisfaction. These are key aspects of a well functioning manufacturing firm. Aghili (2009) is popular with manufacturers despite size of the firms. Another popular QI practice largely adopted in Kenya by manufacturers was found to be lean thinking. Papadopoulos (2011) had found that lean thinking is also preferred by manufacturers as it also seeks to reduce waste in time, effort and costs.

On adoption levels of TQM, Leonard & McAdam (2002) argued that implementation of the TQM practices to improve quality can be extremely difficult, because employees may not comply with them. On findings on benchmarking Anand & Kodali (2008) had found that for benchmarking to succeed as a QI technique there has

to be documented case studies which are lacking in Kenya. Kaizen adoption is relatively low and this could be due to reasons noted Van Scyoc (2008) including participation and commitment of all employees, empowerment of all employees and a high level of trust with a no-blame culture.

The findings show that no firm has ever adopted BPR as an effort to improve quality of its products and services. As noted by Evans (2004), it is hard to implement BPR as it involves radical overhaul of all systems in an organisation which make enormous demands on managers and their skills.

4.3.2 Characteristics of QI Models

On the characteristics of the model, the respondents stated that the model used by their firm ensured consistency in production and customer services, customer satisfaction, waste reduction; improved efficiency in production, minimization of defects in production process and quality and service improvement. The results are in agreement with findings by authors such as Papadopoulos (2011) and Aghili (2009). These authors had found that quality improvement practices adopted had features which were related to waste reduction, improving process efficiencies and reducing wastages.

The findings are also in line with Kumar, et al., (2009) who studied the performance of manufacturing companies which had implemented a business excellence model and found the following benefits of operating procedures: improved quality of products and services, improved processes and productivity and reduced errors / defects. Similarly, the results are as Salaheldin (2009) studied the improvement of operational performance as a result of implementing TQM in industrial small and medium-sized enterprises (SMEs), and more specifically the company's operation in terms of cost and waste reduction, improved quality of products, flexibility, delivery and productivity.

4.3.3 Adoption and integration of quality improvement practices

In this section the study sought to find out the extent to which the firms surveyed had adopted and integrated various quality improvement practices. A scale of 1-5

weighted means was used to make interpretations. The scores "Very Small Extent" and "Small Extent" were represented by mean score, equivalent to 1 to 2.5 on the continuous Likert scale (1 ≤ Small Extent ≤ 2.5). The scores of 'Moderate' were equivalent to 2.6 to 3.5 on the Likert scale (2.6 ≤ Moderate Extent ≤ 3.5). The score of "Large Extent" and "Very Large Extent" represented major contribution to the project implementation rate. This was equivalent to 3.6 to 5.0 on the Likert Scale (3.6 ≤ Large Extent ≤ 5.0).

First the study gave a list of statement which sought to give the researcher and the study an insight into the extent of adoption of TQM practices in the surveyed firms. The results obtained are presented in table 4.4.

Table 4.4: TQM Practices

TQM Practices Aspects	Mean	Std. Deviation
The firm has made adjustment to its organization culture	1.49	1.01
The firm has adopted new quality processes	1.86	1.17
The firm uses cause and effect diagrams to manage quality	1.97	0.82
The firm uses process manuals to manage quality	3.73	1.07
The firm uses plan-do-study-act cycles	2.23	1.29
The firm uses operational manuals to manage quality	4.23	0.17
The firm uses statistical process control to manage quality.	2.47	1.18
The firm has adopted new operational processes	2.49	1.09

The respondents indicated that their firms had adopted most of TQM practices to a small extent as shown by the mean scores registered. The results show that firms had made small adjustment to organization culture as indicated by a mean score of 1.49. The firms had adopted new quality processes to a small extent (M = 1.85). The firms use cause and effect diagrams to a small extent in managing quality (M = 1.97). The firms use of plan-do-study-act cycles was to a small extent (M = 2.23). There were low levels of use statistical process control to manage quality (M = 2.47) and adoption of new operational processes (M = 2.49). The results however show that, the firms use operational manuals (M = 4.23) and process manuals to manage quality (M = 3.73) to a large extent. This means that the adoption of TQM practices is very low in the firms surveyed with only the aspect of use of operational manuals having been embraced.

