



JIMMA UNIVERSITY
JIMMA INSTITUTE OF TECHNOLOGY
SCHOOL OF GRADUATE STUDIES
FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING
CONSTRUCTION ENGINEERING AND MANAGEMENT CHAIR

ASSESSMENT OF IMPLEMENTING SUSTAINABLE
CONSTRUCTION PRACTICES THROUGH KAIZEN METHODS IN
JIMMA ZONE

A Thesis submitted to the School of Graduate Studies, Jimma University, Jimma
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Fulfillment of the Requirements for the Degree Master of Science in Construction
Engineering and Management

by

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DECLARATION

I declare that this research entitled “*Assessment of Implementing Sustainable Construction Practices Through Kaizen Methods in Jimma Zone*” is my original work and has not been submitted as a requirement for the award of any degree at Jimma University or anywhere else.

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ABSTRACT

The construction industry has recently faced increasing pressure to adopt sustainable practices, particularly within small, medium and large sized enterprises (SMEs) in developing regions like the Jimma Zone. Despite the recognized benefits of sustainable construction, the adoption of these practices remains limited due to various challenges. This research addresses this gap by evaluating the implementation of sustainable construction practices through Kaizen methods within SMEs in the Jimma Zone. The study aims to identify key factors influencing the adoption of these practices, analyze the challenges faced by SMEs, evaluate the impact of these factors on implementation, and assess the level of awareness and understanding of sustainable construction practices among SMEs in the region.

The research employed a mixed-methods approach, combining quantitative and qualitative data collection methods to ensure comprehensive analysis. A structured questionnaire was distributed to a sample of 50 SMEs, with a response rate of 95.69% achieved, alongside semi-structured interviews conducted with 12 key informants. The survey data were analyzed using descriptive statistics and Cronbach's Alpha to ensure reliability, while related analysis was employed for qualitative data. The study focused on identifying the key factors, challenges, and levels of awareness that influence implementing sustainable construction practices through Kaizen methods.

The findings revealed that while SMEs have a moderate awareness of sustainable construction practices, significant challenges—such as financial constraints, inadequate training, and limited managerial involvement—delay the effective implementation of Kaizen methods. The results suggest that these challenges significantly impact the successful adoption of sustainable practices. The study emphasizes the need for targeted involvement, including improved financial support, comprehensive training programs, and stronger managerial leadership, to enhance the adoption of sustainable construction practices.

In conclusion, the research highlights the importance of addressing the identified challenges to successfully implement sustainable construction practices through Kaizen methods within SMEs in the Jimma Zone. This study provides valuable understanding for policymakers and industry stakeholders seeking to promote sustainability in the construction sector.

Keywords: Sustainable Construction, Kaizen Methods, SMEs, Jimma Zone, Challenges, Implementation, Awareness, Training

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ACRONYMS

BPR	Business Process Reengineering
CI	Continuous Improvement
EKI	Ethiopia Kaizen Institute
CWQC	Company-Wide Quality Control
ESDP	Education Sector Development Program
FEMSEDA	Federal Micro, Medium, and Small Enterprise Development Agency
FDRE	Federal Democratic Republic of Ethiopia
GDP	Growth Domestic Product
GRIPS	Graduate Institutes for Policy Studies
JICA	Japan International Cooperation Agency
MOE	Ministry of Education
MOFED	Ministry of Finance and Economic Development
SMEs	Small and Medium Enterprises
PDCA	Plan-Do-Check-Act
PM	Prime Minister
QCC	Quality Circle Control
QFD	Quality Function Development
SPSS	Statistical Package for Social Science
QCD	Quality, Cost and Delivery
TQC	Total Quality Control
TQM	Total Quality Maintenance
TPM	Total Production Management
TVET	Technical Vocational Educational Training
UNESCO	United Nations Educational, Scientific and Cultural Organization

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The 2015 World Bank brief highlighted that despite being slow in adapting to changes, small and micro enterprises (SMEs) have an advantage in implementing sustainable principles due to their flexibility and agility. Within the spectrum of sustainable development, there are many views about what constitutes the contribution of SMEs in each of the three sustainable development dimensions, namely, economic, social, and environmental (Rishi et al., 2015). The contribution of SMEs to economic growth, poverty alleviation, and job creation is irrefutable and is manifested in the policies developed by many developed and developing countries to support and promote the SME sector. SMEs strategically contribute toward economic growth predominantly in deprived populations (Du Toit et al., 2010) and are considered the mainstay of the economies of most African nations (Asamoah, 2014). For that matter, the essence of SMEs is tied with the upsurge of sustainability (Masocha and Fatoki, 2018).

According to the Job Creation Commission report of 2021, SMEs make a significant contribution to the Ethiopian economy; there are about 2.2 million and 2850 employees in these enterprises. In 2020, 1.5 million SMEs running in the country employed 4.5 million laborers and generated 40.7 billion Birr in monthly income (Ababiya, 2018; Kassa, 2021). These reports show SME has an impact on the country's economy and infrastructure development in Ethiopia.

Kaizen management originates in the best Japanese management practices and is dedicated to the improvement of productivity, efficiency, and quality; the term “kaizen” is a derivative of two Japanese ideograms, “kai,” meaning change, and “zen,” meaning good or for the better (Six Sigma LLC, 2004). Another definition of the Japanese meaning of kaizen is “to take apart and put back together in a better way” (Minton, 1998, p. 14). The popular meaning is the continual, incremental improvement of all aspects of a company (Imai, 1986).

Singh & Kumar (2017) explain that in the Japanese language, kaizen means continuous improvement and that in practice it seeks to involve all the participants of the process that is being analyzed at a relatively low cost for the company. Continuous improvement implies an incremental, ongoing effort to improve products, processes, and services (Meiling & John, 2010).

