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# DEVELOPMENT OF KAIZEN SUSTAINABILITY MODEL IN MEDIUM MANUFACTURING ENTERPRISES (CASE STUDY: GURAGE ZONE ADMINSTRATIO

FERSHA, SOLOMON

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**BAHIR DAR UNIVERSITY**  
**BAHIR DAR INSTITUTE OF TECHNOLOGY, BIT**  
**FACULTY OF MECHANICAL AND INDUSTRIAL ENGINEERING**  
**INDUSTRIAL ENGINEERING PROGRAM**  
**(PRODUCTION ENGINEERING AND MANAGEMENT)**

**Development of Kaizen Sustainability Model in Medium**  
**Manufacturing Enterprises**  
**(Case Study: Gurage Zone Administration)**

**Master's Thesis**

**By**

**Solomon Fersha**

**May, 2018**  
**Bahirdar, Ethiopia**



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**DEVELOPMENT OF KAIZEN SUSTAINABILITY MODEL IN MEDIUM**  
**MANUFACTURING ENTERPRISES**  
**(CASE STUDY: GURAGE ZONE ADMINISTRATION)**

**By: - SOLOMON FERSHA**  
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A THESIS SUBMITTED TO BAHIRDAR INSTITUTE OF TECHNOLOGY IN PARTIAL  
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SCIENCE IN INDUSTRIAL ENGINEERING (PRODUCTION ENGINEERING AND  
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JUNE, 2018, BAHIRDAR, ETHIOPIA

### Declaration

The researcher here by declares that the thesis in the title: - Developing a Model for Sustainability of kaizen in medium manufacturing enterprises is his original work and that all sources that have been referred to and quoted have been appropriately indicated and acknowledged with complete references.

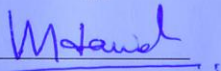
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**BahirDar Univesity**  
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**M.SC in Industrial Engineering**  
**(Production Engineering and Management)**

This is to certify that the thesis is prepared by Solomon Fersha, entitled: Development of Kaizen Sustainability Model in Medium manufacturing enterprises: the case of Gurage Zone Administration in partial fulfillment of the requirements for the Degree of Masters of science in industrial engineering (production engineering and management) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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## **ABSTRACT**

The purpose of this study is to develop kaizen sustainability model in medium manufacturing enterprises in the case of Gurage zone Administration. To achieve the purpose of the study, a survey design was employed. The participants of the study were 108 TVET trainers, 24 TVET leaders, 42 MME's operators, and 32 MME's experts. Out of 485 target population, a total of 206 respondents were included in the study. Except for TVET trainers, all the population was included in the study due to small size. From 350 trainers 108 were taken as sample respondents and randomly selected for the study. Data is collected from the primary sources, and secondary sources. The primary data were collected using semi-structured interviews, questionnaires, and observations. Secondary data were obtained from available documents at EKI, journal papers, international conference papers on kaizen and reports. Data was collected from 164 respondents through questionnaires and from 42 informants using semi-structured interviews, FGD and observations. The quantitative data were analyzed through descriptive statistics with SPSS Version 21. A correlation analysis between dependent and independent variables had been calculated to analyze the relationship between variables. A fish bone diagram was also used to analyze the root causes of non-value adding activities under eight generic headings and found that 23 root causes were associated with wastage mechanisms in MME's. The findings of the research showed that the kaizen implementation in MME's is basically limited to 5S implementation and it is only moderately implemented on average. In addition it was found that the successful implementation of the preceding S of the 5S activities results in the successful implementation of the succeeding S. In this regard, there had been factors distressing sustainability of kaizen which emanated from various sources, like gaps in knowledge and skill, short-termism, inadequate use of kaizen implementation tools, centralized decision making, individualism, absence of functional diversity in kaizen event team, poor use of VMT, absence of rewarding and recognition scheme were the main problems. To tackle these problems a kaizen sustainability model comprising eight interrelated steps has been developed. Therefore, stakeholders should consider those findings as good lessons and effectively address the identified factors affecting the sustainability of kaizen. Finally, it is recommended that to be effective the proposed model should be used.

**Key Words:** Kaizen, MME's, Sustainability, Model, CI

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## **LIST OF ABBREVIATIONS AND ACRONYMS**

AAI	Adequate Auditing and Inspection
APE	Active Participation of Employees
BPR	Business Process Reengineering
CR	Collective Responsibility
CI	Continuous Improvement
EKI	Ethiopian Kaizen Institute
FD	Functional Diversity
FGD	Focused Group Discussion
GRIPS	Graduate Institute for Policy Studies
JICA	Japanese International Cooperation Authority
JIT	Just In Time
JPC	Japanese Productivity Center
JUSE	Japanese Union of Scientists and Engineers
KPI	Key Performance Indicator
LUK	Level of Understanding about Kaizen
MMAK	Management Meetings about Kaizen
MME	Medium Manufacturing Enterprise
NVA	None Value Adding
PDCA	Plan_Do_Check_Act
PDM	Participation in Decision Making
PFU	Progress and Follow-up
PUT	Proper Use of Kaizen Implementation Tools
QC	Quality Control
QCC	Quality Control Circle

ohr	spearman correlation coefficient
RR	Reward and Recognition
SDCA	Study-Do-Check-Act
SGA	Small Group Activity
SKI	Skill about Kaizen Implementation
SME	Small Manufacturing Enterprise
SMF	Support Management Provides for Kaizen Event Team
TPM	Total productivity Maintenance
TPS	Toyota Production System
TQC	Total Quality control
TQM	Total Quality Management
TVET	Technical and Vocational Education and Training
UK	United Kingdom
VMT	Use of Visual Management tools
$\sigma$	Standard Deviation

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## **CHAPTER ONE**

### **INTRODUCTION AND BACKGROUND OF THE STUDY**

#### **1.1 Introduction**

Kaizen sustainability is maintaining the output of the kaizen event by making it a way of life or a habit. It is the most difficult and the most important part of CI where industries are required to establish standards on a continual basis and maintain those standards till the next improvement is initiated.

The Kaizen management is dedicated to the improvement of productivity, efficiency and quality (Thesseloniki, 2006). However as it is apparent from its name unless it is performed in an ongoing basis it is impossible to harvest a rewarding result in key performance indicators mentioned above by implementing kaizen event at some point in company's timeline. Rather, it needs a mind set of being continuous change present in every human being and work for betterment by using resources available within the firm.

In this regard, there is a misconception in that kaizen is taken as a one – shot activity which is leading to huge improvent of organization performance. But it is accumulation of small increamental changes involving every layer of employees regardless of their role in the organization on a continual and a sustainable basis. In fact, it stands on the viewpoint that is not necessary to look for explosive changes for improvement of the organizations, but any improvement will bring productivity enhancement if they are continuous and constant. In other words, if improvements are



sustainably taken they will bring a huge competitive advantage for manufacturing industries. Hence, the central concern in this study is to pave a way how kaizen could sustain (thrive) in MME's as continuous improvement tool.

## **1.2 Background of the Study**

Implementation of kaizen in Ethiopian manufacturing industries was driven by the strong dedication of the top leaders in the quest of driving out incompetence from the manufacturing environment (GRISP,2011). During the two-year period of JICA support on quality and productivity improvement (October 2009 to May 2011), pilot company projects were implemented, and their results have been disseminated and a national plan has been formulated to propagate kaizen activities for manufacturing companies. Then, kaizen has come to be known among policy makers and business managers in Ethiopia. Based on these achievements, the Ethiopian government has decided to establish a core organization responsible for quality and productivity improvement, Ethiopian Kaizen Institute (EKI).

As a result many manufacturing industries implemented kaizen as a continuous productivity and quality improvement tool despite the fact that they are unable to sustain the kaizen event outcome in the long run. In this view, many studies show that, the major obstacle for many organizations is to actually sustain or improve the results of Kaizen event after its wrapping up. Researchers like (Birhanu 2014, Admasu, 2015 and Sulyman 2017) identified different factors hindering sustainability of kaizen. From international perspective also (Laraia, et al., 1999) revealed organizations fail to maintain even 50% of kaizen event outcomes.

### **1.3 Statement of the Problem**

The ultimate objective of manufacturing industries is to increase productivity with high quality. At present, many manufacturing companies are facing problems such as high-quality rejection, high inventories, high lead time, high costs of production, and inability to meet the delivery date. By implementing and practicing the kaizen system such problems can be solved without employing high-tech and high-touch approaches but by involving all layers of people on the shop floor in Kaizen activities on a daily basis. Kaizen refers to continuous improvement in performance, cost, and quality. In this regard, significant numbers of medium manufacturing enterprises have implemented kaizen. However, sustaining kaizen is one of the critical concerns Ethiopia is facing. According to the study on quality and productivity improvement (kaizen), of the 28 manufacturing companies who participated in the pilot project for kaizen implementation only ten companies (36%) have high or good possibilities to become capable of continuously practicing kaizen with a result of realizing achievements that significantly excel other companies in terms of quality/productivity improvement (GRISP, 2011). Recent study also show that, three of the eleven (27%) Kaizen events studied were unable to sustain any of the changes that were implemented during the Kaizen event (Birhanu, 2014). It shows the difficulties enterprises face to sustain or improve upon the results of a Kaizen event after its implementation. Typically, in Gurage Zone Administration also there are about 30 medium manufacturing enterprises of which 13 MME's have implemented kaizen as a continuous improvement tool for quality and productivity. There are also 8 TVET colleges that are directly responsible for the implementation of kaizen in SME's and MME's. But based on observation it has been very difficult for those MME's operators to make a habit practicing kaizen as a continuous improvement tool.

In other words, they are unable to sustain kaizen. To overcome this critical problem the associated factors should be properly scrutinized and a better model should be developed. In response to this problem, this research is initiated so that wastes, defects and non-value adding activities can be easily identified and minimized on a continual basis.

#### **1.4 Research Questions**

To answer the aforesaid research problem, the following basic questions were asked.

1. What do social and technical factors affect the sustainability of kaizen in medium manufacturing enterprises?
2. How are small group activities (SGA's) related to sustainability of kaizen in medium manufacturing enterprises?
3. How could kaizen be better implemented to ensure its sustainability in medium manufacturing enterprises?

#### **1.5 Objective of the study**

##### **1.5.1 General Objective**

The main objective of this research is investigating factors impeding sustainability of kaizen in Ethiopian Medium Manufacturing Enterprises in the pursuit of development of kaizen sustainability model.

##### **1.5.2 Specific Objectives**

- ▶ To investigate the extent to which 5S activities are implemented in MME's in the case area
- ▶ To examine the role of small group activities in sustaining kaizen.

- ▶ To explore the social and technical system that affects the sustainability of Kaizen.
- ▶ To study success factors of industries from international arena to be used as a benchmark to develop kaizen sustainability model in Ethiopian MME's context.

## **1.6 The significance of the Study**

The findings of the study will have the following contributions:

- ▶ It can become a baseline for further investigation for other researchers that focus on the sustainability of kaizen. And it will contribute a little to fill the gap of research in this area.
- ▶ The practical importance of the research will have great value to manufacturing industries for their cost cut; shorten lead time, increase productivity and quality of products.
- ▶ The study can make an imperative contribution for policymakers or strategy developers of related sectors, in the charge of identifying the challenges to sustain kaizen in manufacturing industries, and provides a clear picture to include those pragmatic results in the future policy or strategy.

## **1.7 The scope of the Study**

In Ethiopia, there are a large number of manufacturing enterprises practicing kaizen as a continuous improvement tool. The way they approach CI process varies depending on their level. The scope of this research is to trace factors that affect CI process in MME's in case of Gurage Zone Administration in the pursuit of developing a model to better implement it.

## 1.8 Limitations of the Study

In conducting this research there were some limitations. The first limitation is spatially the study is confined to MMEs in Gurage Zone administration. Purposive sampling, a kind of non-probability sampling is used for the study. Hence generalization should be done carefully. The cost and time constraints were other limitations. In spite of these, an earnest effort made to carry out this research study to bring out useful recommendations.

The proposed model is the result of empirical study in Ethiopian medium manufacturing industries in specified case industries. It is best applicable in Ethiopian manufacturing environment. For application elsewhere it could be modified accordingly.

## 1.9 Operational Definitions of Key Terms

More than one definition may be provided to a single concept, this leads to lack of clarities to the meaning of specific words (Corbin and Strauss, 2008). Hence, operational definitions have been provided for the following terms. This is done with intent to make the application of operational terms clear.

- ▶ **Manufacturing:** - means a mechanical, physical, or chemical conversion of a raw material, substance, or component by using a machine, equipment or labor into products that worth better value.
- ▶ **Medium Manufacturing Industry:-** means an industry having a total capital, excluding building, from Birr 1,500,001 to Birr 20,000,000 (One Million Five Hundred Thousand One Birr to twenty Million Birr) in the manufacturing sector and engages from 31 to 100 workers including the owner, his family members and other employees.(source: Federal Negarit Gazeta No 40 15<sup>th</sup> Feb, 2016, pp,8824.)

- ▶ **Factors** - Obstacles that could affect the sustainability of Kaizen implementation.
- ▶ **Kaizen:** Kaizen refers to, continuous improvement involving everyone in the organization from top management, middle managers, supervisors, and workers (Imai, 1986).
- ▶ **Kaizen event:** means a rapid improvement, is a focused activity on a particular process or activity. The basic concept is to identify and quickly remove waste.

### **1.10 Organization of the Study**

This paper is structured into five chapters. Chapter one mainly focuses on an introduction to the study including the background of the study, statement of the problem, objectives of the study, significant of the study, scope of the study, limitations of the study, an operational definition of key terms, and organization of the study. Chapter two encompasses a review of the related literature regarding Kaizen. The third chapter describes the research design and methodology, target population and sampling, sample size calculation, data collection instruments, methods of data analysis. The fourth chapter presents both quantitative and qualitative data, their analysis, findings, interpretation and kaizen sustainability model /frame work/ (solution). To end with, Chapter five puts conclusions and recommendations.

## **CHAPTER TWO**

### **REVIEW OF RELATED LITERATURE**

#### **2.1 Conceptual Overview of the kaizen philosophy**

In the decade of 1980, management techniques focusing on employee involvement, and empowerment through teamwork approach and interactive communications and on improving job design were not new, but Japanese companies seemed to implement such techniques much more effectively than others. The business lesson of the 1980's was that Japanese firms, in their quest for global competitiveness, demonstrated a greater commitment to the philosophy of continuous improvement than Western companies did. For such a philosophy the Japanese used the term Kaizen. The Kaizen methods are internationally acknowledged as methods of continuous improvement, through small steps of the economical increments' of companies (Thessaloniki, 2006).

In the literature that mentions kaizen is often emphasized small group activity such as quality circles and/or suggestions made by individual workers. In TPS (Ohno, 1978), which explains kaizen methods are used to increase the productivity and product quality. Suzaki (1987) explains that Kaizen is a philosophy widely practiced in a belief that, there is no end to make a process better. Each small improvement consists of many levels of development. Mainly used for improving manufacturing processes.

Teian (1992) describes that Kaizen is much more than just a means of improvement since it speaks to the day to day obstacles happening in the work environment and the way in which these obstacles are succeeding. Kaizen can be applied to where on a need of improvement.

Deniels (1995) describes that the best approach to accomplish principal change on the shop floor is to empower operators to create their own particular measures, to adjust business procedures and to utilize them to drive their Kaizen exercises. The author clarifies that operators are the specialists and once they understand that they are the one, who is going to tackle the obstacles, and afterward everything they need is some direction.

Womack and Jones (1996) refer to Kaizen as a lean thinking and lay out a systematic approach to help organizations systematically to reduce waste. They describe waste as any human activity that absorbs resources but creates or adds no value to the process. Most employees could identify Muda in their workplace, but unfortunately, the waste that they identify is only the tip of the iceberg. The authors state that until these employees have been taught the essentials of lean thinking, they are unable to perceive the waste actually present in their environment.

The Kaizen philosophy according to Imai assumes that our way of life, be it our working life, our social life, or our home life-deserves to be constantly improved. The message of the Kaizen strategy is that not a day should go by without some kind of improvement being made somewhere in the company (Imai, 1986).

It is a philosophy of never being satisfied with what was accomplished last week or last year (Barnes, 1996). The fundamental nature of Kaizen is that the people that perform a certain task are the most knowledgeable about that task; consequently, by involving them and showing confidence in their capabilities, ownership of the



process is raised to its highest level, (Kobayashi, 1990). In addition, the team effort encourages innovation and change and, by involving all layers of employees, the imaginary organizational walls disappear to make room for productivity improvements.

The premise of a Kaizen workshop is to make people's jobs easier by taking them apart, studying them, and making improvements. The message is extended to everyone in the organization, and thus everyone is a contributor (Cheser, R.).

Also, Kaizen constituent are According to James Womack in his book "The Machine That Changed the World" (1991), with Kaizen, the job of improvement is never finished and the status quo is always challenged.

According to Thessaloniki (2006) Kaizen generates process-oriented thinking, is people-oriented, and is directed at people's efforts. Rather than identifying employees as the problem, Kaizen emphasizes that the process is the target and employees can provide improvements by understanding how their jobs fit into the process and changing it. Improvement has become an integral part of theories and models of change, such as Structure theory (Pettigrew, 1990).

Imai (1986) introduced kaizen into the Western world when outlined its core values and principles in relation to other concepts and the practices involving the improvement process in organizations (Berger, 1997). As kaizen implies change and becomes good, after engagement in kaizen, therefore, is expected to go beyond one's contracted role(s) to continually identify and develop new or improved processes to achieve outcomes that contribute to better realization of organizational goals (Newitt, 1996). Kaizen can be understood as having a spirit of improvement founded on a spirit of cooperation of the people, suggesting the importance of teams as a fundamental design in this approach (Imai, 1997). Based on the available past

literature, the kaizen methodology can be summarized as (1) a continuous undertaking that involves all the employees of the firm; (2) improving the methods or processes of work; (3) improvement are small and incremental in their nature, and (4) using teams as the vehicle for achieving these incremental changes (Birhanu, 2014)

According to (Thessaloniki, 2006) Kaizen involves setting standards and then continually improving those standards. To hold up the higher standards, Kaizen also involves providing training, provision of materials and supervision that is needed for employees to achieve higher standards and maintain their ability to meet those standards on an on-going basis.

Thessaloniki asserts, the companies that undertake a Kaizen philosophy place an emphasis on the processes - on the 'how' of achieving the required results

**Table 2.1 differences between a conventional and a process-emphasis approach.**  
(Source: Thessaloniki, 2006)

<b>Conventional approach</b>	<b>Process-emphasis approach</b>
Employees are the problem	The process is the problem
Doing my job	Helping to get things done
Understanding my job	Knowing how my job fits in the process
Measuring individuals	Measuring performance
Change the person	Change the process
Correct errors	Reduce variation
Who made the error?	What allowed tile error to occur?

## **2.2 Benefit of kaizen**

Hyland et al. (2004) highlight the major potential benefits of CI (Continuous Improvement). These benefits are increased business performance (in terms of reduced waste, setup time, breakdowns, and lead time) and increased-people

performance ‘in the form of improved development, empowerment, participation, and quality of work life of employees; all of which address contemporary societal needs.