The study then sought to find out the extent to which the firms had adopted aspects of BPR in the quality improvement efforts. The results are presented in table 4.5.

Table 4.5: Business Process Re-engineering

BPR Aspects	Mean	Std. Deviation
The firm conducted a total management overhaul	1.00	0.00
The firm conducted a total workforce overhaul	1.00	0.00
The firm conducted a total processes overhaul	1.00	0.00
The firm has had a fundamental redesign of its processes as part of its quality improvement strategy	1.79	0.90
The firm used fundamental rethinking to redesign its processes	1.86	0.83

On the business process re-engineering, majority of the respondents revealed that their firms had adopted and integrated the practices to a very small extent as shown by the mean scores: The firm conducted a total management overhaul (M = 1.00); the firm conducted a total workforce overhaul (M = 1.00); the firm conducted a total processes overhaul (M = 1.00); the firm has had a fundamental redesign of its processes as part of its quality improvement strategy (M = 1.79); and the firm used fundamental rethinking to redesign its processes (M = 1.86). This means that the adoption of business process reengineering practices is very low in the firms surveyed given the high cost and radical nature of this approach to improving quality as noted by Evans (2004), who indicated the difficulties in executing this strategy in any firm.

The study then sought to find out the extent to which the firms had adopted aspects of rapid cycle change in the quality improvement efforts. The results are presented in table 4.6.

Table 4.6: Rapid Cycle Change

Rapid Cycle Change Aspects	Mean	Std. Deviation
The firm uses PDSA's to manage quality	1.00	0.00
The firm conducts regular in depth reviews of its mission, processes and structures	4.23	0.00
Successful changes are replicated in other areas of the firm.	2.00	0.96
The firm has conducted an environmental scan	4.52	1.09
The front line staff are involved in implementing quality proposals	2.66	1.29

On rapid cycle change, the results obtained show that two aspects of lean thinking were adopted to a large extent while another two were adopted to a small extent. The results show that firms conduct regular in depth reviews of its mission, processes and structures (M = 4.23) and that they also conduct environmental scans (M = 4.52). On the other hand, the firms use PDSA's to manage quality to a very small extent as indicated by a mean score of 1.00. The results also show that successful changes are replicated in other areas of the firm to small extent as indicated by a mean score of 2.00. The results show that front line staff are involved in implementing quality proposals to a moderate extent as shown by a mean score of 2.65. The results show that rapid cycle changes aspects have been embraced to moderate extent by the firms surveyed.

The study also sought to find out the extent to which the firms had adopted aspects of lean thinking in their quality improvement efforts. The results are presented in table 4.7.

Table 4.7: Lean Thinking

Lean Thinking Practices	Mean	Std. Deviation
The firm has conducted a customer satisfaction survey	3.56	0.75
The firm has identified and modified or eliminated processes / laid off employees that do not create value to the customer.	3.82	1.30

The firm has adopted 5S or CANDO approach reducing workplace friction and making it safer	1.89	1.17
The firm has adopted changes in the processes to eliminate waste and costs.	4.64	0.29

The results reveal that their firms had adopted changes in their processes to eliminate waste and costs to a large extent as shown by a mean score of 4.64. The results show that the firms had adopted two lean thinking aspects to a moderate extent as shown by means scores: the firm has conducted a customer satisfaction survey (M = 3.56); the firm had identified and modified or eliminated processes or laid off employees that do not create value to the customer (M = 3.82). The results also show that the firms have adopted 5S or CANDO approach reducing workplace friction and making it safer to a small extent as indicated by a mean score of 1.89. The results show remarkable adoption of lean thinking as a quality improvement model in manufacturing firms operating in Kenya. This model has aspects cuts across all other quality improvement models and which are meant to reduce wastages and this explains why it is a popular model.

The study also sought to find out the extent to which the firms had adopted aspects of benchmarking in their quality improvement efforts. The results are presented in table 4.8.

Table 4.8: Benchmarking

Benchmarking Practices	Mean	Std. Deviation
The firm has identified local firm(s) which it has benchmarked its processes, operations, structures, and performance against	1.78	0.82
The firm conducts continuous analysis of strategies, functions, processes, products or services, performances	4.59	1.01
The firm has identified international firm(s) which it has benchmarked its processes, operations, structures and performance against	2.68	1.11

On benchmarking, majority the results show that their firms had identified local firm(s) which it had benchmarked its processes, operations, structures, and performance against to a small extent as shown by a mean score of (M = 1.78). The results also show that the firms had identified international firm(s) which they have benchmarked their processes, operations, structures and performance against only to a little extent as indicated by a mean score of 2.68. However, the results revealed that the firm conducts continuous analysis of strategies, functions, processes, products or services, performances to a large extent as shown by mean score of 4.59.