The benefits of Kaizen include the participation of all collaborators in improving and transforming (evolving) the organization in small, every-day, incremental steps that do not lose effectiveness over time. Implementing kaizen, according to EKI (2012), is believed to have benefits. These include: Improves profit, Improves customer satisfaction, discovers hidden talents, promotes self-development, improves the motivation and morale of employees at each level, enhances communication between top to bottom level, helps to build and improve teamwork, creates ownership and trust within each other, reducing waste, proper use of time by making proper layout of the machinery and the set up of the entire enterprise property, engages and empowers employees at all levels, and improves the overall work environment.

### **2.3 Pillars of kaizen**

According to Imai (1986), kaizen management philosophies and practices, the three pillars of kaizen are summarized as follows: 1) 5Ss, 2) waste elimination and 3) standardization and he stated, the management and employees must work together to fulfill the requirements for each category. He also noted that, to ensure success on activities on those three pillars three factors have also to be taken into consideration. Those are Visual management, the role of the supervisor, and the importance of training and creating a learning organization.

### 2.3.1 The 5s Activities

As Schonberger (1996), housekeeping is a process of managing the workplace, known as "Gemba" in Japanese, for improvement purposes.

Other writers like Foss (2004) citation, 5s is a philosophy and checklist for good housekeeping to achieve greater order, efficiency, and discipline in the workplace.

Benefits of applying 5s in any organization, to the employees advised by Imai (1997) are:- Creates cleanliness, sanitary, pleasant, and safe working environments; it refresh workplace "Gemba" and greatly improves employee morale and motivation; it eliminates various kinds of waste by minimizing the need to search for tools, making the operators' jobs easier, reducing physically exhausting work, and freeing up space; it creates a sense of belongingness and love for the place of work for the employees.

The author also asserts that, it needs everyone to maintain 5S guidelines. To maintain discipline, we need to practice and repeat until it becomes a way of life.

According to Helena Cierna (2016) 5S is the corner stone for implementing other, more advanced, methods. The method does not require any advanced management techniques. We deal with five Japanese words:

Seiri - *Sort*: - The first step of 5S is to differentiate between what you need and what you don't. What is essential and what is not. To do that effectively, you need to eliminate unneeded materials, tools or equipment from the work place.

Seiton - *Set in Order*:- Once sorting has taken place, efficient storage methods must be enacted so that items are easy to locate and use, as well as put away (Hough, 2008). The logic behind this stage is that everything that is needed to do a job should be placed where it can be easily accessed (Howell, 2009).

In process industry, this can reduce the downtime of the machines because changeovers become faster (Howell, 2009).

It is having the right tools in clear line of sight near to the workplace where they are required creates more efficient movement of people as well as materials (Howell, 2009).

Drawing current and future-state maps is a good way to identify material position and plan on how things can be re-arranged to make the movement more effective and efficient /help continuous flow/ (Cooper *et al.*, 2007).

A commonly recommended way to execute this phase of the 5S process is (Bullington, 2003):

1. Labeling equipment and storage locations clearly so that all employees can identify them
2. Drawing borders that can distinguish different work areas
3. Drawing lines around specific equipment and highlight the traffic and transportation lanes
4. Identifying safety hazard issues and arrange items so that possible negative effects are countered

Seiso – *Shine* :- This phase assumes that everything unneeded is thrown away or disposed and all the tools now available are organized for efficient use (Howell, 2009). Shining activities mean thoroughly clean up clutter, fix things and involves checking and inspection of everything. Some 5S projects put more emphasis on cleaning, and in the process useful information can be lost in the sweeping. Thus it is imperative that the cleaning process is done not by an outside contractor but by the team members who are focused on interpreting information that the cleaning process is generating. (Hough, 2008)

This phase not only provides a clean work environment for working but many times broken pipes or damaged wires are found and this helps to fix safety hazards (Hough, 2008).

Seiketsu – Standardize: - It is important that gains made by the first three phases are not lost by allowing the procedures from breaking down (Howell, 2008). This can be used to reinforce procedures or practices that will be key in driving improvements in the future.

Some of the points that can help better the standardized process (Cooper *et al.*, 2007) could be listed as:

1. Write down the procedures for the first three phases and make them part of the daily routine
2. Use visual aids and visual management tools (shadow boards, labeled shelving, tagged bins etc.,) as much as possible.
3. Schedule 5S activities as often as possible
4. Consider an official 5S agreement that outlines expectations, roles and responsibilities before starting the implementation of the program.

Shitsuke – *Sustain*: - Most studies (Bullington, 2003, Cooper *et al.*, 2007; Hough, 2008; Howell, 2009) identify the fifth phase as the most difficult phase to be executed in the process. It is important not to go back to the comfort of old methods of doing things (Hough, 2008). The root cause of this problem is that changing long-standing practices and behaviors can be difficult. It involves making 5S philosophy as the way of life in an organization (Howell, 2009).

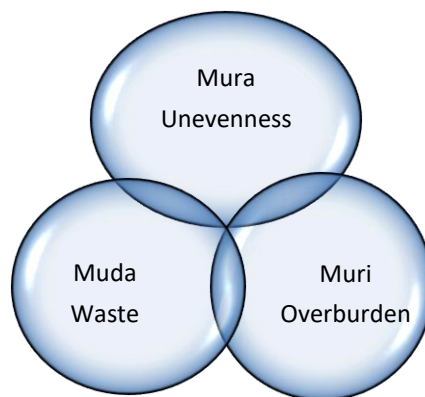
The culture of the organization is a very big factor that dictates how this phase turns out for an organization (Cooper *et al.*, 2007). It takes a very committed effort to keep 5S alive.

### 2.3.2 The 3M's of Waste

According to Thessoliniki, Muda is non-value added activities; all the wasteful activities in making the final product that lengthen the lead times, such as extra movement to get parts or tools, excess inventory, or any type of waiting etc.

**Muri:** Overburdening People or equipment; this means pushing people and machines beyond their natural limits. Overburdening causes safety and quality problems and in machinery, it causes breakdowns and defects.

**Mura:** Unevenness; this means unevenness due to irregular production schedule or fluctuating production volumes due to internal problems, such as downtime or missing parts or defects. Muda will be a result of Mura (Thessoliniki, 2006). Eliminating Muda is only one-third of achieving continuous flow, but to achieve complete flow, eliminating Muri and smoothing Mura are equally important.



**Figure 2.1 the Three M's of wastes in Japanese terms**  
(Source: Thessoliniki., 2006)

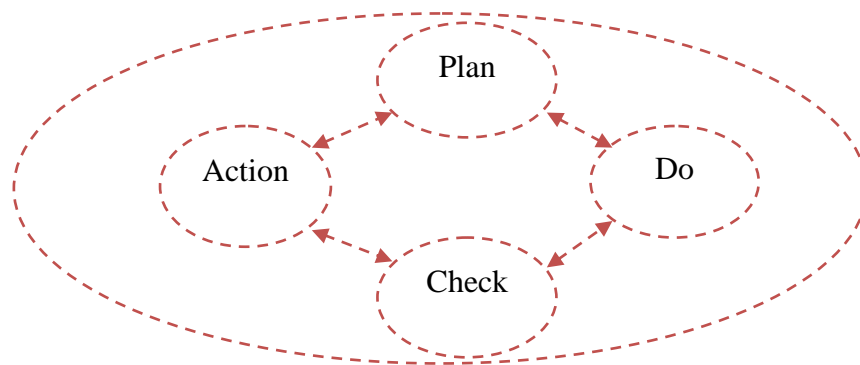
As Karen Martin and Mike Osterling (2007) stated that, the main eight types of waste in the working area, especially in manufacturing plants, are: -overproduction, excess inventory, waiting, transporting, defect-making, unnecessary motion, excess processing and under utilization of people

### 2.3.3 Standardization

Kaizen is distinctive in its focus on small improvements of work standards as a result of an ongoing effort. Furthermore, Imai (1986) said: "There can be no improvement where there are no standards."

According to Kilian (1992), standards are set by management, but they must be able to change when the environment changes. The author also mentioned companies can achieve dramatic improvement by reviewing the standards periodically, collecting and analyzing data on defects, and encouraging teams to conduct problem-solving activities.

Then employees will review the standards and either corrects the deviation or advice management on changing and improving the standard. It is a never-ending process and is better explained and presented by the PDCA cycle (plan-do-check-act), known as Deming cycle (Kilian, 1992). As shown in the diagram below:



**Figure 2.2 the Deming cycle**  
(Source: Watson., 1986)

Watson (1986) said that the origin of Plan-Do-Check-Act (PDCA) cycle or Deming cycle can be traced back to the eminent statistics expert Shewhart in the 1920s. Shewhart introduced the concept of PDCA. The Total Quality Management (TQM) guru Deming modified the Shewhart cycle as Plan, Do, Study and Act. The



Deming cycle is a continuous quality improvement model consisting of a logical sequence of these four repetitive steps for Continuous Improvement (CI) and learning.

## **2.4 Kaizen Application and Implementation**

Kaizen implementation is not once in a month or once in a year activity. It is continuous improvement. Imai (1997) expressed that the rate of the worker participation in terms of providing an important suggestion for their organization and Japanese companies, (such as Toyota and Canon, a total of 60 to 70 suggestions per employee per year are written down, shared and implemented). In most cases, these are not ideas for major changes. Many scholars in the field believe that there are certain minimal conditions which have to be met for successful implementation of kaizen. This includes, a conducive political framework, harmonious social relations, compassionate and sympathetic attitude, and capacity to take individual, as well as collective responsibility, and ability to work collectively or high social capital (Ohno et al 2009).

## **2.5 Roles of Management and Employees in Implementing Kaizen**

Management has two major functions in kaizen (i) Create a conducive environment and encourages continuous improvement (technological, managerial and operative) and establishes standards; (ii) maintaining the standards established; as we go from the bottom, the improvement function increases and the top and middle management have a greater role in it. Similarly, as we come down from the top, the supervisors and workers have a greater role in maintenance function (Imai 1986).

Top Management: They work to establish kaizen as a corporate policy, and (a) to work out strategies for implementation of kaizen management philosophy in the

Company; (b) to allocate resources, extend, provide support and guidance (c) establish clear policies on kaizen and provide cross-functional management goals for achieving kaizen; (d) Evolve systems and procedures and organizational structures for promotion of kaizen (Imai, 1986).

Middle Management: (a) Deploying and implementing Kaizen goals directed by top management. Use kaizen in cross-functional management activities; (b) Improving (kaizen) in functional capacity; (c.) Maintaining and upgrading existing standards through improvements; (d.) Providing assistance to workers to develop skills and acquire knowledge on problem-solving tools.

Supervisors: (a) Follow Kaizen in the functional role (b) Sustain high morale of workers; keep continuous communication links; assist in kaizen. (c) Involve in and support SGA like QC circles and also suggestion system. (d) Provide assistance and involve workers in kaizen activities (Imai, 1986).

Workers (a) through small group activities and suggestion system involve in kaizen. (b) Be disciplined to follow standards. Think of kaizen in day to day activities. (c) Concentrate on self-development continuously and increase capabilities for problem-solving.

Top Management	Innovation
Middle Management	Kaizen
Supervisors	Maintenance
Workers	
Innovation	Drastic improvement in current process
Kaizen	Small continuous improvement in current process
Maintenance	Activities directed to maintaining current technological, managerial and operating standards

Figure 2.3 kaizen and role of management: source Imai (1997)

The model shown in figure 2.3 indicates that top management introduces Kaizen as a corporate strategy; middle management uses Kaizen practices in improving functional capabilities and helps employees develop proper skills for problem solving. Supervisors improve communication with the workers, formulate plans for Kaizen and provide guidance to workers. Workers engage in Kaizen through small group and team activities and practice the tools for continuous improvement.

## **2.6 The System, Technique, and Implementation of Kaizen Family**

When an organization/company want to maintain a level of quality that satisfies their customers at the appropriate time and price then that organization must follow some quality management techniques to fulfill those principles and planning. According to Imai (1986) the techniques associated with Kaizen include, total quality control (TQC)/TQM, JIT, total productivity maintenance (TPM), five's" (5s), Benchmarking, skill gap analysis, six sigma, Policy Deployment, a Suggestion System, Small-group activity, etc.

Under Organizational performance and effectiveness also it has, TQM/Kaizen, Six Sigma and BPR are the meager ones according to (Mullins, 2010). These are generally expressed in terms of a way of life for an organization as a whole, committed in total customer satisfaction through a continuous process of improvement or an application of radical change, and the contribution and involvement of people.

### **2.6.1 The 5s work Place Organization**

The term "Five S" is derived from the first letters of Japanese words referred to five practices leading to a clean and manageable work area: seiri, seiton ,seiso

,seiketsu and shitsuke . The English words equivalents of the 5S's are sorting, Set in order, Shine, Standardization and sustain. Imai (1986) advised that 5s implementation means applying the following activities in the workshop:

### **2.6.2 The Suggestion System**

According to (Birhanu, 2014) the suggestion system functions as an integral part of individual-oriented kaizen and emphasizes the morale- boosting benefits of positive employee participation. Japanese managers see its primary role as that of sparking employee interest in kaizen by encouraging them to provide any suggestions, no matter how small. Japanese employees are often encouraged to discuss their suggestions verbally with supervisors and put them into action right away, even before submitting suggestion forms. They do not expect to reap great economic benefits from each suggestion. Developing kaizen -minded and self-disciplined employees is the primary goal. This outlook contrasts sharply with that of Western management's emphasis on the economic benefits and financial incentives of suggestion systems.

### **2.6.3 Small-Group Activities**

Wickens (1990) describes the contribution of teamwork to make the concept of Kaizen. The key role and authority of each supervisor as a leader of his team have been described by taking an example of Nissan Motor Plant in the UK. Emphasis is placed on teamwork, flexibility, and quality. Teamwork and commitment do not come from involving the representatives of employees, but from direct contact and communication between the individual and his boss.

Newitt (1996) has given a new insight into the old thinking. The author has suggested the key factors to determine the business process management

requirements. The author also has stated that Kaizen philosophy in the business process management will liberate the thinking of both management and employees at all levels and will provide the climate in which creativity and value addition can flourish.

Williams (2001) highlighted that CI (Continuous Improvement) techniques are the recognized way of making a significant reduction in production costs. Doolen et al (2003) describe the variables that are used to measure the impact of Kaizen activities on human resource. These variables include attitude toward Kaizen events, skills gained from event participation, understanding the need for Kaizen, the impact of these events on an employee, the impact of these events on the work area, and the overall impression of the relative successfulness of these events.

## **2.7 Obstacles to Kaizen Implementation**

The Japanese concept of kaizen, or continuous improvement, has been long lauded as a success. However, according to different literatures for instance (Murata, K., Katayama, H., 2010; Murata, K., Katayama, H., 2009; Birhanu T, 2014, and Sulyman J, 2017) there are several obstacles in organizations when implementing kaizen. Firstly, kaizen is seen as a short-term project. The emphasis here is on long-term improvement. The main problem here is that often companies expect a quick turn around and visibility in Key Performance Indicators (KPIs) within a year, and when it doesn't appear, write kaizen off as a failure. Secondly, kaizen can only succeed in places where there is a true desire to improve (overemphasis on tying kaizen to KPIs). While it is important to tie kaizen to KPIs, overemphasis on it would ignore the fact that improvements are often incremental, not revolutionary. Kaizen is like a snowball rolling down a gently sloping hill – it gathers momentum and

increases in size as it comes down. The improvements gradually accumulate over time, as processes are perfected and methodologies tweaked. Thirdly, lack of commitment is only one of several common reasons why kaizen implementation fails (implementing kaizen in a heavily bureaucratic organization). Kaizen will never succeed in an organization bogged down by a bureaucratic mindset, filled with rules and procedures with people who would resist any sort of change. Fourthly, kaizen will never work if people do not implement its full suite of tools and concepts, with sufficient training given to take advantage of them (training on kaizen isn't provided). Fifthly, kaizen implementation will fail where management does not support kaizen initiatives. The importance of support cannot be overemphasized. It is essential that management isn't just fully on board but essential that they want to fully embrace the long-term commitment of kaizen to the organization. They need to pass on their enthusiasm and demonstrate that even they are continually looking for new and better ways of doing things.

To conclude, kaizen is about everyone improving everything, not just a group doing all the work. Kaizen is all about making things better in the long run and improving profits and processes. It is a strategy that needs to be implemented now, for the future.

## **2.8 Continuous and Process Improvement Sustainability**

There is limited research on Kaizen sustainability; this section reviews publications that discuss sustainability with respect to different process and continuous improvement methods. To address the sustainability of continuous improvement, Kaye and Anderson (1999) reviewed relevant literature and conducted

semi-structured interviews. Their research resulted in a model that highlights the ten essential criteria of continuous improvement.

Relatively recently, Readman and Bessant (2007) assessed the results of the United Kingdom's (UK) continuous improvement survey that was administered to 1000 UK firms. A part of the survey inquired about enabling improvement activities that served to encourage or reinforce the continuous improvement behaviors and routines.

Anand (2009), identified infrastructure decision areas that are important for continuous improvement initiatives through the creation of a framework of continuous improvement, as a dynamic capability, when it includes a comprehensive organizational context.

To address the sustainability of various process improvement activities, Dale et al. (1997) identified key TQM sustainability issues through qualitative research and reference to relevant theoretical literature.

Keating (1999) worked with research partners to address general process improvement program sustainability. System dynamics modeling analysis explained both internal dynamics and external interactions that appear to influence the sustainability of process improvement activities.

## 2.9 Kaizen sustainability Models Proposed by Others (Bench Marks)

The researcher investigated models proposed by others to be used as a benchmark for the development. The table below shows the models proposed by others and their corresponding shortcomings in achieving kaizen sustainability.

**Table 2.2 models proposed by others**

Author's name	Type of model	Shortcomings
Imai (1986)	▶ Proposed kaizen implementation model which shows role of all layers of employees from top management to front line workers in kaizen initiatives.	▶ It didn't show the procedure in which kaizen could be implemented and sustained it only puts work division.
Slobodan (2011)	▶ Presented 9 sets of principles as a kaizen implementation guideline	▶ Asserts principles, but it didn't show how this principles are integrated to assure kaizen implementation then sustainability.
Upton (1996)	▶ Focuses on accelerating performance improvement, maintaining consistent long-term objectives, and choosing periodic projects based on organizational ability	▶ It didn't show any frame work (guide line) how this principles could be implemented.
Tujuba (2016)	▶ Asserts a four phase implementation strategy (current state mapping, revise policy, modify organizational culture and implementation of selected tools).	▶ It didn't address the sustainability issue any longer.



## **2.10 Research Gap**

The review of literature reveals that there is acute shortage of research studies on this topic in general and Ethiopian Medium Manufacturing units in particular.

Based on the researcher's investigation, few author's namely Sulyman (2016), Birhanu (2015), and Admasu (2015) carried out their studies focusing on challenges and prospects of kaizen implementation, factors affecting sustainability of kaizen and transferability of the Japanese continuous improvement system respectively.

However, no studies have been carried out on development of kaizen sustainability model in Ethiopian medium manufacturing enterprise's. To fill this research gap, the presented study entitled 'Development of Kaizen Sustainability Model in Medium Manufacturing Enterprises' has been undertaken.

## **CHAPTER THREE**

### **RESEARCH DESIGN AND METHODOLOGY**

#### **3.1 Research Methodology**

The method of the research study emerges out of the nature of the problem and the purpose of the study (Kothari, 2001). The very focal point of this study is to make a detailed investigation of challenges to sustain Kaizen in MME's in the case of Gurage Zone Administration. It is a continuous improvement process that is affected by different factors. As a result, the study will focus on basic factors that determine the successful implementation and the sustainability of kaizen in MME's.

To achieve the purpose of the research, descriptive research design has been employed because such type of research helps the state of affair as it exists at present and report what happened or what is happening and finally discover the cause. According to Ayalew (1999), descriptive research design makes the objective description of the status of a phenomenon at a particular time without value judgment and with no effort to describe what underlies to happen that way. Investigation of kaizen practice (facts) using descriptive research method allows the description of the present application status of kaizen. Best and Kahn (2002) on their part have noted that the relevance of this method for such a purpose.

On the other hand, so as to get the intended objectives of the study both qualitative and quantitative research approaches have been used because using one of

the approaches independently in the study does not bring the intended results of the research. Moreover, according to Creswell (2003) each of the paradigms, which is quantitative and qualitative methodology have their own limitation.

As a result, one can benefit much from using the methodologies in a mixed way. A mixed investigational design is used in an effort to describe the current practices of kaizen implementation in depth as well (Fraenkel a Norman, 1932).

A quantitative method has been used to show the practical application of kaizen implementation, successes, challenge and future emphasis. A structured interview has been employed as the qualitative method to obtain information from the participants to use such information for inference.

Qualitative research is regarded as providing rich data about real-life people and situations and being more able to make sense of behavior and to understand behavior within its wider context (De Vaus, 2002).

Hence, the researcher used the methodology in a mixed manner in order to cross-validate the findings obtained by each of the methods. Both quantitative and qualitative data will be collected at the same time but quantitative carries more weight than qualitative.

### **3.2 Sources of Data**

This research used both primary and secondary data collected through questionnaires, observations, interview and FGD with MME's operators at shopfloor level.

### **3.2.1 Primary Sources of Data**

Primary data were collected from TVET leaders, TVET trainers, manufacturing enterprise experts, and MME's operators. The total number of TVET colleges in Gurage zone administration is 8 but according to the data obtained from trade and industry department, it is only in two town administrations namely wolkite and Butajira where medium manufacturing enterprises which implement kaizen exists. The target population of the study consists of trainers and leaders of both wolkite poly Technique College and Butajira TVET college, members of MME's which implement kaizen in both towns, manufacturing enterprises experts of both towns and Gurage zone administration had been considered as a population to the study.

### **3.2.2 Secondary Sources of Data**

Secondary sources were reports, proceedings, and documents of kaizen which are used to enrich the data obtained from a primary source. Secondary information has also been gathered from library books, journals, related thesis and online searches about issues related to the practices of kaizen and challenges to sustain kaizen and to establish a conceptual and theoretical background of the study in the quest of developing a kaizen sustainability model (framework).

### **3.3 Target Population**

In this study, the target populations were members of operators of all MME's (45) that implement kaizen, in Gurage Zone Administration. Wolkite poly technique and Butajira TVET college trainers and leaders (whose population size was 350) were the target population since they are responsible for kaizen implementation. In

addition, manufacturing experts of wolkite town and Butajira town administration, and Gurage zone administration which have 36 members were also part of the population.

### **3.4 Method of Data Collection and Sampling Technique**

Three independent questionnaires were designed for trainers, MME'S operators, TVET leaders, and manufacturing experts accordingly. During the course of field visits, the questionnaires were modified to MME's operators' condition. The questioners were prepared and piloted before data collection in order to include all the necessary information. The formal survey was made with randomly selected trainers. The population size had been taken as the sample size for respondents other than trainers. Enumerators, who know the local language and have acquaintance with the culture of the local people were selected, trained and employed for the data collection.

An important decision that has to be taken while adopting a sampling technique is about the size of the sample. Appropriate sample size depends on various factors relating to the subject under investigation like the time aspect, the cost aspect, the degree of accuracy desired, etc (Rangaswamy, 1995). As sample size increases, the sampling distribution of the mean decreases in variability (the standard error decreases) and become more like the normal distribution in shape, even where the population distribution is not normal.

A sampling procedure was applied to draw the required number of sample units for the study. First, all medium manufacturing enterprise operators were purposively selected due to their small number. Secondly, out of 350 TVET trainers in Gurage zone administration 108 trainers were selected randomly. TVET leaders and manufacturing experts were also selected as census data. The determination of

sample size is resolved by means of Yamance (1993) sample formula with 90 percent confidence level.

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

- ▶ n = sample size for the research
- ▶ N = Population size
- ▶ E = margin of error at 10%

Hence, for TVET trainers,  $n = \frac{350}{1+350(0.08)^2} = 108$

**Table 3.1 Sample Respondents of the study**

N <sup>o</sup>	Respondent	Population	Sample		Method of data collection
			N <sup>o</sup>	%	
1	TVET Trainer's	380	108	31%	Questionnaire
2	TVET leaders	24	24	100%	Questionnaire and interview
3	MME's operators	45	42	93%	Observation checklist and interview
4	MME's experts	36	32	89%	Questionnaire
Total		485	206	44%	

### 3.5 Data Collecting Instruments

The study had employed both qualitative and quantitative research approach to investigate the extent to which kaizen is applied in MME's and the associated factors affecting its' sustainability. Data collection has been carried out using tools like a questionnaire to collect quantitative data and, interview to collect qualitative data. Direct personal observations involved in visiting of kaizen events in MME'S by using observation checklist to get real-time data. Since members of MME'S and enterprises

development officers were few in number in comparison to TVET trainers the total population is used as sample size. Furthermore, there had been events for FGD with MME's operators in their respective workshop. Instruments were constructed based on the extensive review of the literature and the objectives of the research.

### **3.5.1 Questionnaire**

A questionnaire is preferential research instrument because it enables the researcher to secure data from the sample respondents at a time and for its natural characteristics that allow them to express their ideas and opinions freely.

Combination of a close and open-ended questionnaire was administered to 108 trainers, 24 TVET leaders, 32 manufacturing enterprises experts, and 42 MME's operators. Open-ended questions in the questionnaire were included to give chance to respondents to forward their additional opinions. Of course, it has been used for inference, rather than analysis. The questionnaire designed is given in Appendix (A).

### **3.5.2 Interview**

The interview method of collecting data involves a presentation of oral-verbal stimuli and reply in terms of oral-verbal responses. This method can be used through personal interviews and, if possible, through telephone interviews. (Kothari, 2001)

For the purpose of this study, a semi-structured interview has been conducted by using a list of specific questions to be discussed and was administered to 42 MME'S Operators and 24 TVET leaders. The semi-structured interview helps to offer respondents to advance their additional outlook than a structured interview. Moreover, it helps to gather information with a facial gesture of respondents. In this regard, Kothari, (2001) stated that: Interview, in general, is very flexible and can be used to collect large amounts of information. Trained interviewers can hold the respondent's attention and are available to clarify difficult questions. They can guide interviews,

explore issues, and probe as the situation requires. A personal interview can be used in any of questionnaire and can be conducted fairly quickly. Interviewers can also show actual products, advertisements, packages and observe and record their reactions and behavior. Thus, the researcher conducted in-depth interview with MME's operators to collect data regarding the extent to which 5S activities are implemented on the shop floor. The interview checklist is given in appendix (C)

### **3.5.3 Observation**

This method implies the collection of information by way of investigator's own observation, without interviewing the respondents. The information obtained relates to what is currently happening and is not complicated by either the past behavior or future intentions or attitudes of respondents. This method is no doubt an expensive method and the information provided by this method is also very limited. As such this method is not suitable for inquiries where large samples are concerned (Kothari, 2001). An observation was conducted to gather data to test out how sustainability activities such as SGA, 5's' activities, waste elimination activities and social and technical characteristics practiced in MME'S. The data gathered through observation thematically analyzed and substantiated with the data collected through questionnaires. The observation checklist is given in appendix (D)

## **2.6 Pilot Study**

After the questionnaire was constructed, the researcher pilot it by taking at least two from each sample type such as TVET trainers, MME's operators, MME's experts, and TVET leaders. This means that the research instrument has been tested to see whether or not it obtained the objectives the researcher required.



First of all, the researcher asked those people who had not been involved in its construction to read it through and to see if there were any unclear ideas which remained overlooked. Once this has been done, amended the questions in view of that, and then sent out a number of questionnaires to the types of people who would be taking part in the main survey. The researcher had to make sure they knew it was a pilot test and asked them to forward any comments they may have about the length, structure, and wording of the questionnaire. Based on the feedback generated from the pre-test and pilot study, the researcher went through each response very carefully, noted comments and looked at the answers to the questions. Finally, the researcher altered the questionnaire again accordingly.

### **3.7 Reliability**

When selecting scales to include in a study it's important that they are reliable. One of the main issues is concerned with the scales internal consistency. This refers to the degree to which the items that make up the scale 'hang together'. One of the most commonly used indicators of internal consistency is Cronbach's alpha coefficient. It refers to the believability of the researcher's findings i.e. all types of activities that the researcher has done in designing, carrying out and reporting the research results to make them credible. For the purpose of measuring the internal consistency of the scales, Cronbach's alpha coefficient of correlation was used.

Therefore, those scaled items in the questionnaire were found to be reliable and valid because the Cronbach's alpha coefficient correlation was calculated to be .887 which is higher than .70. One can conclude that those Likert Scales which are developed and designed to measure the outlook of those respondents, particularly TVET trainers, MME's operators, MME's experts and TVET leaders towards the sustainability of kaizen in MME'S in the case area.

Generally, those items which are included in the questionnaire to measure different aspects of the respondents regarding kaizen sustainability do have internal consistency, reliability, and valid standards. Thus, those itemized Likert Scales could be used as reliable and valid scales.

### **3.8 Procedures for Data Collection**

In order to obtain data pertaining to the issues under investigation, different instruments have been used to collect both primary and secondary data from the respective sources. Thus, the researcher developed the instruments to measure what factors do affect the sustainability of kaizen activity by involving TVET trainers, manufacturing enterprise experts, MME'S operators, and TVET leaders. Accordingly, the following data collection instruments were employed: interview guide to conduct semi-structured interviews, a questionnaire to undertake survey, observation checklist to conduct observations and reviewing proceedings of industries prepared by EKI, and other published and unpublished written materials as secondary sources of data.

Persistent observations during the visits of the MME's using fishbone diagram were used which provided a general and comprehensive understanding how each problem causes a corresponding effect on the sustainability of kaizen.

The questionnaire was constructed to answer what exactly was needed for this study. It has also been decided on how to use the questionnaire - self-administered or interviewer-administered (i. e. interview schedule). Here, the wording and the structure of the questions; length and ordering of questions; the beginning of questions with easy questions which respondents would enjoy answering, and thus encouraging them to continue filling in the responses of the items in the questionnaire; and grouping the questions into specific topics as this made it easier to understand and follow.

In the questionnaire, a total of 31 items on socio-demographic characteristics of the respondents, attitude towards the implementation of kaizen, factors affecting the sustainability of kaizen, effect of small group activities on implementation of kaizen, constraints, and suggestions were included in the questionnaire. The items of the questionnaire were closed- and open-ended questions which were constructed in English.

A total of 223 questionnaires were distributed to those sampled respondents. Out of those questionnaires distributed, about three (3) questionnaires were lost and two (2) were not filled properly. Finally, the researcher managed to collect data from 108 sample respondents. Likewise, 32 manufacturing enterprise experts, 42 MME's operators and 24 TVET leaders responded to the questioner. Generally, the response rate of the questionnaire was calculated to be 97 % which allowed further data analysis.

Information on the kaizen sustaining activities in the MME's best obtained through observations. It was believed to apply a structured observation checklist to conduct the observations and the researcher observes 10 MME's shop floor activities such as shop layout, cleaning schedule, SGA, post-event characteristics, kaizen implementation plan and social and technical characteristics.

### **3.9 Methods of Data Analysis**

As mentioned above the researcher has used both qualitative and quantitative research. So the collected data were analyzed in different ways. The analysis had been made separately on the raw data obtained numerically and in words. Thus, raw data obtained through questionnaire was checked, classified, arranged and organized

in tables, diagrams, graphs based on their characteristics or variables and the analysis was made.

The questionnaires were also coded statistically. The coded data from the questionnaires entered into the computer and the analysis was carried out according to the basic questions of the study. For scaled types of questionnaire, descriptive statistics in the form of mean, average mean, standard deviation and frequency percentage were presented to illustrate the level of agreement of the respondents with their implications for the organization. The responses of the respondents for different variables were measured on a five-point Likert scale with 1= strongly disagree, 2= disagree, 3 = undecided, 4= agree and 5= strongly agree /1 = not implemented at all, 2 = only a little implemented, 3 = moderately implemented, 4 = sufficiently implemented, 5 = excessively implemented/. However, while making interpretation of the results of mean the scales were reassigned as follows to make the interpretation easy and clear. Used formula adapted from Tujuba citation (2016),  $(N-1)/N = (5-1)/5 = 4/5 = 0.8$ . It means items, which fall between the ranges of 4.20 - 5.00, are considered as Strongly Agree, 3.40 - 4.19 are considered as Agree, 2.60 - 3.39 are considered as Undecided, 1.80 - 2.59 are considered as Disagree, 1.00 - 1.79 are considered as strongly disagree, (Asedesach, 2014) .In order to analyze the data, the researcher used IBM SPSS Statistics Version 21 and MS-Excel software packages.

For qualitative data, that was collected through interview and observation has been analyzed as the research progresses, continually refining and reorganizing in light of the emerging themes and produced as an interview summary form as soon as possible after each interview has taken place. This might be a series of written answers on the semi-structured interview or field notes or memos written by the researcher. Among different types of qualitative data analysis methods such as

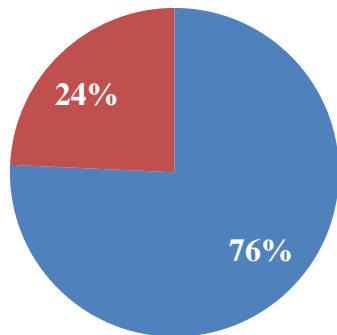
thematic analysis, comparative analysis, and content analysis. The researcher preferred thematic analysis method because this type of analysis could be used for open-ended questions which have been added to questionnaires or structured interview and enables the researcher to quantify the answers easily. Finally, these data have been analyzed using table value and the results will be summarized using percentage.

## **CHAPTER FOUR**

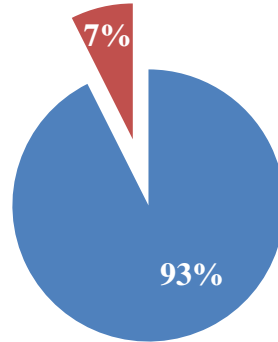
### **RESULTS AND DISCUSSION**

This part deals with the presentation, analysis, and interpretation of the data collected through questionnaire, interview, and observation. In order to get the relevant information about the outcomes and factors affecting the sustainability of kaizen implementation, the data were gathered from TVET trainers, TVET leaders, MME's operators, and MME's experts. The quantitative and qualitative data were collected and analyzed using descriptive statistics and thematic analysis techniques, respectively. Inferential statistics were employed to interpret the result. This chapter presents the analysis of both quantitative and qualitative data gathered through various means. The first section is on demographic characteristics of the respondents. Section two is data analysis and interpretation, which examine the extent to which kaizen is implemented in MME's and the associated factors affecting its sustainability. It also discusses the outlook of stakeholders about the need for kaizen implementation. Next, the summarization of those major results of the quantitative data analysis, and the findings of the qualitative data analysis in the research were presented. Finally, a framework (model) used to address the factors affecting the sustainability of kaizen implementation was presented.

## 4.1. Demographic Information of the Respondents

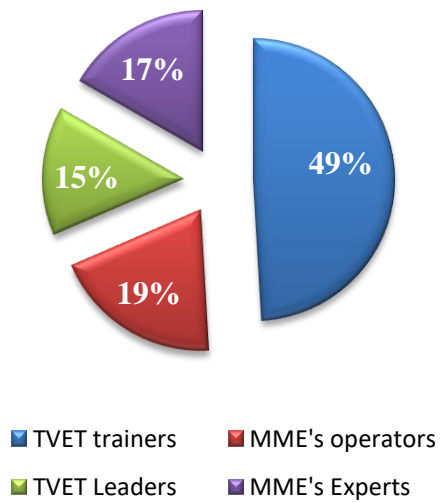


■ Male ■ Female

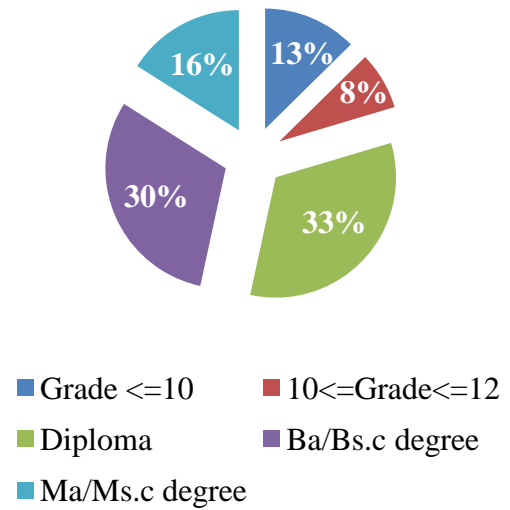


■ Trained ■ Untrained

Fig. 4.1 Distribution of respondents by gender    Fig. 4.2 proportion of trained vs. untrained



■ TVET trainers    ■ MME's operators  
 ■ TVET Leaders    ■ MME's Experts

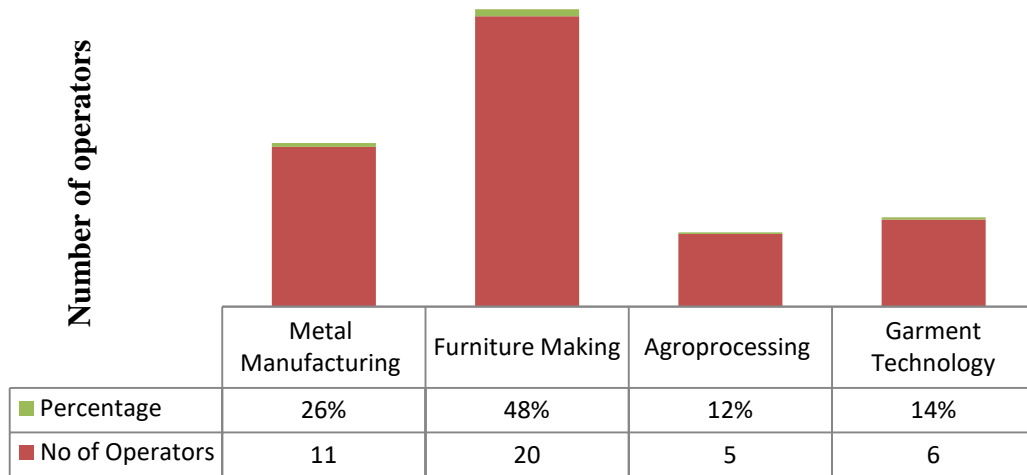


■ Grade <=10    ■ 10<=Grade<=12  
 ■ Diploma    ■ Ba/Bs.c degree  
 ■ Ma/Ms.c degree

Fig 4.3 Distribution of respondents by work

Fig 4.4 Academic background of respondents

Composition of MME's operators by sector



**Figure 4.5 Distribution of MME's operators by sector**

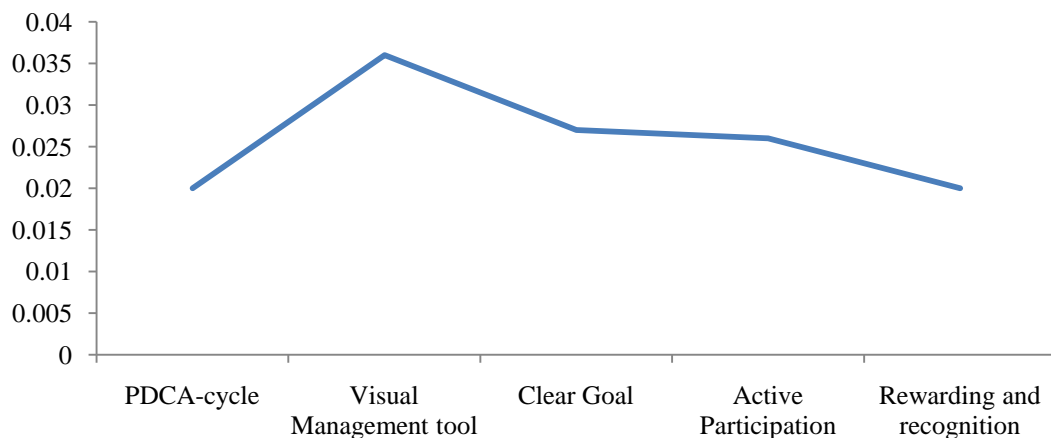
The diagrams shown above indicate the demographic characteristics of the respondents. As shown in figure 4.1 a total of 150 (76%) of the respondents were males and 50 (24%) were females. The majority of the respondents were males. Although efforts were made to encourage female by the government, the data shows less contribution of female workers in MME's. Here it's apparent that females are fewer participants; and it has its own impact to enhance the existing low level of technology in manufacturing sectors, which involves much more physical work. This implies possible means need to be sought and put in place for appropriate technology utilization which enables a better female participation. On the other hand from figure 4.2, the majority of the respondents, 192 (93%) were found to be trained, while the remaining, 14 (7%) were untrained. Thus, the majority of the stakeholders who are implementing and sustaining the kaizen strategy have got short-term training. The respondents agreed that the pieces of training were concerned with only a few topics like kaizen overview and 5S implementation. It is advisable to provide periodic and



demand-driven skill gap training on a continual basis till MME's operators graduate from government support on kaizen implementation.