The results show that only one aspect of benchmarking has been embraced by firms in the manufacturing industry. The findings can be explained by Miguel, et al. (2012); Magd (2008) and Diebäcker (2000) who noted that in transition markets such as Kenya benchmarking is difficult as these economies are not knowledge based. The difficulties in accessing information on the running of firms make it hard for benchmarking to be adopted by firms operating in Kenya.

The study also sought to find out the extent to which the firms had adopted aspects of Six Sigma in their quality improvement efforts. The results are presented in table 4.9.

Table 4.9: Six Sigma

Six Sigma Aspects	Mean	Std. Deviation
The firm has put in place intensive technical training and coaching led by the "Champions"	1.87	1.02
The firm has adopted interventions to address variations	2.17	1.02
The firm uses Statistical process control (SPC) to monitor /detect shifts in processes and analyse process stability and predictability	2.24	1.18
The firm uses Define Measure Analyse Improve Control (DMAIC) approach to identify the causes of defects and variations.	2.34	0.94
The firm uses statistical tools and analysis to identify root causes of variations	2.37	1.20

The firm has been able to achieve a rate of only 3.4 defects per million	2.61	1.18
The firm has implemented processes that aim to eliminate defects and reduce variation in processes.	3.89	0.92

The results shows that the respondents agreed to a small extent that their firm had put in place intensive technical training and coaching led by the "Champions" (M = 1.87); the firm had adopted interventions to address variations (M = 2.17); and that their firms used statistical process control (SPC) to monitor /detect shifts in processes and analyse process stability and predictability (M = 2.24). However, the respondents agreed to a moderate extent that their firm had been able to achieve a rate of only 3.4 defects per million (M = 2.61) while the respondents further agreed to a large extent that the firm had implemented processes that aim to eliminate defects and reduce variation in processes as shown by a means score of 3.89 on the likert scale.

The study also sought to find out the extent to which the firms had adopted aspects of Kaizen in their quality improvement efforts. The results are presented in table 4.10.

Table 4.10: Kaizen

Kaizen Aspects	Mean	Std. Deviation
The firm adopts suggestions from employees and tracks their implementation	2.22	1.61
The firm holds regular brainstorming sessions where employees are allowed to suggest quality improvement initiatives	2.44	1.46
The firm rewards employees whose suggestions lead to quality improvements	2.81	1.47

On Kaizen quality improvement model, the result shows that the firms had adopted suggestions from employees and tracks their implementation to a small extent as indicated by a mean score of 2.22. The results also show that the firms held regular brainstorming sessions where employees were allowed to suggest quality improvement initiatives to a low extent as indicated by a mean score of 2.44 registered on this query. There were mixed reactions on the extent to which the firms

reward employees whose suggestions lead to quality improvements with this query posting a mean score of 2.81. The results point to a situation where the Kaizen model adoption is relatively low among the firms surveyed.

4.3.3 Adoption of QI Adoption and Size of the Firm

In this section, the study sought to show the relationship between adoption of QI adoption and the size of the firm. A scale of 1-5 was used. The scores "Strongly Disagree" and "Slightly Disagree" were represented by mean score, equivalent to 1 to 2.5 on the continuous Likert scale ($1 \leq$ Slightly Disagree ≤ 2.5). The scores of 'Neutral' were equivalent to 2.6 to 3.5 on the Likert scale ($2.6 \leq$ Neutral ≤ 3.5). The score of "Slightly Agree" and "Strongly Agree" represented major contribution to the project implementation rate. This was equivalent to 3.6 to 5.0 on the Likert Scale ($3.6 \leq$ Slightly Agree ≤ 5.0). Weighted means were used to interpret the results where a score of between 1 and 2.5 meant absence of the item; 2.6 to 3.5 meant mixed reactions with no clear observation and 3.6 to 5 was taken to mean presence of the aspect being tested in the likert scale.