The sign before the value of the correlation coefficient determines the direction of relationship between the variables and the size of the value determines the strength of relationship between the two variables, the correlation is small, medium, and large if  $r=0.1$  to  $0.29$ ,  $r=0.3$  to  $0.49$ ,  $0.5$  to  $1$  respectively (Julie Pallant, 2016).

From the diagram shown in figure 4.6, there is a positive correlation between training vs. kaizen sustainability indicators in such a way that for all the indicators there is a moderate positive correlation. Hence it shows that training is indispensable for kaizen sustainability.

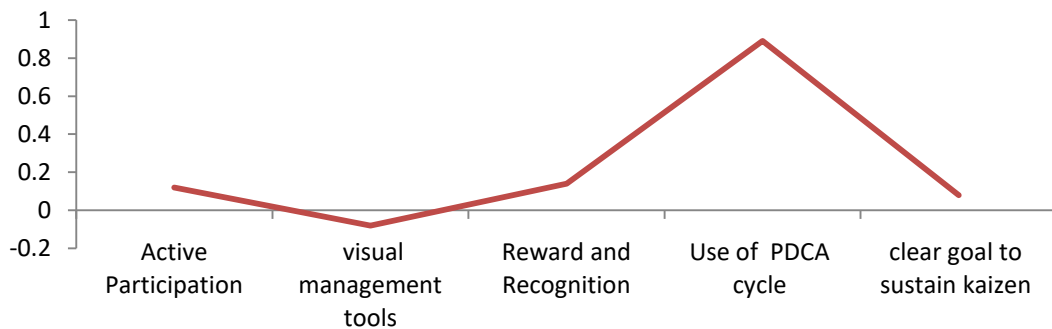


**Figure 4.6 the correlations between training and kaizen sustainability indicators.**

Regarding their educational status, a significant proportion of the respondents, 42 (21%) were below grade 12, 68 (33%) were diploma, 63 (30%) were first degree, and 33 (16%) were second degree holders. The diagram shown below represents the correlation between the level of education and kaizen sustainability indicators.

From the diagram shown in figure 4.7 there is a positive correlation between the level of education and kaizen sustainability indicators except for one item which is negatively correlated with the level of education. So there is a need to upgrade the

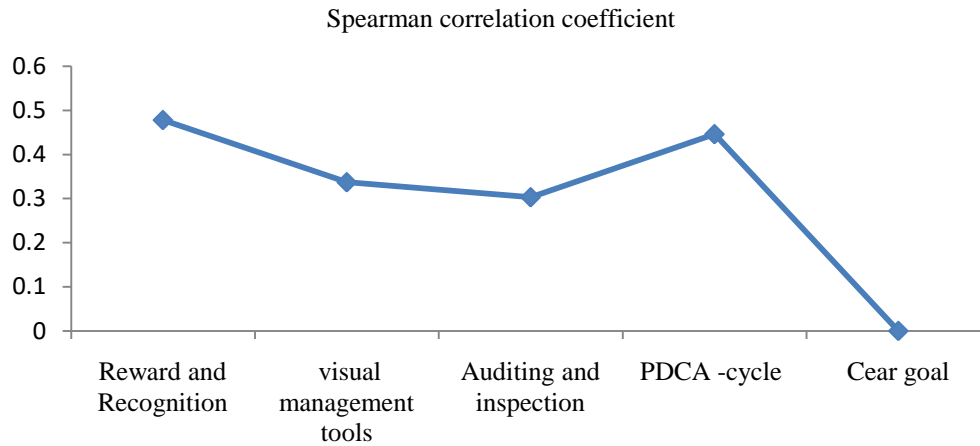
educational status of MME's operators to cope up with the advanced techniques of kaizen implementation in the long run.



**Figure 4.7 the correlations between level of education and kaizen sustainability indicators.**

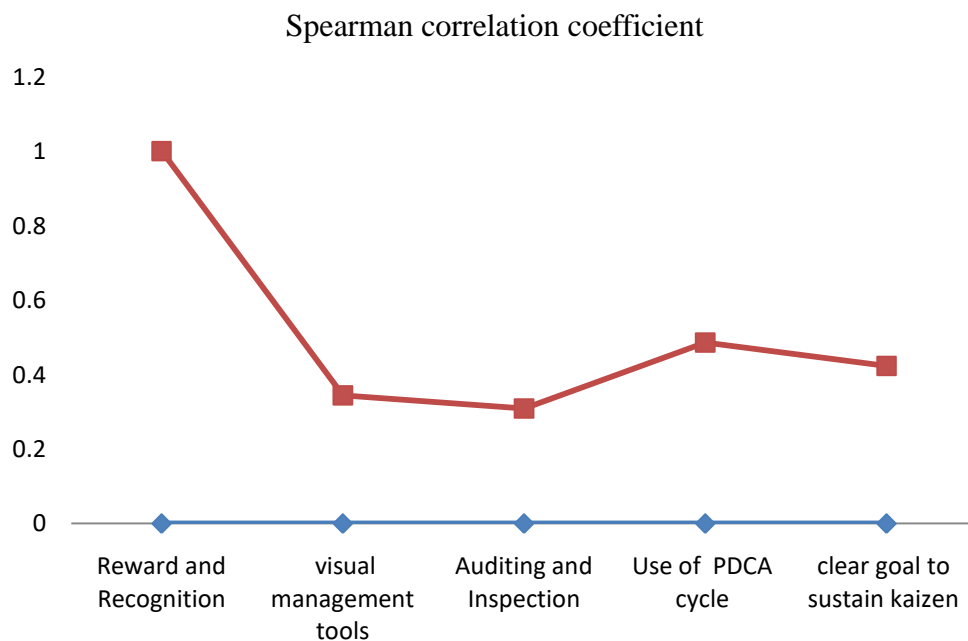
From the diagram shown in figure 4.8 there is a moderate positive correlation between top management conviction and kaizen sustainability indicators except for one item that is only slightly positively correlated. Hence to be effective in sustaining kaizen top management should take the lead to create conducive environment in which all employees actively can take part. In the literature review part also it had been thoroughly discussed that continuous improvement can only thrive where there is a top management commitment and conviction. It had been also noticed that it is the role of top management to introduce kaizen as a continuous improvement tool and to establish standard operating condition.

Hence, to be successful in kaizen sustainability it is mandatory to be sure whether the top management of MME's is convinced about the need for CI or not.

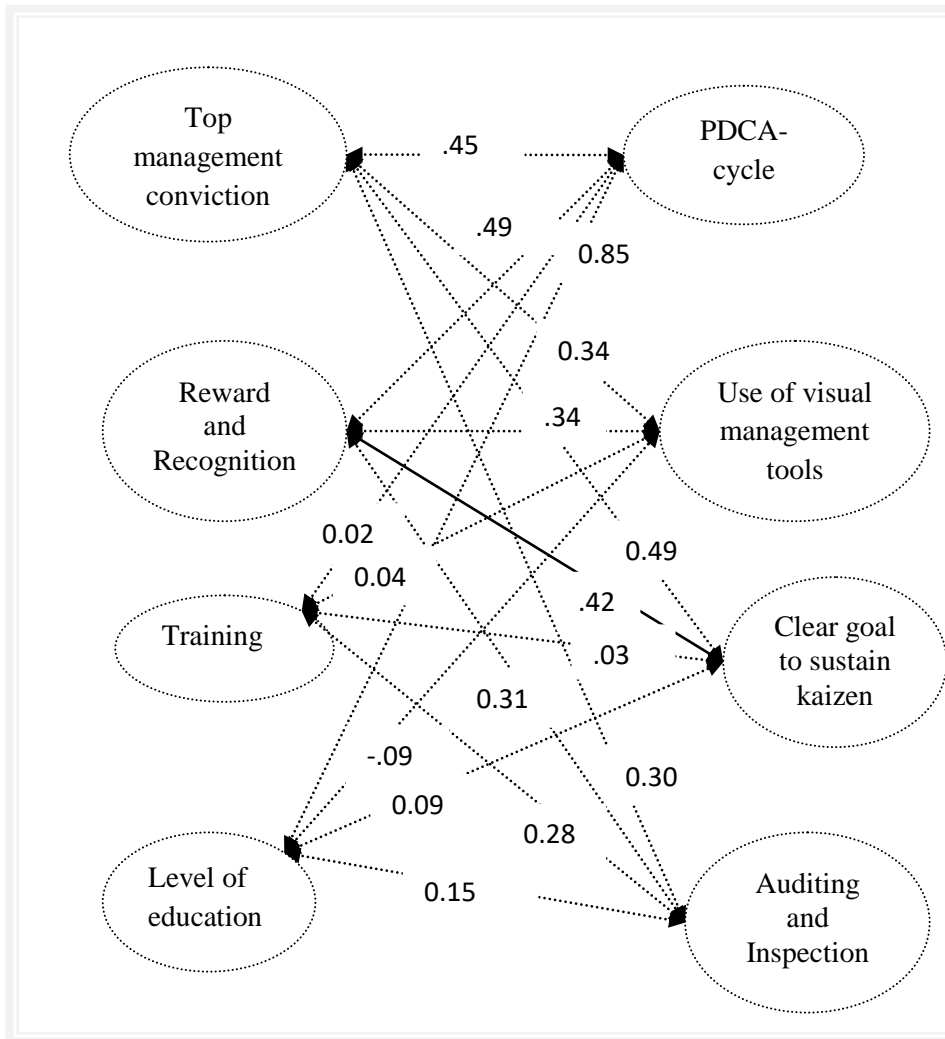


**Figure 4.8 the correlations between top management conviction and kaizen sustainability indicators.**

The diagram shown in figure 4.9 indicates that there is a moderate positive correlation between reward and recognition vs. kaizen sustainability indicators. From this as MME's incorporate a rewarding and recognition scheme there is a higher possibility of sustaining the kaizen event outcomes. Hence MME's should incorporate rewarding and recognition scheme as part of kaizen sustainability initiatives.

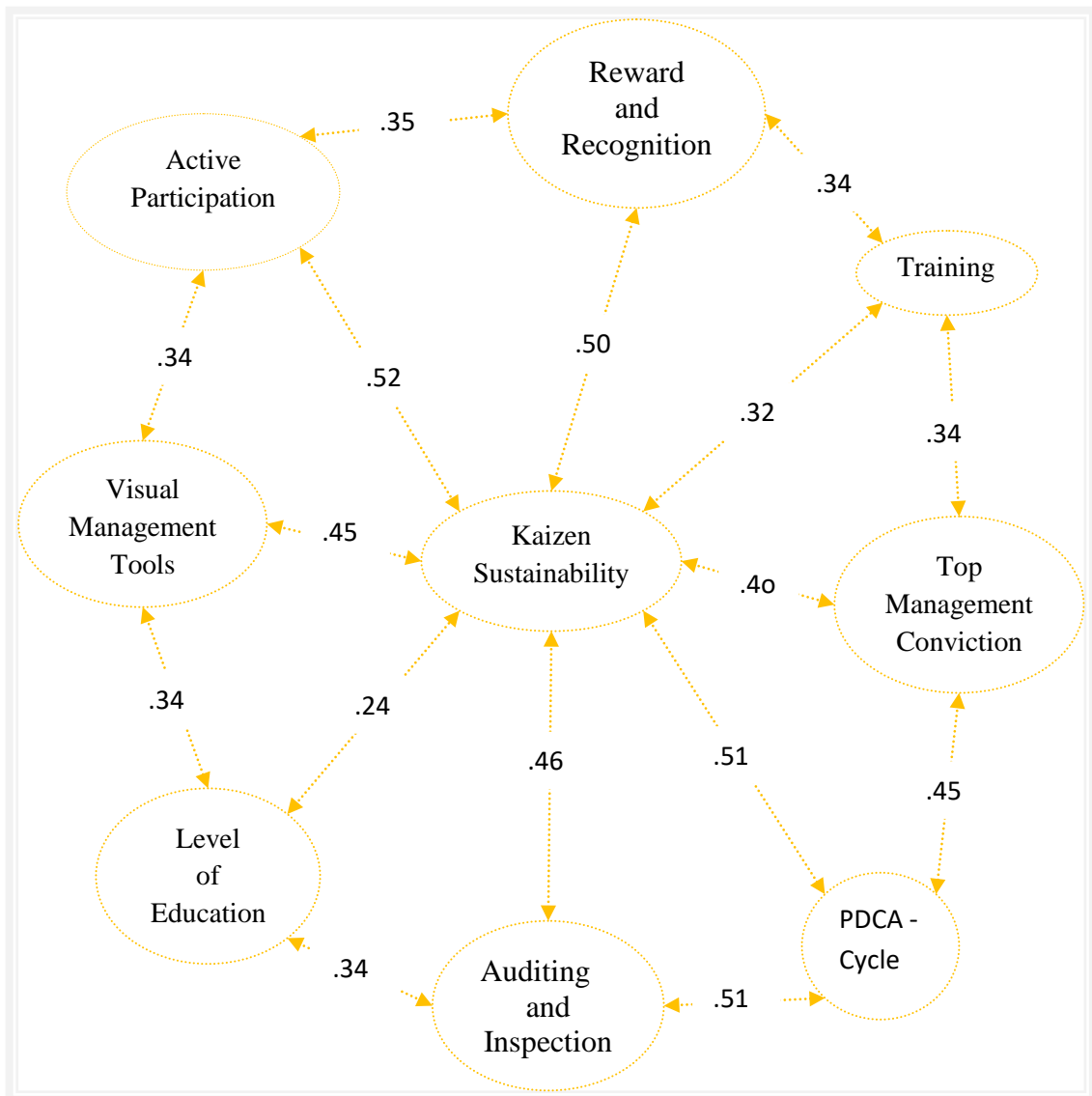


**Figure 4.9 the correlations between reward and recognition Vs. Kaizen sustainability indicators.**



**Figure 4.10 the correlations between different variables vs. kaizen sustainability indicators**

The diagram shown in figure 4.10 represents the correlation between different independent variables and kaizen sustainability indicators. From the diagram it is apparent that there is a positive correlation and for most of the variables vs. kaizen sustainability indicators except for level of education vs. use visual management tools which are slightly negatively correlated.



**Figure 4:11 a model of the correlation between different variables vs. kaizen sustainability**

From the diagram shown in figure 4:11 there is a strong positive correlation between active participation of employees, rewarding recognition scheme, and use of PDCA-cycle vs. kaizen sustainability. There is a moderate correlation between provision of training, visual management tool, auditing and inspection, and top management conviction vs. kaizen sustainability. Further there is a slight but still a positive correlation between levels of education vs. kaizen sustainability.

## **4.2 The extent of 5S implementation practices in MME's**

The 5S principle in kaizen is a style of managing a workplace with the intention of improving efficiency, eliminating waste and increasing process consistency. It derives its name from the use of five Japanese words beginning with the letter S as the cornerstones of this philosophy.

As shown in the review of related literature, sustainability of kaizen is linked with implementation phase. Sustaining is the end result of how well we have performed the four S's (Sort, Set in order, shine and Standardize). At this stage, think of ways to make a habit of maintaining what has already been achieved and searching for a new standard for improvement. It is by far the most difficult part of housekeeping activities which needs making a custom to properly maintain the new processes.

In this regard, MME's operators were requested to give their views about maintaining the housekeeping activity as a way of life at a workplace (Gemba). The interview guide was developed based on the 5 points Likert scale by choosing one among alternatives ranging from Excessively done (5) to Not done (1). In-depth interview on the issue of 5S implementation was carried out with operators of MME's while carrying out their daily duties in their workshop.

According to the respondents' view and the observation made by the researcher by transect walk across the shop floor the mean average for Sorting was 3.47 that indicated the first 'S' was sufficiently implemented. Moreover, the average mean was calculated for set-in-order, shine, and standardize and their value was obtained to be 3.25, 3.03, and 2.65 respectively, which implies the middle 3'S's were applied moderately.

Finally, the average mean value for the last 'S' is found to be 2.37, meaning that only little sustaining activities were implemented. Tables from 4.1 - 4.5 show the 5S activities rating based on a five-point Likert scale.