Table 4.11: Adoption of QI Adoption and Size of the Firm

Link between adoption of QI and Size of the Firm	Mean	Std. Deviation
Size of the firm dictates the financial resources to be allocated for QI	3.07	0.73
Size of the firm determines the speed of QI adoption	3.13	1.08
Size of the firm dictates QI model to be adopted	3.34	0.94
Size of the firm determines the processes and systems that need to be changed	3.43	0.93
Size of the firm dictates the human resources to be allocated for QI	3.84	1.14

The results show that there we mixed reactions on whether size of the firm dictates the financial resources to be allocated for QI as indicated by a mean score of 3.07. Mixed reactions were also found on the issue of whether size of the firm determines the speed of QI adoption as this item registered a mean score of 3.13. Also there was

no clarity on whether size of the firm dictates QI model to be adopted with this query posting a mean score of 3.34. The results also show mixed reactions with regard to whether size of the firm determines the processes and systems that need to be changed as this item posted a mean score of 3.43. However, the results show that size of the firm does dictates the human resources to be allocated for QI as shown by a mean score of 3.84 posted on this item. The results show that there is no clear direction with regard to the relationship between size of the firms in manufacturing industry and the strategies they have adopted in the quest to improve quality of their products and services.

4.4 Challenges Facing Implementation of QI Practices

In this section the study sought to establish the extent to which various challenges were encountered within firms in the process of adopting quality improvement practices. The scale and interpretations used for table 4.11 were used. The results are presented in table 4.12.

Table 4.12: Challenges Facing Implementation of QI Practices

	Mean	Std. Deviation
There is lack of commitment by management towards adoption of QI practices	1.30	0.78
There is lack of commitment by employees towards adoption of QI practices	1.77	1.22
There is manifest resistance to change among the employees	2.09	1.14
The firm management has not invested enough in training and development despite adoption of latest technology	2.13	1.19
The financial resources allocated to implement QI are inadequate	2.36	0.99
Lack of necessary infrastructure for adoption of QI practises	2.55	1.18
There are few accessible local case studies where the firm can learn and adopt appropriate best practices	4.14	0.60
Adoption of necessary technology is very costly	3.94	0.90

The results show that there was commitment by management towards adoption of QI practices as indicated by a mean score of 1.30 posted on item regarding lack of commitment. The results also show that there was commitment by employees towards adoption of QI practices as indicated by a mean score of 1.77 posted on a query on lack of commitment by employees. The results indicate negation of the statement that there was manifest resistance to change among the employees (M = 2.09). The firm management had not invested enough in training and development despite adoption of latest technology (M = 2.13); the financial resources allocated to implement QI were inadequate (M = 2.36). There were mixed reactions on whether lack of necessary infrastructure for adoption of QI practices was a challenge (M = 2.55). The results show that there are few accessible local case studies where the firms could learn and adopt appropriate best practices (M = 4.14). The results also show that adoption of necessary technology was very costly as shown by a mean score of 3.94. The results show that the challenges that are manifest in process include inadequate resources, cost of technology, inadequate investment in trainings and lack of accessible case studies to learn from. The results show that the management and workforce do not pose a challenge in the process of adopting quality improvement strategies. There were no definite conclusions on whether available firm infrastructure hinders or facilitates the adoption quality improvement practices among manufacturing firms.

4.4.1 Challenges Facing Adoption of QI Adoption and Size of the Firm

The study also sought to find out the challenges facing adoption of QI in relation to the size of the firms. A likert scale similar to one used in table 4.11 was used and the results shown in table 4.13.

Table 4.13: Challenges Facing QI Adoption and the Size of the Firm

	Mean	Std. Deviation
Small firms do not have enough resources to enable adoption of QI	2.89	1.28
Large firms have a huge opportunity cost in adoption of QI	3.49	0.78
Large firms have a challenge in overhauling systems and processes	3.48	1.00

Results shows that there were mixed reactions on statements relating to the relationship between size of the firm and the challenges faced in process of QI adoption. First it was not clear whether small firms do not have enough resources to enable adoption of QI (M = 2.89); or whether large firms have a huge opportunity cost in adoption of QI (M = 3.49). It was also not clear whether large firms have a challenge in overhauling systems and processes with a mean score of 3.48 being registered on this item. The results point out to a situation where the challenges faced in the process of adopting quality improvement practices cannot be conclusively be said to be determined by the size of the firm.