**Table 4.1 the extent of implementation of sorting activities**  
Source: Appendix (E)

Indicators	Mean	$\sigma$
The shop floor is free of unnecessary things	3.48	.6
Cupboards, shelves, tables, etc. are free of unwanted items.	3.50	.6
Items are stored according to a frequency of use (there is a place for everything and everything is in its place)	3.36	.5
Walls are free of old posters, calendars, pictures, notices etc.	3.50	.6
There is a general disorder free appearance in the work area	3.50	.7
Average Mean	3.47	

**Table 4.2 the extent of implementation of set-in-order activities**  
Source: Survey data derived from appendix (E)

Indicators	Mean	$\sigma$
Direction indicators available for all facilities	3.33	.7
All items, tools & equipment have identification labels	3.36	.6
All rooms, cubicles and similar areas are clearly numbered	3.38	.6
Specific areas are demarcated for garbage/rejects/wastes	3.26	.7
Switches, fan regulators, controls, etc. are labeled	3.24	.7
All cables, wires, pipes etc. are neat and straight	3.26	.7
color coding is used effectively for easy identification	3.12	.7
There is a general appearance of orderliness	3.19	.7
It is easy to find any item without delay	3.17	.7
Average Mean	3.25	

**Table 4.3 the extent of implementation of for shine**  
**Source: Survey data derived from appendix (E)**

Indicators	Mean	$\sigma$
Cleaning schedules are existing and visibly shown	3.00	.6
Floors, walls, windows, doors etc. maintained at a high level of cleanliness	3.10	.7
Use of adequate cleaning tools is apparent	3.07	.7
Machines, pieces of equipment, tools, etc. are maintained clean and their maintenance schedules displayed	3.07	.7
There is a general appearance of cleanliness all round	2.86	.7
Average mean	3.02	

**Table 4.4 the extent of implementation of standardization**  
**Source: Survey data derived from appendix (E)**

Indicators	Mean	$\sigma$
The previous 3S procedures are standardized	2.71	.7
Standard checklists are used to regularly scrutinize 5S	2.67	.6
Aisles/gangways have a standard dimension and color	2.55	.7
Pipes, cables etc. are color coded	2.67	.8
Average mean	2.65	



**Table 4.5 extent of implementation of Sustain**  
**Source: Survey data derived from appendix (E)**

Indicator	Mean	$\sigma$
There is a system for how and when the 5S activities will be implemented	2.60	.6
There is the support for a 5S program by recognition, resources, and leadership	2.40	.7
There is a habit of practicing the first 3S on a daily basis	2.29	.8
Employees participate in 5S activities by their own initiatives	2.31	.8
5S posters and 5S points of work reminders are displayed	2.26	.8
Average mean	2.372	

From the above tabular values, the application of 5S activities in MME's was not sustainably implemented. The average mean value of the respondents view in 5S implementation showed that only the first 'S' was sufficiently implemented, the middle 3'S's were moderately implemented and the last 'S' was only a little implemented. Even though, 5'S' activities are kaizen implementation tool for particularly the starter industries from the result of this study it's observed that MME's in the case area were not able to master techniques of 5'S' implementation. Hence, it is perceptible that there is an opportunity for improvement. The diagram below shows the summary of the extent to which 5'S' activities are implemented in MME's.

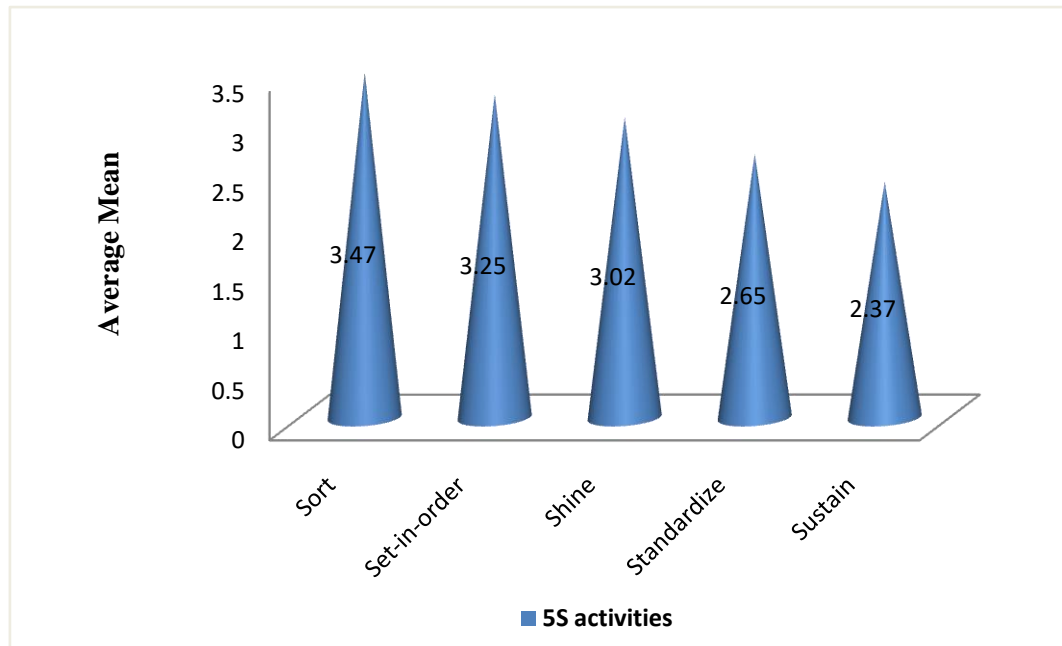


Figure 4.12 the extent of 5S implementation in MME's

### 4.3 Role of small group activities (SGA's)

Small group activities could be any kind of team activities in order to improve business process, give solutions to problems, or do proactively. The most known small groups are quality circles with characteristics as developed in Japan and then transferred elsewhere. Respondents were asked concerning the presence of diversity in functional expertise in kaizen event team and 6% strongly disagreed, 25% disagreed, 35% undecided, 23% agreed and 10% strongly agreed. The mean for the respondents' view for this item was found to be 2.84 based on the 5 points Likert scale. From this, it is difficult to judge that there is a diversity of functional expertise, which is vital for the kaizen event team, since different problems may practically be faced in the workplace.

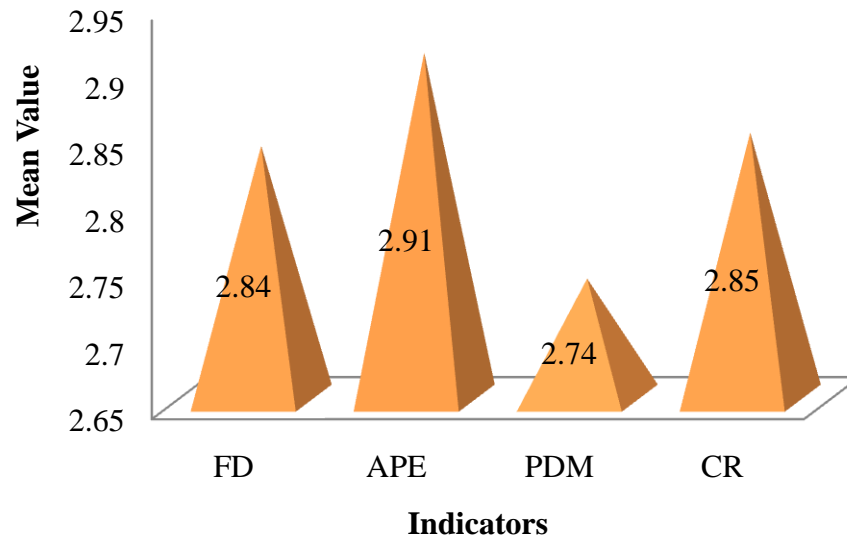
Concerning active participation of MME's operators in kaizen event, 8% strongly disagreed, 31% disagreed, 33% undecided, 18% agreed, and 10% strongly agreed. The mean for the respondents view in this case is 2.91 based on the 5 points Likert scale. Furthermore, according to the observation of the researcher during

kaizen implementation in MME's, the operators tend to be reluctant rather than being committed to lending hands to the success of problem-solving activities. In other words, they expect everything to be accomplished by TVET trainers. However, according to (Slobodan, 2011) Kaizen is a system that involves every employee - from upper management to the cleaning crew. Everyone is encouraged to come up with small improvement suggestions on a regular basis. In addition, Deniels (1995) describes that the best approach to accomplish principal change on the shop floor is to empower operators to create their own particular measures, to adjust business procedures and to utilize them to drive their Kaizen exercises. Hence it is advisable for MME's operators' to participate in problem-solving during kaizen implementation.

Respondents were asked about the extent to which operators participate in decision making and 14% strongly disagreed, 35% disagreed, 28% undecided, 20% agreed and only 3% strongly agreed. The mean score for this item is found to be 2.74 based on the Likert scale, which shows there is no active participation of employees in decision making. However, it is briefly discussed in the literature review part that a kaizen is mostly a bottom-up approach in which employees participate in decision making through different means like suggestion system and braining storming session of QCC for problem-solving.

Further, the respondents view regarding collective responsibility in the work area was found to be 9% strongly disagreed, 32% disagreed, 28% undecided, 27% agreed and 4% strongly agreed. The mean is obtained to be 2.85 which indicate that it is difficult to conclude there is a collective responsibility in work areas of MME's.

## Role of SGA's



**Figure 4.13 the role of Small group activities**

Key: FD-functional diversity, the APE-active participation of employees, PDM-participation in decision making, CR - collective responsibility.

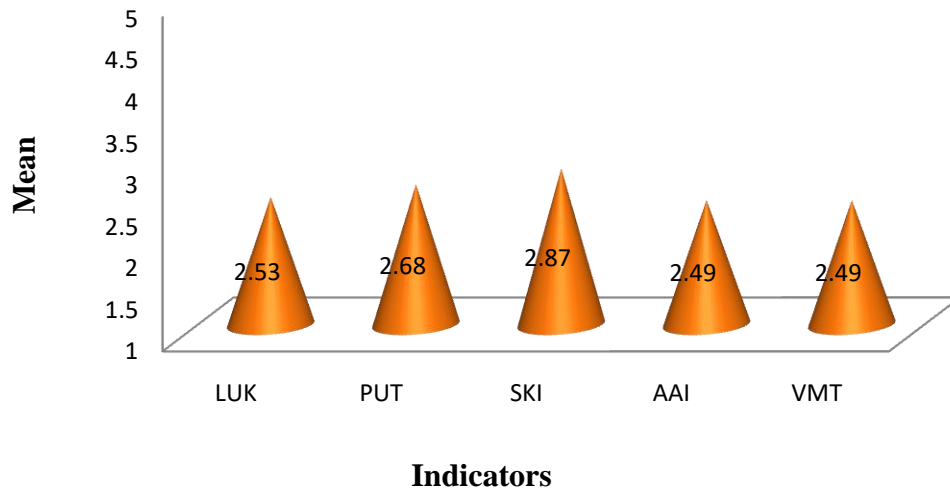
Finally, the average mean for all the items on the role of SGA's for sustainability of kaizen in MME's was found to be 2.82, indicating that QCCs are merely organized without actively participating in problem-solving in a workplace (gemba). In addition, MME's operators agreed during the focused group discussion that there were no standard checklists used for QCC activities and there was no regular brainstorming session regarding problem-solving on quality issues. According to (Thessaloniki, 2006) quality circles are not a panacea for quality improvement but given the right top management commitment, organization and resources they can support continuous quality improvement at shop-floor level. Therefore MME's had better-organized QCC based on the known guiding principles.

#### 4.4 Technical factors affecting the sustainability of kaizen

Table 4.6 technical factors affecting the sustainability of kaizen

Source: Derived from appendix (C)

Indicators	Mean	$\sigma$
There is a clear understanding of the importance of Kaizen as a continuous improvement tool.	2.53	1.2
MME's operators are well equipped in using kaizen implementation tools & techniques	2.68	1.1
Operators understand what continuous improvement is.	2.94	1.1
Operators understand how continuous improvement can be applied.	2.87	1.1
There is auditing on changes made on kaizen implementation by kaizen coordinator (or another external body like EKI).	2.66	.98
MME'S operators properly use kaizen visual management tools	2.49	1.1
Average mean	2.69	



**Figure 4.14 technical factors affecting the sustainability of kaizen**

Key: LUK-level of understanding about kaizen philosophy, PUT-Proper use of kaizen implementation tools and techniques, SKI- skill about kaizen implementation, AAI-adequate auditing & inspection, VMT-use of visual management tools

From the graph shown it is possible to see that the mean value for each item is below the Likert scale mean which indicates that lack of skill, improper use of kaizen implementation techniques and tools, skill gap, absence of adequate auditing & inspection technique and poor application of visual management tools are found to be the major technical factors impeding the sustainability of kaizen in the case industries.

#### 4.5 Role of leaders vs. kaizen implementation in MME's

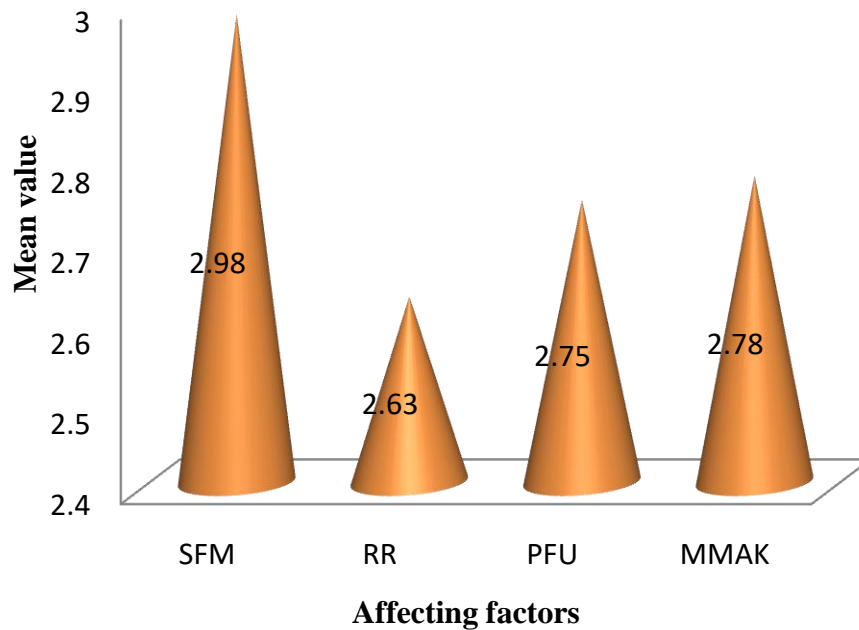


Figure 4.15 Role of leader VS. Kaizen sustainability

KEY: SMF-support management provides for kaizen event team, RR-reward and recognition, PFU-Progress and Follow up, MMAK-management meetings about kaizen.

From the diagram shown in the figure 4.15, it is clearly visible that the mean values for items under roles of the leader in Kaizen implementation were less than the Likert scale mean and hence it shows there is less commitment of MME's leaders in kaizen implementation. Furthermore, the average mean for the items is obtained to be 2.78 which are also showing that kaizen implementation is not given the attention of leaders at the desired level.

#### **4.6 Root cause analysis (RCA) of eight types of wastes (muda) in MME's**

The RCA consists of a Fishbone diagram, a Why-Why Analysis. The potential causes that can have an effect on the waste generation of MME's are identified by the Fishbone diagram given in figure 4.16. A tool also called cause and effect diagrams (Ishakua Diagram). It shows and identifies systematic relationships between an effect and its possible causes. Besides, it can be used to structure a brainstorming session.

This is because it is an effective tool to immediately sort ideas about the causes for problems into useful categories as it displays the hierarchy of causes. These potential causes were identified by brainstorming which was considered to be an effective technique for identifying the categories of causes utilizing an informal approach to problem-solving with cross thinking.

The brainstorming sessions contributed nearly around 36 potential causes which were then reduced to 23 unique ideas by eliminating redundancies and formalizing standard definitions. Under categories of generic causes namely inventory, rework, motion, transportation, over processing, overproduction, waiting, and intellect factors that may be affecting the cause were listed. Twenty three English alphabet letters have been used to represent root causes on the fishbone diagram-to minimize space consumption. A summary of the major categories with their key causes is represented in table 4.7. With reference to the fishbone diagram, two to four key root causes are selected which thought to be directly the source of waste.



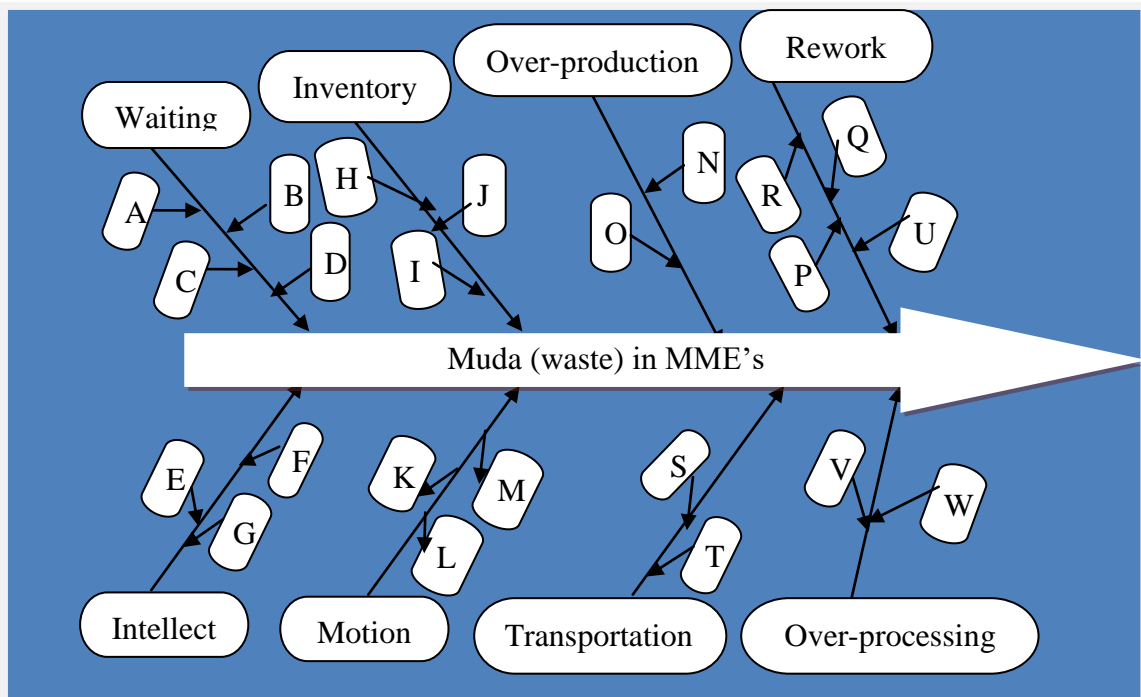


Figure 4.16 Cause and effect analysis diagram of sources of wastes in MME's.  
 (Source: contribution of the researcher)

The above diagram shows, different aspects of Muda in MME's. To eliminate them different approaches should be used. Muda of over production:- producing more than a customer needs, leads to extra pieces that need to be taken care of, such as handling and keeping in stock. Muda of inventory: - This is the result of over production. If what the next process needs is produced, muda of inventory can be eliminated altogether. Muda of waiting: - No value is added when operators or machines are waiting and looking. Muda of motion: - When the operator is moving around, looking for tools or going to get the work pieces, no value is added. Muda of transportation: - When materials are moving on the trucks, forklifts, or on the conveyer, no value is added. Muda of producing rejects: - Producing rejects leads to rework, or else rejects must be thrown away, a big muda. Muda of processing: - By rearranging the working sequence, often a particular process can be eliminated. The concept of muda elimination is central. Intellect: - untapped human talent, can be eliminated by cross-functional thinking and multi-skilling.

**Table 4.7 Causes of the eight types of waste in Medium manufacturing enterprises  
(Source:result of root cause analysis using fish bone diagram)**

Types of wastes		No	Root cause	Verification
1	Waiting	A	Unevenness	▶ Idle employee
		B	Lack of cross-functional skill	▶ Idle machines
		C	Push environment	▶ Idle workstations
		D	Underutilization	(starved workstations)
2	Inventory	H	Push environment	▶ Mess up in warehouse and other storage areas
		I	No partnership with suppliers	
		J	Presence of money bottleneck workstations	▶ High carrying cost
3	Overproduction	N	Push production system	▶ High WIP
		O	Make to stock	▶ Idle workstations
4	Rework	R	Unevenness	▶ Too much correction on defects
		P	Lack of cross-functional skill	
		Q	Push environment	
		U	Underutilization	
5	Intellect	E	Prioritizing individual efforts than team goals	▶ Idle people in one workstation and overburden on the other workstation.
		F	No cross-functional thinking	
		G	Non-participatory approach	
6	Motion	K	Poor layout	▶ Traveling to share tools
		L	Lack of tools and pieces of equipment	▶ Searching for information
		M	Inadequate design of the workstation	
7	Transportation	S	Lack of pieces of material handling equipment	▶ Inadequate material handling equipment
		T	Poor layout	▶ Traveling shared pieces of equipment
8	Over-processing	V	Unable to understand customer requirement	▶ Working beyond actual customer requirement
		W	Lack of standardized working procedure	▶ Redundancy

## **4.7 Summary of major findings**

### **4.7.1 Causes of Wastes**

The fishbone diagram was drawn by the researcher to identify the sources of wastes under the eight generic headings. The generic headings were used to prompt ideas during the brainstorming session with MME's operators. Layers of branches show thorough thinking about the causes of the problem. For example, under the heading "waiting," branches such as, unevenness, lack of cross-functional skill, Push environment and underutilization have been emerged which were considered to be the root causes for waiting in MME's. In a similar way the root causes for the eight generic wastes were identified and drawn on the fishbone diagram shown in figure 4.15 and the root cause analysis is also presented in table 4.7, showing that there were about 23 major root causes associated with non-value adding process (wastage mechanisms) in MME's.

### **4.7.2 Application of 5Ss in MME's**

Based on the results of analysis of the data collected through observation, interview and FGD the level of application of 5S were rated as sufficiently done for the first S, moderately done for the middle 3Ss, and only a little done for the last S based on the five points Likert scale. In relative terms, the degree of implementation decrease as we go from the first S to the last S. From the result it is obtained that the successful implementation of the preceding S results in the successful implementation of the succeeding S. Further, it had been noted that the average mean for sort, set-in-order, shine, standardize & sustain activities were found to be 3.47, 3.25, 3.02, 2.65, and 2.37 respectively, showing that as one move forward in implementing 5S techniques the difficulty to sustain increase.

Sustaining is the end result of how well we have performed the previous four S's. In the Sustainment stage, think of ways to make a habit of maintaining the previous 4S in a work area (gemba). It is by far the most difficult where you need to make it habit to properly maintain the new processes. In MME's the major problem hindering sustainability of 5S is that it is considered to be a short-term project, due to this once the kaizen event is accomplished everybody assumes as if everything is over. In this regard, (Tujuba, 2016) asserts that the major misconception affecting sustainability is considering kaizen as a short-term project.

In relation to this, most studies (Bullington, 2003, Cooper et al., 2007; Hough, 2008; Howell, 2009) also identified that the fifth phase as the most difficult phase to be executed in the process. The root cause of this problem is that changing long-standing practices and behaviors can be difficult. It involves making 5S philosophy as the way of life in an organization (Howell, 2009).

#### **4.7.3 Role of SGA's**

The result of the data analysis in figure 4.12 showed that it's difficult to conclude that SGA's are playing the expected role for problem-solving. Out of the four indicating questions raised the mean value of the respondents' views regarding QCC activities were 2.84, 2.91, 2.74 and 2.85 for functional diversity, active participation in kaizen, participation in decision making and collective responsibility respectively. Furthermore, the majority of operators joined quality control circle activity voluntarily (55%). The rest 45% is based on other's obligation and decision.

From this result, we can say the significant number of the front line workers doesn't have the motive for participating in quality control circle activities. From this, even though SGA'S in MME's were practicing QCC as problem-solving tools it is not based on the right principles. From the researcher's observation and the FGD made

with MME's operators, there was no brainstorming session on issues related to work area and there were also no standard checklists, techniques used.

Here it is clear that the major problems hindering the role of SGA's activities in sustaining kaizen are, limited participation of MME's operators in kaizen event, centralized decision making, and absence of functional diversity in kaizen event teams and lack of team spirit (collective responsibility). Moreover, (Asnake Gudisa, 2016), found that inadequate training and education, lack of proper support of management, insufficient awareness and lack of documentation of the achievements in exercising Kaizen were the challenges affecting SGA's in kaizen implementation.

#### **4.7.4 Technical factors affecting the sustainability of kaizen**

Respondents were asked the extent to which MME's perceive kaizen as a continuous improvement tool, 26% strongly disagreed, 27% disagreed, 24% undecided, 15% agreed and 9% strongly agreed. The mean value for respondents' view for this item is found to be 2.53 which indicate that respondents agreed that there is no clear understanding of kaizen as the continuous improvement tool. Although the concept of kaizen is quite simple to understand, it is difficult to master and will need time before it is fully understood by all employees. Thus, TVET colleges' had better trained MME's operators about the philosophy, the tools and techniques of kaizen, prior to implementation. In this regard, training modules should also be prepared in the context of MME's operators.

Concerning proper use of kaizen implementation tools and techniques 13% strongly disagreed, 38% disagreed, 22% undecided, 23% agreed & 4% strongly agreed. The mean value of respondents view for this item is found to be 2.68, which shows it is impossible to generalize that MME's operators are adequately using kaizen

implementation tools & techniques. Moreover from the observation of the researcher and the FGD made with MME's operators it is noticeable that only 5S and QCC are used as tool for implementation despite the fact that kaizen is an umbrella concept composed of tools such as 5S, Suggestion System, Quality Control Circles (QCC) or Quality Circle (QC), Total Quality Control (TQC), Total Quality Management (TQM), Toyota Production System (TPS), Just-In-Time (JIT) System, *Kanban* System, and so on. Here it is advisable for MME's to adopt the advanced applications and tools of kaizen to be competent in the global market since it is tricky to change the outcome without changing the system.

Regarding auditing and inspection work 10% strongly disagreed, 39% disagreed, 30% undecided, 19% agreed and 3 strongly agreed. The mean value of respondents view for this item is also found to be 2.66 which indicated that timely auditing and inspection is not evident. From observation also there were no standard checklists prepared for follow up and no prepared schedule for inspection work.

Moreover, respondents view regarding the proper use of visual management tools was found to be 26% strongly disagree, 27% disagree, 23% undecided, 17% agreed and 7% strongly agreed. The mean value for this item is 2.49 which show MME's operators are not using visual management tools properly. From the observation and the FGD made with MME's operators, it is distinguished that the majority of the enterprises didn't use visual management tools, like direction indicators, color coding, information board, kaizen board and so on. Due to this the workplace looks completely cluttered rather than being pleasant and attractive.

In general 6 indicating questions were asked to respondents how technical factors were associated with the sustainability of continuous improvement in MME's and the average mean score was found to be 2.69 which signify that technical factors

impede the sustainability of kaizen in MME's. In other words, the inadequate use of kaizen implementation techniques affects its sustainability.

#### **4.7.5 Role of leaders vs. kaizen implementation in MME's**

To measure the role of leaders in MME's in kaizen implementation respondents were asked whether there is a support that senior leadership provide including material, supplies, equipment & assistance for organization, 14% strongly disagreed, 34% disagreed, 30% undecided, 20% agreed and 3% strongly agreed & the mean value is 2.98 which indicate that the role of senior leadership is not audaciously practical in sustaining kaizen. But, according to (Imai, 1986) senior leadership has two major functions in sustaining kaizen the first being creating a conducive environment (technological, managerial and operative), the second establishing standard for improvement.

Concerning reward and recognition, 23% strongly disagreed, 56% disagreed, 49% undecided, 31% agreed and 5% strongly agreed & the mean value is 2.63 which show there is no adequate system in MME's to value the best performance. Organizational culture has several essential components i.e. organizational values, leadership, and the reward and recognition structure of the organization (Knouse, 1996). The reward system reflects the organizational philosophy, democratic and innovative or autocratic and bureaucratic.

The respondents were also asked about management meetings regarding kaizen, 21% strongly disagree, 51% disagree, 46% undecided, 35% agreed and 11% strongly agreed. The mean value is 2.78 based on the 5 points Likert scale. Further, during FGD the MME's operators strongly raised the idea that their suggestion for improvement is not even implemented by the management. However, Slobodan

describes that the Japanese management encourages employees to generate a great number of suggestions and works hard to consider and implement these suggestions, often incorporating them into the overall Kaizen strategy. Management also gives due recognition to employee's efforts for improvement. An important aspect of the suggestion system is that each suggestion, once implemented, leads to an upgraded standard. Here it's the researcher's strong remark that top management should motivate employees to forward their suggestion for improvement for the practical implementation.

In general, to assess how the role of leadership is associated with the sustainability of kaizen 5 questions were asked and the average mean is obtained to be 2.78 based on the 5 points Likert scale from which it's impossible to generalize that top management is committed to the sustainability of kaizen in MME's.

According to (Karsten and Pennink, 2007), managers' misconceptions about continuous improvement are common sources of difficulty, since they often expect instant results, whereas in reality, it takes time before the benefits of quality management become visible

#### **4.8 Proposed Kaizen Sustainability Model**

Kaizen sustainability framework for MME's is proposed based on the findings of the research, the practical experience of the researcher and the detailed review of related literature (benchmarking of others' work). The proposed framework is wide in its scope that it integrates the whole process of kaizen implementation. It incorporates eight interrelated phases, and it is the systematic strategy that shows the interrelationship that should exist between different facets of implementation of continuous improvement to ensure its sustainability. The steps are the courses of actions used to rectify the identified problems hindering sustainability.



This model differs from other proposed models in that it is a comprehensive approach which entails from the selection of MME's for implementation by creating awareness through different means like the brainstorming of the top management to scaling up scheme to foster kaizen dissemination by means of implementation by example.

The other feature of the model is that in it the assessment issue is addressed just after the completion of training on kaizen concept, implementation tools and techniques. It is done with intent to be in a position to pre-determine success in the implementation phase. Otherwise, it is impossible to judge whether candidates are well equipped or not in the kaizen implementation tools and techniques with the provision of a short-term training. In this regard, if candidates are not competent during the assessment, they will be retrained meanwhile the implementation commences with competent candidates.

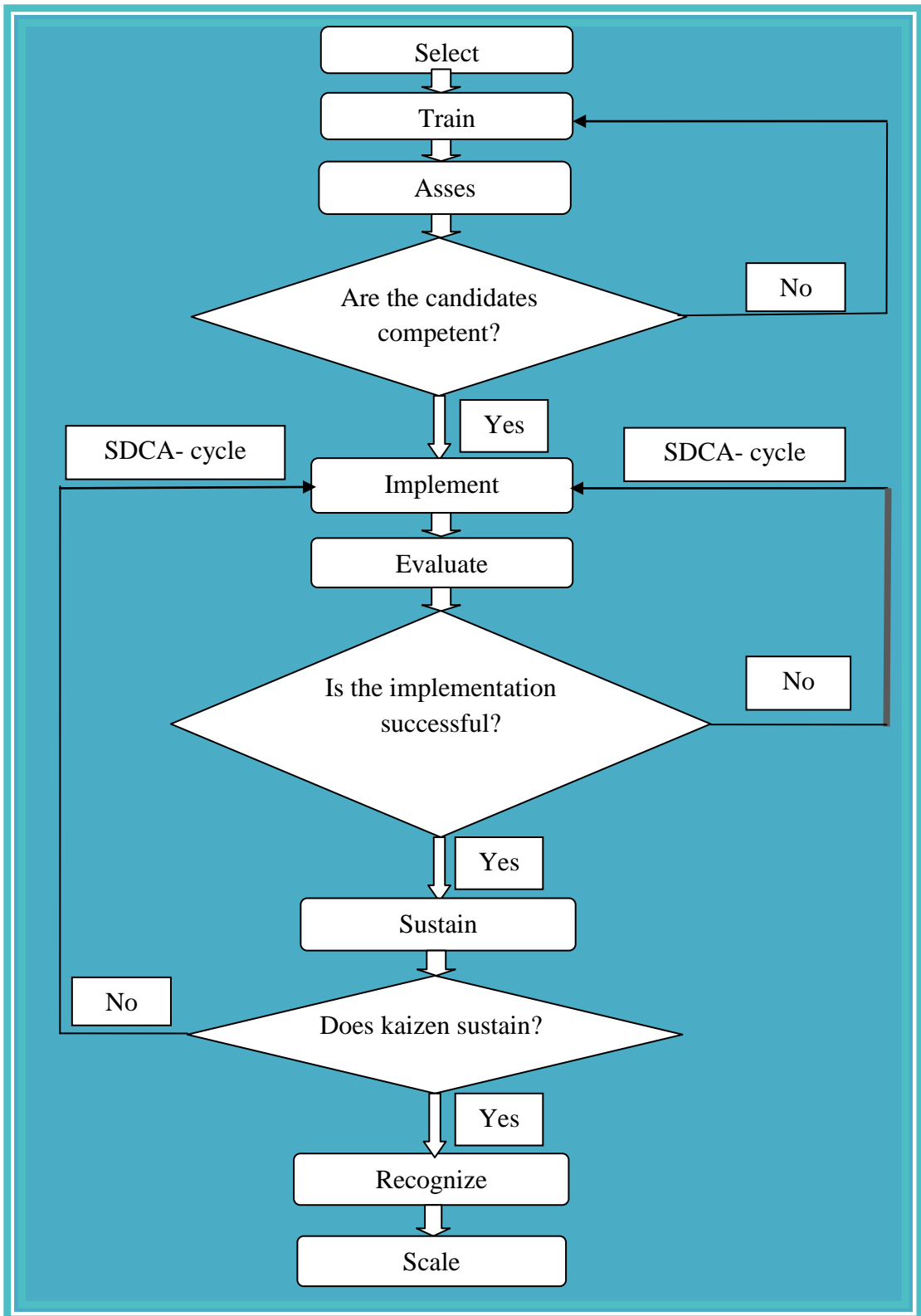
In the implementation phase, a generic implementation procedure is proposed due to the fact that there are no significant gaps in it. Just after implementation, the evaluation phase is integrated into the model in the pursuit of identifying the challenges faced and results obtained during implementation. Here performance criteria are proposed. Based on the evaluation, if set objectives are met to the required level the management of MME's is expected to establish the standardized operating condition to maintain the achievement till the next improvement is initiated. If there is still gap then the implementation continues based on SDCA cycle.

Once a standard operating condition has been established the sustaining phase follows in which industries make a habit to practice kaizen on a daily or a continual basis. Then after recognition and rewarding scheme follows. - Where best

performance is valued. Here the management body is expected to give a due attention by allocating the required resource and creating conducive environment.

After rewarding and recognition it's now time to disseminate the achievements to other MME's in a similar sector, provided that there is a need. In other words, the scaling up scheme can be launched to address a larger number of MME's. The scaling up scheme is incorporated to cut the cost of implementation.

In general, the proposed model encompasses interrelated steps to ensure sustainability of kaizen and it is an adequate tool to address the problems that are identified in this study. Many of the studies on sustainability issues emphasize the following characteristics or activities in order to sustain improvement outcomes over time: communication within the work area and across various levels of the organization, employee focus and commitment, improvement activity characteristics (e.g., project scope, goals, and improvement team dynamics), improvement culture, learning (education and training), management, measurement, and organizational structure and policies. But they didn't present a framework that depicts the interrelationship between each activity. The proposed model presented below is intended to fill this gap.



**Figure 4.17 proposed kaizen sustainability model**  
 (Source: researcher's own contribution)

## **Description of the model**

### **4.8.1 Select**

The study result showed that there is a moderate positive correlation (0.40) between top management conviction and kaizen sustainability indicators. On the other hand, the study also revealed that the support of top management in the case industries was not audacious and this is identified as one of the affecting factors. Hence, selection phase is incorporated in the framework to prioritize enterprises for implementation based on the conviction and commitment level of top management.

Based on the detailed investigation of literature review also the starting point for improvement is to recognize the need. So Kaizen principles emphasis problem-awareness and provide clues to identifying problems. Kaizen approach is based on the premise that there is no perfection in a process because no structure, product, or system ever achieves the ideal stage and where it can be improved by further reducing waste.

Since the benefits of Kaizen principles come gradually and its effects are felt usually on a long-term basis, it is obvious that Kaizen can thrive only under top management that has a genuine concern for the long-term health of the company.

Therefore, for the sustainability of kaizen top management commitment is compulsory. Hence before implementation, the top management should be convinced about the need for continuous improvement.

### **4.8.2 Train**

The study result shows that there is a moderate positive correlation (0.32) between the training and kaizen sustainability. Therefore as more training is provided the sustainability will increase and vice versa. Also, there is a slight positive

correlation (0.27) between the level of education and kaizen sustainability indicators, meaning that as the level of education of the operators increases kaizen sustainability will be enhanced and vice versa.

On the other hand, the result of the data analysis revealed that skill and knowledge gap on part of operators in the case industries were some of the main problems hindering sustainability of kaizen. Hence to ensure success in sustaining continuous improvement industries should train their operators prior to implementation.

According to Admasu Abera (2015), kaizen will never work if people do not implement its full suite of tools and concepts, with sufficient training given to take advantage of them.

“Training will neither make a fish fly nor a bird swim; but training will certainly help a fish to swim faster and a bird flies higher” ( Yong, AKB, 1996.)

The approach to train on kaizen should base on an Action Learning Model. The training module should be developed based on streamlined approach (level by level training). The course-training syllabus of kaizen should be designed to achieve real-time improvements, cost reduction, quality improvements, productivity improvement, and waste reduction in Processes. Further, MME's operators should also upgrade their educational level to cope up with the advanced application of kaizen tools and techniques in the long run.

#### **4.8.3 Asses**

In the study it is found that 93% of respondents were trained in kaizen implementation tools, on contrary skill gap on kaizen implementation tools identified as a factor affecting sustainability. This is due to commencing into implementation

without measuring the extent to which operators understood the implementation tools after training. The assessment is incorporated as part of the framework to help to be in a position to determine the level of understanding of operators before implementation.

Hence the candidates should sit for occupational assessment after completion of the training in which he/she is expected to be examined 30% theoretical (knowledge test) and 70% practical (skill test) exam regarding the application of kaizen philosophy, tools and techniques. The occupational assessment is administered by the National Center of Competence (CoC). Knowledge is used to describe what candidates need to know if they are to perform competently. The application of knowledge is fundamental to the concept of occupational competence and is one of the defining characteristics of occupational standards.

Skills: - Competence and skill are not the same things. People need skills to be competent, but competence is about applying skills, knowledge, and attitudes to achieve a work function.