4.5 Correlation Analysis

The study sought to find out whether there was a relationship between company's size and adoption of quality management models. This was tested using Pearson Product Moment Correlation Coefficients as shown below:

Table 4.14: Pearson Correlation Analysis

		Adoption of Quality Mgt Models	Large Manufacturing Firms	Small manufacturing firms
Large Manufacturing Firms	Pearson Correlation	0.23	1	
	Sig. (2-tailed)	0.05		
Small manufacturing firms	Pearson Correlation	0.12	-0.19	1
	Sig. (2-tailed)	0.08	0.00	.

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

The results show that, a low and insignificant relationship between adoption of quality improvement models and large manufacturing firms (r = 0.23; p = 0.054). Further the

results show an insignificant association between adoption of quality improvement models and small manufacturing firms as shown by ($r = 0.11$; $p = 0.08$). The results are a furtherance of descriptive statistics in tables 4.11 and 4.13 which had shown that there was no clarity on the association between size of the firm and the processes of adopting quality improvement practices in manufacturing.

The findings are in agreement with Bishop and Megicks (2002) who argued that that the strategic management models are useful to organisations despite their sizes with a few adjustments. The findings however disagree with argument by a relationship between firm size and the adoption of quality improvement strategies authors such as Gupta and Whitehouse (2001); Soha,l et al. (2001) and Meredith (2003) who argued that there is a relationship between size of the firm and the strategies it adopts.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presented the summary of the findings and also the conclusions and recommendations of the study based on the objective of the study which sought to investigate the quality improvement practices used by manufacturing firms in Nairobi.

5.2 Summary of Key Findings

The study was designed to investigate the patterns of adoption of quality improvement practices among manufacturing firms in Kenya. A number of key findings were made and are presented in sections 5.2.1 and 5.2.2.

5.2.1 Quality Improvement Practices

On the quality management models adopted, the study found out that most firms had adopted Six Sigma; followed by Lean Thinking model. The findings can be explained by authors such as Westwood and Silvester (2006) who argued that Six Sigma is popular with manufacturing industry as it was designed to eliminate defects as well as wastes and ensure customer satisfaction which are key aspects of a well functioning manufacturing firm. Aghili (2009) is popular with manufacturers despite size of the firms. Another popular QI practice largely adopted in Kenya by manufacturers was found to be lean thinking. Papadopoulos (2011) found that lean thinking is preferred by manufacturers as it also seeks to reduce waste in time, effort and costs.

On adoption levels of TQM, Leonard and McAdam (2002) argued that implementation of the TQM practices to improve quality can be extremely difficult, because employees may not comply with them. On findings in regard to benchmarking, Anand and Kodali (2008) had found that for benchmarking to succeed as a QI technique there has to be documented case studies which are lacking in Kenya. Kaizen adoption is relatively low and this could be due to reasons noted Van

Scyoc (2008)   including participation and commitment of all employees, empowerment of all employees and a high level of trust with a no-blame culture.

The findings show that no firm has ever adopted BPR as an effort to improve quality of its products and services. As noted by Evans (2004), it is hard to implement BPR as it involves radical overhaul of all systems in an organisation which make enormous demands on managers and their skills.

The study found that most notable characteristics of the models were that, they ensured consistency in production and customer services, customer satisfaction, waste reduction; improved efficiency in production, minimization of defects in production process and quality and service improvement. The results are in agreement with findings by authors such as Papadopoulos (2011) and Aghili (2009). These authors had found that quality improvement practices adopted had features which were related to waste reduction, improving process efficiencies and reducing wastages.

The findings are also in line with Kumar, et al., (2009) who studied the performance of manufacturing companies which had implemented a business excellence model and found the following benefits of operating procedures: improved quality of products and services, improved processes and productivity and reduced errors/defects. Similarly, the results are as Salaheldin (2009) who found that implementing TQM in industrial, small and medium-sized enterprises (SMEs) resulted in improvement of operational performance and more specifically the company's operation in terms of cost and waste reduction, improved quality of products, flexibility, delivery and productivity.

On the extent of TQM practices adoption the study found that the firms had integrated most aspects only to a small extent. Aspects such as adjustment to organization culture, adoption new quality processes, uses of cause and effect diagrams, use of process manuals use of plan-do-study-act cycles, use of statistical process control and adoption of new operational process were not being felt in the firms. The study found the only aspect under TQM which was observed as being the use of operational manuals to manage quality.

On the business process re-engineering, the study established that the firms had not adopted the practices the aspects of BPR. The firms had not conducted a total

management overhaul; the firms have not conducted total workforce overhaul; the firms had not conducted a total processes overhaul; the firm haven't had fundamental redesigns of their processes as part of quality improvement strategy and the firm had not used fundamental rethinking to redesign its processes. This was taken to mean that the adoption of business process reengineering practices is very low in the firms surveyed given the high cost and radical nature of this approach to improving quality as noted by Evans (2004) who noted the difficulties in executing this strategy in any firm.

Further the study found out that the firms had adopted and integrated the rapid cycle change practices to a small extent. The firms surveyed rarely use PDSA's to manage quality and successful changes are rarely replicated in other areas of the firms. The study found that front line staff were involved in implementing quality proposals, the firms usually conducted environmental scans as well as in depth reviews of their mission, processes and structures.

With regard to adoption of lean thinking practices, the study found that manufacturing firms had adopted the practices to varied extents. The firms were found to be conducting customer satisfaction surveys regularly and that they also identified and modified or eliminated processes as well as laying off employees that do not create value to the customers. The study also found that that manufacturing firms had adopted changes in their processes to eliminate waste and costs to a large extent. The firms had not adopted 5S or CANDO approach to reduce workplace friction and make it safer. The results showed remarkable adoption of lean thinking as a quality improvement model in manufacturing firms operating in Kenya. This model has aspects cuts across all other quality improvement models and which are meant to reduce wastages and this explains why it is a popular model.

The study found that benchmarking quality improvement model aspects as having been adopted to a very low extent. The study found that majority firms had not identified local firm(s) which they could benchmark their processes, operations, structures, and performance against. The study also found that majority of firms had not identified international firm(s) which they could benchmark their processes, operations, structures, and performance against. The study found that the firms regularly conduct continuous analysis of strategies, functions, processes, products or

services and performances. The findings can be explained by Miguel, et al. (2012); Magd (2008) and Diebäcker (2000) who noted that in transition markets such as Kenya benchmarking is difficult as these economies are not knowledge based. The difficulties in accessing information on the running of firms make it hard for benchmarking to be adopted by firms operating in Kenya.

The study found that the Kaizen model adoption is relatively low among the firms surveyed. The study found that the firms rarely adopt suggestions from employees nor tracks their implementation. The study also found that the firms rarely held regular brainstorming sessions where employees were allowed to suggest quality improvement initiatives.

The study found that there were no differences in patterns of adoption of quality improvement practices across different firm size. The study found a low and insignificant relationship between adoption of quality improvement models and large manufacturing firms (r = 0.23; p = 0.05). Further the study also found an insignificant association between adoption of quality improvement models and small manufacturing firms as shown by (r = 0.11; p = 0.08). The findings are in agreement with Bishop & Megicks (2002) who argued that that the strategic management models are useful to organisations despite their sizes with a few adjustments. The findings however disagree with argument by a relationship between firm size and the adoption of quality improvement strategies authors such as Gupta & Whitehouse (2001); Sohal, et al. (2001) and Meredith (2003) who argued that there is a relationship between size of the firm and the strategies it adopts.

5.2.2 Challenges Facing Implementation of QI Practices

The study found that the key challenges include inadequate resources, cost of technology, inadequate investment in trainings and lack of accessible case studies to learn from. The study also found that management and workforce do not pose a challenge in the process of adopting quality improvement strategies. The study did not find enough evidence on whether available firm infrastructure hinders or facilitates the adoption quality improvement practices among manufacturing firms. The study found that there was no clear relationship between challenges in the process of adopting quality improvement practices and the size of the firm.

5.3 Conclusions

The study concludes that the manufacturing firms sampled have adopted quality improvement models which have overlapping aspects. The firms have adopted aspects of a number of models and it is not possible to conclude that firms have adopted one model. The firms have adopted bits Kaizen, TQM, Lean Thinking, Benchmarking and Six Sigma models to varied levels.