Here if the candidate is competent he/she shall be awarded a certificate on the occupational level by the CoC; and completed and passed the training and evaluation of the kaizen implementation on the respective level. If candidates are not competent they should be retrained and re - assessed till they are familiar with the kaizen implementation tools and techniques. On the other hand, the implementation would proceed with competent candidates.

#### **4.8.4 Implement**

There is a strong positive correlation (0.52) between active participation of operators vs. kaizen sustainability. To implement the kaizen approach, what the organization need is to organize a team that has been consistent with the target

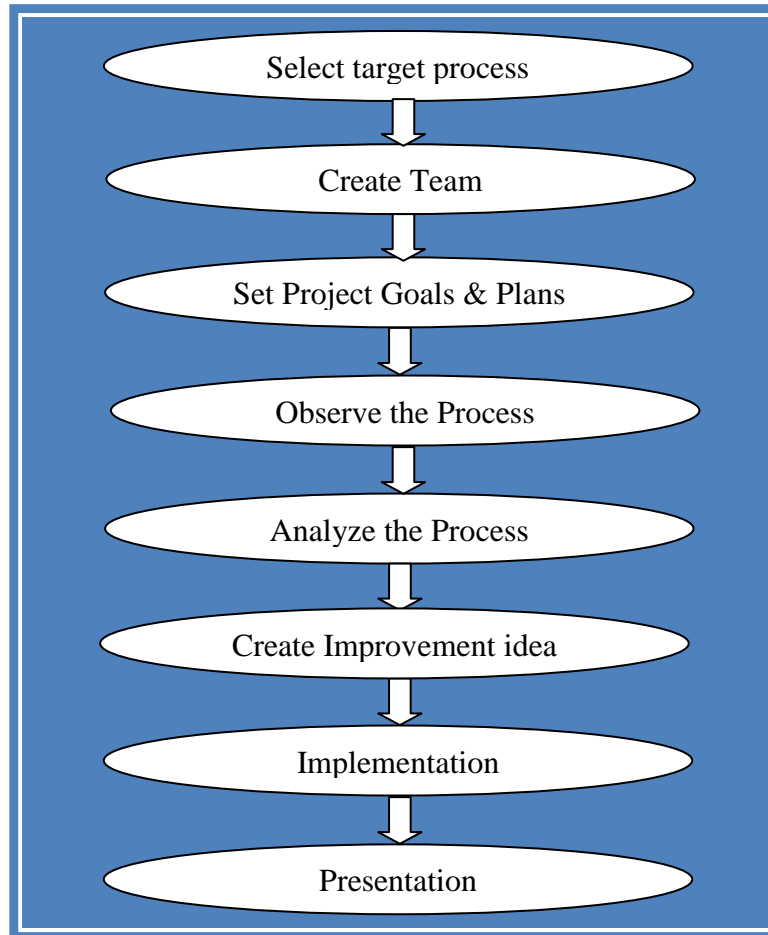
process in the system. The team should be of cross – functional one so that it can deal with different arrays of problems associated with workplace. Typically, the people in this group should be the one that is trained and assessed so that we can start facilitating the kaizen methodology into the target industry. Kaizen is actually an activity that should be performed daily and work team should be provided a purpose which should go beyond improvement. When implemented correctly, kaizen will enable the organization to humanize the workplace as well as eliminate all the processes that need a lot of work from employees which can be about mental and physical activities.

Kaizen will also teach people how they can perform tasks in a rapid way through experiments (Rajesh G. et al., 2012).

During the implementation phase, the work team follows the generic approach of kaizen implementation techniques. As articulated by Anh, et al., (2011) for successful kaizen transferability, kaizen practices should be adapted to the local culture in order to have the highest probability of success (J. Michalska, D. Szewieczek, 2007).

Given that a kaizen is a vital approach to problem - solving, its application requires restructuring the organizational culture and then use formal root cause analysis to identify and correct the problem at the source. Thus, kaizen practices could be implemented by the manufacturing industries through cross-functional team cooperation of 8 to 12 people with a skilled facilitator to identify, measure, and correct the problem associated with the process. As discussed by Zimmerman (1991) and Imai (1997), as a process kaizen utilizes various tools and methods to make the problem visible, and uses formal root cause analysis tool and other means to identify and correct the problem.

In order to implement kaizen, MME's should follow the generic methodology of kaizen. Today, it is used to improve various kinds of processes that are involved in manufacturing, management and other supporting processes in the business.



**Figure 4.18 the kaizen implementation Methodology**  
(Source: Admasu 2015)

#### **4.8.5 Evaluate**

The evaluation scheme is inbuilt in the model in the quest of identifying the success factors and constraints faced during the implementation phase. As it is clearly shown in the study there are problems associated with the kaizen implementation such as the inadequate use of tools, skill and knowledge gap, lack of collective responsibility and absence of active participation of operators were identified as problems linked with implementation and affecting sustainability. Hence to be in a



position to ensure kaizen sustainability it should be evaluated just after implementation.

Performance review significantly impacts on workers' attitude and commitment towards Kaizen events (Glover 2010). The self-assessment and kaizen certification naturally drives the organization goal to continually improve the quality and the cost-effectiveness of providing the product or service through the systematic guide using Key Performance Indicators (KPIs).

In employing the kaizen techniques, each workgroup needs its own set of KPIs to enable it to monitor its own progress. Each workgroup must examine its own work processes to develop the KPIs which describe how the group influences productivity across the key areas. The following are the proposed KPIs for kaizen event outcome:

**Table 4.8 proposed key performance indicators for kaizen implementation**  
(Source: researcher's own contribution)

No	Indicators	Metrics
1	Productivity	Percentage of enhanced productivity
2	Inventory levels	Percentage of decrease in inventory level
3	Inventory cost	Percentage of decreased inventory cost
4	Lead time	Percentage of shortening lead time
5	Number of accidents	Percentage of reduced accident per period
6	Machine Breakdowns	Percentage of machine breakdown per period
7	Searching time	Percentage of shortening of search time
8	Reject rate	Percentage of reduced reject rate per period
9	Rework	Percentage of reduced rework per period
10	Customer complaints	A rate of reduced customer complaints per period
11	Suggestions	Number of suggestions per period

It is not possible to adopt all the KPIs as one needs to adapt them to one's own organizational culture. The workgroup needs to discuss and prioritize the usage of

KPIs to foster a productive work culture. The performance metrics for the extent of evaluation of kaizen sustainability should be based on the set goals for improvement.

#### **4.8.6 Sustain**

This phase of the framework is to sustain the changes from the kaizen event which is the most difficult part of CI. From the correlation diagram shown in the figure, 4.10 there is a direct correlation between use of visual management tools (0.45) and kaizen sustainability. Hence to ensure sustainability of CI industries should pursue using visual management tools such as kaizen board, information board, labeling, color coding, red tagging, signal system and others based on their level to ensure a visual and a tidy or cluttered free workplace.

From the correlation analysis, it is also revealed that there is a direct positive correlation (0.46) between auditing and inspection and that of kaizen sustainability, hence to help the sustainability of CI, MME's should pursue a regular auditing and inspection scheme supported by standard checklists.

Here sustaining is to mean that to make it a habit what has already been achieved during the kaizen event. To this end, MME's deserve to establish standard operating conditions so that each operator can follow them on a regular basis. Most importantly to ensure sustainability all employees from top management to a cleaning crew should participate in problem solving by coming with suggestions for improvement on a daily basis.

According to (Van et al. 2010) the sustain phase handles the results after the kaizen event. In order to sustain the results properly, the results have to be measured, evaluated and adjusted. When sharing the results with other parties it is important to make sure to standardize the best practices and share the lessons learned within the organization. However, if there is a problem in sustaining the outcome at any level

(enterprise level or division level) it needs to go back to implementation phase based on SDCA – cycle. From the correlation analysis also there is a strong direct correlation (0.51) between use of PDCA- cycle vs. kaizen sustainability. Hence MME's should pursue to use SDCA – cycle to re-implement the kaizen event when there is a serious problem associated with sustainability.

#### **4.8.7 Recognize**

The study result revealed that there is a strong positive correlation (0.5) between recognition and reward vs. kaizen sustainability indicators. Hence MME's should trail recognition and reward scheme to create a competitive edge for continuous improvement. The reward and recognition scheme should address best performing individuals, divisions or industries based on set objective and adequate metrics

According to Glover, after the performance review, the application of reward and recognition system helps to reinforce employees' behavior of continuous improvement (Bessant et al. 2001). It is suggested that human resource (HR) policies should be reconstructed if it doesn't match the need of Kaizen culture. For example, in order to retain employees' long-term commitment and motivation, organizations should build a system which promotes intrinsic motivation like self-challenges as well as extrinsic performance-based rewards such as profit-sharing plans across the company to recognize and reward collective excellence (Recht and Wilderom, 1998)

Organizational psychology emphasizes on building an organizational structure and culture to offer employees a safe and satisfying work environment and to motivate employees (Aamodt 2013). Brunet and New (2003) found that Kaizen generates intrinsic psychological benefits for employees from work recognition and

satisfaction. It is much easier for employees to receive the psychology acceptance for small but incremental improvements (Maurer 2012).

#### **4.8.8 Scale**

The scaling up scheme is integrated into the framework to assure the wider reach of medium manufacturing enterprises after the outcomes and the success factors have been identified. The other advantage of the scaling up phase is to cut the cost of implementation in other industries.

Explicitly considering the appropriate scale and reach of a given idea is important to ensuring that the appropriate resource and risk is taken to pursue it so it is not stretched beyond a natural boundary to become a failure. There are a significant number of MME's in Ethiopia. To be effective in process improvement there needs to be model enterprises in CI since the tools & techniques are obtained from abroad it may be difficult to master them at large scale.

Being evidence-based is the most common requirement for an innovation to be spread and scaled-up. Innovations demonstrated to be effective by having a positive impact on a problem (Elliot et al 2004)

The scaling process is best served by having as many of the issues and troubles identified in evaluations addressed and resolved before beginning the scaling (Littlejohn et al 2003).

## **CHAPTER FIVE**

### **CONCLUSION AND RECOMMENDATION**

#### **5.1 CONCLUSION**

Based on the results of the data analysis, it had been found that MME's operators didn't have fully trained and engaged in full basic kaizen practices. The training given was only for short period, and limited to topics such as kaizen overview, 5S, and definition of muda. The extent of 5S implementation had been thoroughly investigated and found that only the first S or sorting was sufficiently implemented, the middle 3Ss (set – in – order, shine, standardize activities) were moderately implemented and the last S or sustain was only a little implemented which shows even though 5S is implemented as CI tool there is a high probability of failure unless an adequate means is sought for its sustainability. On average 5S had been moderately implemented in MME's in the case area. Also, it had been noticed that the successful implementation of the preceding S leads to the successful implementation of the succeeding S.

The study had revealed the role of SGA's in the sustainability of kaizen in MME's in such a way that despite the fact that significant number of QCC was organized, it had not been based on the known guiding principles. The main challenges and limitations identified during the study were centralized decision making on part of the top management, lack of team spirit (absence of collective responsibility), the absence of functional diversity in kaizen event team were the main problems hindering the activities of SGA's.

Further the associated technical and social factors impeding the sustainability of kaizen were critically scrutinized and found that there was no reward and recognition scheme, no audacious top management support, short-termism, skill and knowledge gap, no auditing and inspection supported by standard checklist, inadequate use of kaizen implementation tools, and poor use of visual management tools (VMT) were apparent. Based on the why – why analysis 23 root causes for non – value adding activities in MME’s at shopfloor level were also identified.

To ensure sustainability of kaizen in MME’s a model has been developed. The model has eight interrelated phases. In each phase, activities are procedurally included, which can be countermeasures for the challenges hindering the sustainability.

## **5.2 RECOMMENDATION**

The management of MME’s, TVET’s and trade industry department requires showing a better commitment by revising their kaizen implementation strategy. Rather than tying kaizen with short-term achievements, the stakeholders need to link kaizen initiative with long-term goals since it is a continuous improvement process (an endless journey of improvement).

Adequate kaizen implementation tools and techniques should be used as means of waste reduction and kaizen implementation accordingly rather than only sticking on 5S. As kaizen is an umbrella concept consisting of many tools, MME’s should pursue constant training and development of operators based on their baseline knowledge and skill.

There is a direct positive correlation between training and level of education vs. kaizen sustainability indicators therefore, stakeholders like TVET, EKI, trade and industry had better work together to unbundle the packages in the kaizen toolkit to

bring competitive advantage for MME's by creating a learning organization rather than blindly judging kaizen as a failure with an only limited application of tools and a short period of time.

MME's should incorporate reward and recognition scheme to value the best performance in kaizen implementation based on set goals and corresponding metrics.

There is a strong positive correlation (0.52) between active participation vs. kaizen sustainability. Hence, bring everyone together so that CI can succeed. Kaizen is mainly conducted through teams formed from top management to frontline worker. It mostly requires active participation and commitment of all workers.

To be more effective, MME's, TVET, EKI, trade and industry department and another responsible body can apply the above-proposed kaizen sustainability model.

Finally, the proposed model can be further modified and developed based on further investigation since it's the first work.

## REFERENCES

- Aamodt, M. G. 2013. *Industrial/Organizational Psychology: An Applied Approach*. Wadsworth Publishing, USA.
- Admasu Abera, (2015), " Kaizen Implementation in Ethiopia: Evidence in Literature", *Journal for Studies in Management and Planning*.
- Anand, G., Ward, P.T., Tatikonda, M.V., and Schilling, D.A. (2009), *Dynamic Capabilities Through Continuous Improvement Infrastructure*, *Journal of Operations Management*, Vol. 27 No. 6 pp. 444-461.
- Anh, P. et al. (2011). "Empirical study on Transferability of Kaizen Practices." The 11<sup>th</sup> International DSI and the 16<sup>th</sup> APDSI Joint Meeting, Taipei, Taiwan, July 12-16, 2011.
- Asayehgn (2011). "The Transferability of the Japanese Kaizen Management Techniques."
- Asedesach Asfaw, (2014). "Achievements of kaizen Implementation in Wonji/ Shoa sugar Factory." Unpublished thesis paper, Mekelle University
- Asnake Gudisa, (2016) "Developing Model of Kaizen Implementation through Kaizen promotion Team for Manufacturing Companies in Ethiopia"
- Ayalew Ishibashi et al.,(Aug 1999). *Research in Education. Distance Education Journal for Studies in Management and Planning*
- Barnes, T. (1996), " Kaizen strategies for successful leadership", Pitman Publishing London
- Berger, A. (1997) *Continuous improvement and kaizen: standardization and organizational designs. Integrated Manufacturing Systems*, 8, pp110-117.
- Best, J .W and Kahn, J.V. (2002).*Research in education (7<sup>th</sup> ed)*. New Delhi, Prentice Hall of India
- Bessant, J. Caffyn, S. and Gallagher, M. 2001. *An evolutionary model of continuous improvement behavior, Technovation*, 21 (2), pp. 67–77.
- Birhanu Tadesse Taye. (2014). *Practices and Challenges of Kaizen Implementation at Entoto Polytechnic Cluster College: The Case of Woreda Three Enterprises of Gulele Sub-City in Addis Ababa City Administration, Addis Ababa, Ethiopia*
- Brunet, A. P. and New, S. (2003) *Kaizen in Japan: An Empirical Study. International Journal of Operation and Production Management*, 3, pp1426-1446.
- Bullington, K. E. (2003). *5S for Suppliers. Quality Progress*, pp. 56-59.
- Cheser, R., "Kaizen is more than continuous improvement ", *Quality progress*, 1994
- Cooper, k., keif, m. and macro, k. (2007). *lean printing pathway to success*
- Corbin, J, and Strauss, A (2008).*Basics of Qualitative Research (3<sup>ed</sup> ed)*. California: Sage
- Creswell, John (2009). *Research Design Qualitative and Quantitative and mixed Methods Approaches*, London; Sage. ISBN 978-1-4522-2609-5.
- Dale, B., Boaden, R., Willcox, M. and McQuater, R. (1997), *Sustaining Total Quality Management: What Are the Key Issues? TQM Magazine*, Vol. 9 No. 2, pp. 372-80.
- DeVaus, D.A. (2002). *A survey in Social Research (5<sup>th</sup> ed)*. London and New York: Rout ledge.
- Deniels R C (1995), "Performance Measurement at Sharp and Driving Continuous Improvement on the Shop Floor", *Engineering Management Journal*, Vol. 5, No. 5, pp. 211-214
- Doolen, T.L., Worley, J.M., Van Aken, E.M., and Farris, J.A. (2003), - *Development*



- of an Assessment Approach for Kaizen Events, Proceedings of the 2003 Industrial Engineering Research Conference, Portland, OR, May 18-20, 2003, CD-ROM.
- Elliott, D. S., and Mihalic, S. (2004). Issues in disseminating and replicating effective prevention programs. *Prevention Science: The Official Journal Of The Society For Prevention Research*, 5(1), 47-53.
- EKI, (2012). Pamphlet on Kaizen implementation in industries in Addis Ababa, Ethiopian Kaizen Institute (2012:36 and 39)
- Federal Negarit Gazeta, (2016). Federal Negarit Gazette of the Federal Democratic The Republic of Ethiopia, 'Federal Small and Medium Manufacturing Enterprises Development Agency Establishment Proclamation' Addis Ababa, Ethiopia
- Foss, I (2004). Development of Trade in Africa: Promoting Export through Quality and Product Safety. NORAD/SIDA
- Fraenkel, Jack R and Norman, E (1932).How to Design and Evaluate Research in Education (7<sup>th</sup> ed). The McGraw-Hill Companies Higher Education: Avenue of the Americas, New York, NY 10020.
- Glover, W. J. 2010. Critical Success Factors for Sustaining Kaizen Event Outcomes. Ph.D. dissertation, Virginia Polytechnic Institute and State University, USA.
- GRIPS. (2011). Kaizen National Movement: A study of Quality and Productivity Improvement in Asia and Africa. Japan International Cooperation Agency (JICA). GRIPS Development Forum.
- Helena Cierna, (2016) Application of the Kaizen philosophy – a road to a learner business
- Hough, R. (2008). 5S Implementation Methodology. Management Services
- Howell, V. W. (2009). 5S for Success. *Ceramic Industry*, pp. 17-20.
- Hyland P W, Milia L D and Terry R S (2004), - CI Tools and Technique: Are There any Difference Between Firms? Proceedings 5th CI-Net Conference, Sydney, Australia.
- Imai, M., (1997), GEMBA KAIZEN. A commonsense, low-cost approach to management.
- Imai, M. (1986). Kaizen: The key to Japan's competitive success. McGraw-Hill Publishing Company.
- Julie Pallant, "A step by step guide to data analysis using IBM SPSS" (6<sup>th</sup> Ed), 2016
- James Womack, ' The Machine That Changed the World ' (1991)
- J.Michalska, D.Szewieczek.(2007). The 5S methodology for as a tool for improving, *Journal of Achievements in Materials and Manufacturing Engineering*.
- Karen N and Mike Ostring (2007), "Achieving Rapid Improvement in Office, Service, and Technical Environments", Productivity Press New York, PP. 9-11.
- Karsten, L. and, Pennink B. (2007). "Total quality management in the African business community of Burkina Faso: A change in perspective on knowledge development." CDS Research Report No.25. July 2007.
- Kaye, M. and Anderson, R. (1999), Continuous Improvement: The Ten Essential Criteria, *International Journal of Quality and Reliability Management*, Vol. 16 No. 5, pp. 485-506.
- Keating, E.K., Oliva, R., Repenning, N., Rockart, S., and Serman, J. (1999), Overcoming the Improvement Paradox, *European Management Journal*, Vol. 17 No. 2, pp. 120-134.

- Kilian, C.S (1992). "The world of W .Edwards Deming" (2<sup>nd</sup> ed). Knoxville, TN: SPC Press
- Knouse, S. B (1996).The Reward and Recognition Process in Total Quality Management. Milwaukee, WI: ASQC, Quality Press
- Knouse, S. B., "The reward and recognition process in total quality management ", 1996,.Milwaukee, WI: ASQC, Quality Press
- Kobayashi,I.," 20 keys to workplace improvement ",1990,Cambridge :productivity press
- Kothari, C.R (2001).Research Methodology: Methods and Techniques (2<sup>nd</sup> ed).New Delhi: Wishwa Prakashan.
- Laraia, A.C., Moody, P.E., and Hall, R.W. (1999), The Kaizen Blitz: Accelerating Breakthroughs in Productivity and Performance, New York: The Association for Manufacturing Excellence.
- Littlejohn, A., Campbell, L. M., Tizard, J., and Smith, A. (2003). From Pilot Project to Strategic Development: scaling up staff support in the use of ICT for teaching and learning. *Journal of Further and Higher Education*, 27(1), 47.
- Maurer, R. 2012. *The Spirit of Kaizen: Creating Lasting Excellence One Small Step at a Time*, McGraw-Hill Professional Publishing, USA.
- Mullins, (2010). *Management and organizational behavior*. Ninth Edition Portsmouth UK: Laurie J. Mullins. published by Rotolito Lombada, Italy.
- Murata, K., Katayama, H., (2009). An Evaluation of Factory Performance Utilized KPI/KAI with Data Envelopment Analysis. *Journal of the Operations Research Society of Japan (JORSJ)*, Vol. 52.
- Murata, K., Katayama, H., (2010). Development of Kaizen Case-base for Effective Technology Transfer: A Case of Visual Management Technology. *International Journal of Production Research (IJPR)*, Vol. 48.
- Newitt, D.J. (1996). Beyond BPR and TQM Managing through processes: is Kaizen enough? In: *proceedings Industrial engineering*, London; UK: Institution of Electric Engineers.
- Ohno, T. (1978). *Toyota production system: Beyond large-scale production*, Productivity Inc.
- Ohno, I. Hhno, K and Uesu, S. (October 2009). "Introducing Kaizen in Africa." GRIPS Development Forum Tokyo: Roppongi, Minato-ku.
- Rajesh Gautam, Sushil Kumar, and Sultan Singh, (2012). Kaizen Implementation in an Industry in India: A Case Study. *International Journal of Research in Mechanical Engineering and Technology*, Vol.2, No.1.
- Rangaswamy, R., 1995. *A Textbook of Agricultural Statistics*. Wesley Eastern Limited, New Delhi.
- Readman, J., and Bessant, J. (2007), What Challenges Lie Ahead for Improvement Programmes in the UK? Lessons from the CINet Continuous Improvement Survey 2003, *International Journal of Technology Management*, Vol. 37 No. 3/4, pp. 290-305.
- Recht, R. and Wilderom, C., 1998. Kaizen and culture: on the transferability of Japanese suggestion systems. *International Business Review*, 7(1): pp.7–22.
- Pettigrew, A. M. (1990). Longitudinal Field Research: Theory and Practice. *Organization Science*, 1(3), 267-292.
- Schonberger, R (1996). "World Class Manufacturing: The next decade". New York: Free Press.
- Slobodan, P (2011) 'International Symposium Engineering Management and Competitiveness', Zrenjanin, Serbia

- Sulyman, J., (2017) 'Factors affecting implementation of kaizen' unpublished thesis, Adama science and technology university
- Suzuki K (1987), *The New Manufacturing Challenge-Techniques of Manufacturing Systems*, John Wiley and Sons, Inc., New York.
- Teian K (1992), *Guiding Continuous Improvement through Employee Suggestions*, Productivity Press, Portland, US.
- Thessaloniki, J, "Kaizen Definition and Principles in Brief: A Concept and Tool for Employees Involvement", 2006
- Tujuba, (2016) "Achievements and challenges of kaizen implementation in Ethiopian metal manufacturing firms, Unpublished thesis, Mekele University
- Upton, D. (1996), *Mechanisms for Building and Sustaining Operations Improvement*, European Management Journal, Vol. 1 No. 3, pp. 215-28.
- Van, E.M., Farris, J.A., Glover, W.J. and Letens, G. 2010, "A framework for designing, managing, and improving Kaizen event programs", *International Journal of Productivity and Performance Management*, vol. 59, no. 7, pp. 641-667.
- Watson M. (1986). *The Deming Management Method*, Perigee Books.
- Wickens P. D., (1990). *Production Management: Japanese and British Approaches*.
- Williams M. (2001). *Maximum Cost Reduction Minimum Effort*, *Manufacturing Engineer*, Vol. 80, No. 4, 179-182.
- Womack J P and Jones D T (1996), *Lean Thinking*, Simon and Schuster, New York.
- Yamance, Taro (1993), *Statistics, An introduction analysis*, 3<sup>rd</sup> ed., New York: Harper and Row
- Yong, AKB (1996). "Malaysian Human Resources management." Kuala Lumpur: Malaysian Institute of Management.
- Zimmerman, W. (1991). "kaizen: the Search for Quality." *The Journal of Continuing Higher Education*. Vol. 39, No. 3, pp. 7-10.

## **APPENDICES**

APPENDIX (A)

Bahir Dar University

Bahir Dar Institute of Technology, BiT

Faculty of Mechanical and Industrial Engineering

Industrial Engineering Program

MSc in Industrial Engineering

(Production Engineering and Management)

**Introduction and purpose**

Dear Participant:

First and for the most I would like to thank you for the eagerness to reply to my questions. The following questions are not intended to test your knowledge. The aim of this study is to analyze factors affecting sustainability of Kaizen in Medium manufacturing enterprises and develop a model to better implement it. The attached questionnaire also intended to assess the factors affecting sustainability of kaizen in Medium manufacturing industries in case of Gurage Zone Administration. I kindly request you to help me by responding to the attached questionnaire. It consists of separate parts and it may take 15 to 20 minutes to complete. For the purpose of the study data will be collected through questionnaire, interview, observation checklist and using measurements also. Any information shared with me will be secured with the at most confidentiality and the respondent's personal identity will be kept unspecified. There are no unknown risks and uneasiness associated with this study. The expected benefits associated with this study are the end results that may be helpful to improve sustainability of kaizen in the existing manufacturing set up through development of a model. I would be pleased to share the findings with you after the study is accomplished or even while in succession.

Thus, heartily collaboration in providing pertinent and truthful information is extremely essential for the success of the study. Hence, please be sincere and legitimate when responding to each question.

Thank You in advance for cooperation.



## APPENDIX (C)

**Instruction:** The followings items are some issues related to sustain kaizen as a quality management system in MME's. Please select the response that BEST suits your opinion of the extent to which each of the following activities has occurred in Medium Manufacturing Enterprises. Indicate your response by marking ( ✓ ) against each item from the given rating scales.

5=strongly agree    4=agree    3=undecided    2=disagree    1=strongly disagree						
Item no	Items factors affecting sustainability of kaizen event activities in your	Ratings scales				
		1	2	3	4	5
1	There is a clear understanding about the importance of Kaizen as continuous improvement tool.					
2	MME's operators are well equipped in using kaizen implementation tools & techniques					
3	There is a clear cut procedure to train MME'S regarding kaizen implementation					
4	There is clear goal to sustain kaizen in Medium Manufacturing Enterprises					
5	Task complexity negatively impact sustainability of kaizen in MME's.					
6	There is diversity of functional expertise within the Kaizen event team (QCC)					
7	Support that senior leadership provided to the team, including materials and supplies, equipment, and assistance for SGA's members.					
8	There is communication across work areas (stakeholders) to support continuous improvement after a Kaizen event.					
9	MME's operators are able to share experiences and lessons learned with peers.					
10	MME's operators find out new things by applying them in practice					
11	There is collective responsibility in work area within MME's					
12	Operators actively participate in kaizen event.					
13	Operators understand what continuous improvement (kaizen) is.					
14	Operators understand how continuous improvement can be applied to					
15	To institutionalize change every member of the organization performs the Plan-Do-Check-Act cycle on continual basis.					
16	Management's support of work area employees and Kaizen event team (QCC) members include Rewarding and recognition of employees					
17	Operators believe in the value and need of the change mechanism.					
18	Management blame when team goals are not achieved.					
19	There is progress or follow-up and Meetings with Kaizen coordinator or facilitator					
20	There is auditing on changes made on kaizen implementation by kaizen coordinator (or other external body like EKI).					
21	There is meetings with management about kaizen					
22	Employee freely shares information with one another.					
23	There is a way in which employees are involved in decision making					
24	MME'S operators properly use visual management tools					

### APPENDIX (D)

**መመሪያ:-** ቀጥሎ የተዘረዘሩ ሃሳቦች በመሃከለኛ የዕድገት ደረጃ ላይ የሚገኙ አምራች የጥቃቅንና አነስተኛ ዉስጥ ተገባራዊ የተደረገዉ ከይዘን የማስቀጠል ሁኔታን የሚገልጹ ናቸው። ከዕድገትና ካይዘን ማስቀጠልን ከሚመለከቱ እንቅስቃሴዎች ዉስጥ በዕርሶ መረዳት በትክክል (በተሻለ) ደረጃ ተግባርን ይገልጻል የሚሉትን ከቀረቡት 5 አማራጮች አንዱን ቲክ በማድረግ ይምረጡ።

5 = በጣም እስማማለሁ		4 = እስማማለሁ		3 = አልወሰንኩም		2 = አልስማማም		1 = በጣም አልስማማም	
ተ.ቁ	የካይዘን ቀጣይነት ላይ አሉታዊ ተጽዕኖ የሚያሳድሩ ጉዳዮች	የክብደት ነጥብ							
		1	2	3	4	5			
1	ካይዘን ቀጣይነት ላለዉ መሻሻል የሚያገለግል ሁነኛ መሳሪያ መሆኑ የኢንተርፕራይዙ አባላት በሚገባ ተረድተዋል								
2	የኢንተርፕራይዙ አባላት የካይዘን ቴክኒኮችና መሳሪያዎች በመጠቀም ብቁ ናቸዉ								
3	በመሃከለኛ አምራች ኢንተርፕራይዞች ካይዘን ለመተግበር የሚያስችል ግልጽ አሰራር ስለመኖሩ								
4	በኢንተርፕራይዙ ካይዘንን ለመተግበር የሚያስችል ግልጽ ግቦች የተጣሉ ስለመሆኑ								
5	የስራ ቦታ የአደረጃጀት ዉስብስብነት የካይዘን ቀጣይነት እየጎዳዉ ስለመሆኑ								
6	ካይዘን ለመተግበር የሚመደቡ ባለሙያዎች ከተለያዩ የሙያ ዘርፍ የተዉጣጡ ስለመሆኑ								
7	የበላይ አመራሮች የካይዘን ተግባር በግብዓት፣ በክህሎት እና በተግባር ይደግፋሉ								
8	በባለድርሻ አካላትና በስራ ክፍሎች መሃከል የካይዘን ተግባርን በሚመለከት ትብብር ስለመኖሩ								
9	የመሃከለኛ አምራች ኢንተርፕራይዞች አባላት እርስ በዕርስ የሚደጋገፉ ስለመሆኑ								
10	የመሃከለኛ አምራች አንቀሳቃሾች አዳዲስ ሃሳቦችን በማመንጨት ወደ ተግባር ይቀይራሉ								
11	በስራ ቦታ ላይ የጋራ የተጠያቂነት መንፈስ ስለመኖሩ								
12	አንቀሳቃሾች በካይዘን ትግበራ ወቅት በንቃት የሚሳተፉ ስለመሆኑ								
13	አንቀሳቃሾች ካይዘን ማለት ምን እንደሆነ በሚገባ የተገነዘቡ ስለመሆኑ								
14	አንቀሳቃሾች ካይዘን እንዴት ተግባራዊ ሊደረግ እንደሚችል የተረዱ ስለመሆኑ								
15	ለዉጥን ተቋማዊ ለማድረግ አንቀሳቃሾች አቅድ-አድርግ-አረጋግጥ-ተግብር (PDCA-cycle) የሚለዉን ኡደት በቀጣይነት እየተገቡ ሰለመሆኑ								
16	የበላይ አመራሮች በካይዘን ትግበራ ላይ የተሻለ አፈጻጸም ለስመዘገብ ዕዉቅና የሚሰጡበት ስርዓት ስለመኖሩ								
17	አንቀሳቃሾች በለዉጥ ላይ እምነት አላቸዉ								
18	ዉጤት ሳይመዘገብ ሲቀር አመራሮች ሰራተኛን ይወቅሳሉ								
19	ከካይዘን አስተባባሪ ጋር የክትትልና ድጋፍ ስርዓት ስለመኖሩ								
20	በካይዘን ተግባር ላይ ኦዲት የሚያደርግ አካል ስለመኖሩ (ለምሳሌ-ኢኮኢ)								
21	አመራሮች በካይዘን ተግባር ላይ በቋሚነት ይወያያሉ								
22	ሰራተኞች ኃሳቦችን በነጻነት ይለዋወጣሉ								
23	ሰራተኞች በዉሳኔ አሰጣጥ ላይ የሚሳተፉበት ስርዓት ስለመኖሩ								
24	የኢንተርፕራይዙ አባላት የመረጃ ሰሌዳ እና የካይዘን ሰሌዳ በአግባቡ ይጠቀማሉ								

**NB:** This is the direct translation of the questioner to Amharic language to gather data from operators of MME's who don't understand English language.



## APPENDIX (E)

**Interview Guide to Medium Manufacturing Enterprises operators, in Gurage Zone Administration.** The purpose of this interview is to gather data pertaining to the extent of 5S implementation in Medium Manufacturing Enterprises, in Gurage Zone Administration. The quality of the research is highly dependent upon the degree to which the respondents are genuine. So, you are kindly requested to give legitimate complete responses to the issues raised.

5 = excessively done 4 = sufficiently done 3 = moderately done 2 = only a little done 1= not done at all

No	Criteria on the availability system to sustain kaizen implementation	Ratings				
		1	2	3	4	5
<b>1</b>	<b>Sort out – Seiri</b>					
1	The shop floor is free of unnecessary things					
2	All cupboards, shelves, tables, etc. are free of unwanted items.					
3	Items are stored according to frequency of use (there is a place for everything)					
4	Walls are free of old posters, calendars, pictures, notices etc.					
5	There is a general disorder free appearance in the work area (gemba)					
<b>2</b>	<b>Set in order – Seiton</b>					
6	Direction indicators available for all facilities from the entrance to shop floor					
7	All items, tools & equipment have identification labels					
8	All rooms, cubicles and similar areas are clearly numbered or named					
9	Specific areas are demarcated for garbage/rejects/waste, etc.					
10	Switches, fan regulators, controls, etc. are labeled					
11	All cables, wires, pipes etc. are neat and straight					
12	color coding is used effectively for easy identification					
13	There is a general appearance of orderliness					
14	It is easy to find any item without delay					
<b>3</b>	<b>Shine – Seiso</b>					
15	Cleaning schedules are existing and visibly shown					
16	Floors, walls, windows, doors etc. maintained at a high level of cleanliness					
17	Use of adequate cleaning tools is apparent					
18	Machines, equipments, tools, etc. are maintained clean and their maintenance schedules displayed					
19	There is a general appearance of cleanliness all round					
<b>4</b>	<b>Standardize – Seiketsu</b>					
20	The previous 3S procedures are standardized					
21	Standard check lists are used to regularly scrutinize 5S activities					
22	Aisles/gangways have a standard dimension and color					
23	Pipes, cables etc. are color coded					
<b>5</b>	<b>Sustain – Shitsuke</b>					
24	There is a system for how and when the 5S activities will be implemented					
25	There is support to 5S program by recognition, resources and leadership					
26	There is a habit of practicing the first 3S on a daily basis					
27	Employees participate in 5S activities by their own initiatives					
28	5S posters and 5S points of work reminders are displayed					

## APPENDIX (F)

### Interview Guide to manufacturing sector heads, tvet college deans, and vice deans

#### Dear Respondent:

The purpose of this interview is to gather data pertaining to factor hindering sustainability of kaizen implementation as a continuous improvement tool in Medium Manufacturing Enterprises, in Gurage Zone Administration. The quality of the research is highly dependent upon the degree to which the respondents are genuine. So, you are kindly requested to give legitimate complete responses to the issues raised.

- 1 Would you tell me your professional and leadership experience related to this position?
  - a. Qualification
  - b. Related experience
  - c. Experience as a whole
- 2 Do you have taken training on implementing Kaizen? If so is that short-term training or long term?
- 3 Do you think that the training you have attended enable you manage the implementation of Kaizen strategy in MME's?
- 4 How do you describe the implementation and the success of kaizen in MME'S?
- 5 Are there any factors distressing sustainability of kaizen in MME's?
- 6 How the factors affecting sustainability of kaizen faced as a responsible body?
- 7 Do you think that all MME'S operators make a habit of practicing kaizen? If yes, would you mind reveal the indicators?
- 8 Is there any way of auditing on changes made as a result kaizen implementation by kaizen coordinator and top management to sustain kaizen?
- 9 Is there a regular system of rewarding or recognizing to team members who commit to sustain kaizen in MME's?
- 10 What solutions do you suggest to be taken to lighten those factors affecting sustainability of kaizen in MME's?

Thank you!

For being ready to lend a hand

## APPENDIX (G)

Table 9 Observation Checklist to be used by the researcher to scrutinize the level of  
kaizen implementation in MME'S

5 = excessively available    4= sufficiently available    3 = moderately available  
2= Available    1= Unavailable

N <sup>o</sup>	Observation criteria on the availability system to sustain kaizen	ratings scales				
		1	2	3	4	5
1	There is clear goal to sustain kaizen in MME's					
2	Task complexity negatively impact sustainability of improvement in MME's					
3	There is support that senior leadership provided to the team, including materials and supplies, equipment, and assistance from organizational members.					
4	There is communication across work areas (departments) to support continued improvement after a Kaizen event.					
5	Operators are able to share experiences and lessons learned with peers.					
6	Employers out new things by applying them in practice (Active experimentation with new ideas)					
7	There is meetings with QCC members about kaizen					
8	Operators actively participate in kaizen event.					
9	To institutionalize change every member of the MME's perform the PDCA cycle on continual basis.					
10	There is Rewarding and recognition of operators for best performance in kaizen implementation.					
11	There is progress or follow - up and Meetings with Kaizen coordinator or facilitator					
12	Conducting regular audits on changes made kaizen implementation by kaizen coordinator					
13	There is kaizen board to show the difference of the work area before & after implementation					