The study also concludes that there is no discernible pattern which is dictated by size of the firms as there were no clear differences in the quality improvement processes of the firms across the sizes. The study concludes that the pattern of adoption of quality improvement practices could be better explained by other factors such as nature of products, technology and skills and competencies.

5.4 Recommendations

The study recommends that there is need for the manufacturing firms to conduct awareness campaigns in their organisations to ensure that employees especially in the quality assurance departments are knowledgeable on the quality improvement processes in the firms. There is need to conduct a needs assessment or a survey to assess the employees knowledge on these processes.

The study also recommends that there is need for the firms to document the processes in a format that is understandable to all employees even in other departments apart from quality and production.

The study also recommends that there is need for KAM to undertake a survey among its members so as to document the best practices and the costs of adoption of various quality improvement strategies. This will go a long way in ensuring that manufacturing firms do not repeat mistakes made by others. Such a move would also be beneficial to small and medium manufacturing firms who can't be able to make costly mistakes. This will go a long way towards the achievement of Vision 2030.

5. 5 Limitations of the Study

The main weakness of the study is that it did not undertake to collect enough observatory information. Given the manufacturing processes and activities which were being investigated can be observed and their presence or absence confirmed This study also focused on the firms in manufacturing sector in Kenya. The results are therefore confined to these firms and interpretation outside this sample must therefore be approached with care.

The study also based its analysis on primary data which were the views of the respondents. Despite the respondents having been selected credibly, the study notes that there was a weakness on relying on the viewpoints to give indicators of "size of the firm". The study notes that secondary data on turnover would have been more appropriate.

5.6 Suggestions for Further Research

The study suggests that a study should be undertaken in Kenya which apart from relying on the questionnaires and interview guides also invests in rigorous observatory and counterchecking process. This will help clear whether there are differences in patterns of adoption of QI practices across various sizes of the firms and whether such differences are statistically significant. This would help give a clearer picture on the extent of actual adoption and implementation of quality improvement practices. The study also suggests that such a study should also be undertaken to study the firms which were not covered in the current study's population.

The study suggests that a study should be undertaken to determine the correlation between financial performance and quality improvement practices. There is need for such a study to use secondary data.

Further studies can also look into how other factors such as nature of products, technology and skills and competencies relate to patterns of adoption quality improvement practices in manufacturing sector or other sectors.

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APPENDICES

Appendix I: Research Questionnaire

Part A: General information

1. Name of the firm: _____

2. What is your designation? _____

3. Kindly state your gender: Male   [ ]   Female   [ ]

4. Kindly state your age bracket? 20-30 years   [ ]   31-40 years   [ ]

    41-50 ears   [ ]   Over 50 years   [ ]

5. Which is your highest academic qualification?   Masters and above   [   ]

    Graduate   [   ]   A Level   [   ]

    O' Level   [   ]   Any other (Specify)

_____

6. How long have you been in the manufacturing industry?   0-5 Years   [ ]

        6-10 Years   [ ]   11-15 Years   [ ]

        16-20 Years   [ ]   Over 21 Years   [ ]

7. What is your length of time have you been in your current firm? 0-5 Years   [ ]

    6-10 Years   [ ]   11-15 Years   [ ]

    16-20 Years   [ ]   Over 21 Years   [ ]

8. What is the annual turnover of the firm: Up to Ksh 50 million   [ ]

    Ksh 51 million to Ksh 500 million   [ ]   Ksh 501 million to 1 billion   [ ]

        Ksh 1.1 billion to 5 billion   [ ]   Ksh 5.1 billion and above

[ ]

SECTION B: QUALITY IMPROVEMENT PRACTICES

9. a) Which quality management model has been adopted by your firm:

    Kaizen   Yes [ ] No [ ]   Lean Thinking   Yes [ ] No [ ]

    TQM   Yes [ ] No [ ]   Benchmarking   Yes [ ] No [

    BPR   Yes [ ] No [ ]   Six Sigma   Yes [ ] No [

    Others (Specify)

_____

  b) Describe briefly the most notable characteristics of the model (s)

_____

_____

_____

10. The following statements relate to the extent to which firms surveyed have adopted and integrated quality improvement practices. Rate the extent to which your firm has adopted the various stated quality improvement practises as per the given scale.

	Very Small Extent	Small Extent	Moderate Extent	Large Extent	Very Large Extent
TQM Practices					
The firm uses statistical process control to manage quality.					
The firm uses cause and effect diagrams to manage quality					
The firm uses plan-do-study-act cycles					
The firm uses process manuals to manage quality					
The firm uses operational manuals to manage quality					
The firm has adopted new operational processes					
The firm has adopted new quality processes					
The firm has made adjustment to its organisation culture					
Business Process Re-engineering					
The firm has had a fundamental redesign of its processes as part of its quality improvement strategy					
The firm used fundamental rethinking to redesign its processes					
The firm conducted a total management overhaul					
The firm conducted a total workforce overhaul					
The firm conducted a total processes overhaul					
Rapid Cycle Change					
The firm uses PDSA's to mange quality					
The firm conducts regular in depth reviews of its mission, processes and structures					
The firm has conducted an environmental scan					
Successful changes are replicated in other areas of the firm.					
The front line staff are involved in implementing quality proposals					
Lean Thinking					
The firm has conducted a customer satisfaction survey					
The firm has identified and modified or eliminated processes / laid off employees that do not create value to the customer.					

The firm has adopted 5S or CANDO approach reducing workplace friction and making it safer					
The firm has adopted changes in the processes to eliminate waste and costs.					
Benchmarking					
The firm conducts continuous analysis of strategies, functions, processes, products or services, performances					
The firm has identified local firm(s) which it has benchmarked its processes, operations, structures, and performance against					
The firm has identified international firm(s) which it has benchmarked its processes, operations, structures, and performance against					
Six Sigma					
The firm has implemented processes that aim to eliminate defects and reduce variation in processes.					
The firm uses statistical tools and analysis to identify root causes of variations					
The firm has put in place intensive technical training and coaching led by the "Champions"					
The firm uses Define Measure Analyse Improve Control (DMAIC) approach to identify the causes of defects and variations.					
The firm uses Statistical process control (SPC) to monitor /detect shifts in processes and analyse process stability and predictability					
The firm has adopted interventions to address variations					
The firm has been able to achieve a rate of only 3.4 defects per million					
Kaizen					
The firm holds regular brainstorming sessions where employees are allowed to suggest quality improvement initiatives					
The firm adopts suggestions from employees and tracks their implementation					
The firm rewards employees whose suggestions lead to quality improvements					

11. The following statements relate to adoption of QI adoption and the size of the firm?

	Strongly Disagree	Slightly Disagree	Neutral	Slightly Agree	Strongly Agree
Size of the firm dictates the financial resources to be allocated for QI					

Size of the firm dictates the human resources to be allocated for QI					
Size of the firm dictates QI model to be adopted					
Size of the firm determines the processes and systems that need to be changed					
Size of the firm determines the speed of QI adoption					

12. i) To what extent does the size of the firm determine the adoption of QI practices?

Very Little Extent   [ ]   Low Extent   [ ]   Moderate Extent   [ ]

High Extent   [ ]   Very High Extent   [ ]

ii) Describe

briefly_____

_____

___

SECTION C: CHALLENGES FACING IMPLEMENTATION OF QI PRACTICES

12. The following statements relate to the extent to which various challenges are encountered within firms that have adopted quality improvement practices. Rate the extent to which your firm has encountered the various challenges as per the given scale.

	Strongly Disagree	Slightly Disagree	Neutral	Slightly Agree	Strongly Agree
There is lack of commitment by management towards adoption of QI practices					
There is lack of commitment by employees towards adoption of QI practices					
The financial resources allocated to implement QI are inadequate					
Adoption of necessary technology is very costly					
The firm management has not invested enough in training and development despite adoption of latest technology					
There is manifest resistance to change among the employees					
There are few accessible local case studies where the firm can learn and adopt appropriate best practices					
Lack of necessary infrastructure for adoption of QI practises					

13. The following statements relate to challenges facing the adoption of QI adoption and the size of the firm?

	Strongly Disagree	Slightly Disagree	Neutral	Slightly Agree	Strongly Agree
Small firms do no have enough resources to enable adoption of QI					
Large firms have a huge opportunity cost in adoption of QI					
Large firms have a challenge in overhauling systems and processes					

Thank you for your input and cooperation