Consequently, Kaizen is a useful technique for several reasons, including (1) minimizing irreversible downtime; (2) improving product quality with lower costs and shorter service times; and (3) economically eliminating or reducing hidden expenses resulting from excessive waste (Padial et al., 2017).

Among the construction sectors, improving construction production is desired to reduce costs, shorten schedules, improve quality, increase competitiveness, be beneficial for worker safety, and ultimately improve a firm's economic standing in construction. As a production management approach for project delivery, Kaizen in construction is implemented to maximize performance at the jobsite level by looking at construction as both conversions and flow, where only conversions add value to the final product (John Gambatese, 2014).

The idea of kaizen was first brought to the attention of Ethiopia in 2008. Adimasu (2015) states that the implementation of Kaizen in Ethiopia began with JICA's support, following the Ethiopian government's request to Japan for technology transfer in Kaizen. All the concerned stakeholders selected KAIZEN as one of the management tools to improve and enhance the managerial capability to implement the Growth and Transformation Plan.

The Kaizen method was implemented in the construction industry because of its effectiveness in waste minimization and because it promotes sustainable construction practices. Kaizen is a part of the lean production system, which essentially addresses waste reduction incrementally (Jin and Doolen, 2014; Junker, 2010; Khanna, 2009). The benefits of kaizen are improved productivity, waste reduction, profit, client satisfaction, quality enhancement, and increased competitive advantage (Kumiega and Vliet, 2008; Macpherson et al., 2015).

1.2 Statement of the Problem

According to the definition by Steve and Odek (2016), sustainable construction is the set of processes that enable a profitable and competitive industry to deliver built assets such as buildings, structures, and supporting infrastructure that enhance quality of life, offer customer satisfaction, provide flexibility for future user changes, support desirable natural and social environments, and maximize efficient resource use. The benefits of sustainable construction are multifaceted, encompassing environmental, economic, social, health, and community advantages. Specifically, environmental benefits include improved air and water quality, reduced energy and water consumption, and minimized waste disposal.

Although there are potential benefits, the management practices of small, medium and large enterprise enterprises (SMEs) in Ethiopia face significant challenges in waste minimization, waste management, and resource utilization. The Kaizen method has been implemented in Ethiopia for over a decade, but its effectiveness in promoting sustainable construction practices remains underexplored.

However, medium and small businesses have encountered many difficulties, particularly in urban areas such as Addis Ababa. Challenges such as a shortage of highly qualified human resources, low employee motivation, and insufficient managerial commitment have contributed to low productivity and performance levels (Michael, 2014; Eden, 2017).

In the Jimma Zone, TVET colleges and polytechnic institutions have been actively engaged in training SMEs on the Kaizen methodology for sustainable construction practices. Despite these efforts, there has been a lack of comprehensive assessment regarding the key factors, challenges, and levels of awareness related to the implementation of sustainable construction practices in this Jimma zone.

As a result, this study aims to investigate the findings on the implementation of Kaizen methods in sustainable construction practices within the Jimma Zone, addressing the existing gaps in awareness and providing insights to enhance the effectiveness of these initiatives. By examining the challenges faced by SMEs in implementing Kaizen for sustainable construction, this research seeks to contribute to the development of more

effective training programs, improved management practices, and ultimately, better outcomes in waste minimization and resource utilization in the construction industry.

1.3 Research Questions

1. What is the current awareness of sustainable construction practices among SMEs in the Jimma Zone?
2. What are the key factors influencing the implementation of sustainable construction practices through Kaizen methods in the Jimma Zone?
3. What are the main challenges SMEs face when adopting sustainable construction practices in the Jimma Zone?
4. How do the identified factors and challenges impact the effectiveness of implementing sustainable construction practices through Kaizen methods in the Jimma Zone?

1.4 Objectives

1.4.1 General Objectives

To Conduct assessment of the implementation sustainable construction practices through Kaizen methods in SMEs with in the Jimma Zone, focusing on identifying key factors, analyzing challenges, and evaluating the level of awareness these practices

1.4.2 Specific Objectives

1. To assess the awareness of sustainable construction practices among SMEs in the Jimma zone
2. To identify key factors influencing the implementation of sustainable construction practices through kaizen methods in the Jimma zone.
3. To analyze the challenges facing small and medium-sized enterprises (SMEs) adopting sustainable construction practices in the Jimma zone.
4. To evaluate the impact of identified factors and challenges on the implementation of sustainable construction practices through kaizen methods in the Jimma zone.

1.5 Scope of the Study

The scope of this study was limited to conduct assessment of the implementation sustainable construction practices through Kaizen methods in small, medium and large enterprize in the Jimma Zone. Specifically, the study focused on five woredas in the Jimma Zone: Aggroo Town, Saka Coqosa, Assandaboo, Dedoo, Sarboo, and Jimma Town. The researcher used simple randomness. The research methodology involved using questionnaires, site visits, and personal interviews with the project proponents who would undertake the referenced projects.

1.6 Significance of the Study

This thesis is for owners of small, medium and large enterprises and Kaizen operators, would address issues related to productivity improvement for SMEs. By adopting Kaizen principles and utilizing them for implementation and sustainability, SMEs would their objectives throughout the project lifecycle. Adopting Kaizen principles has also been observed to bring about positive changes in sustainability for small and medium-sized (SMEs). Other businesses or individuals could the study's findings to implement policies embraced by SMEs' management, employees, and members. These findings could also have been used to change employee attitudes and improve how the construction industry engages SMEs in project execution, aiming to reduce waste and expedite work processes. Ultimately, the findings of this study could advantages to the sustainable construction practices being investigated.

1.7 Structure of the Study

The Organization of the study is divided in different chapters, as follows:

Chapter 1. Introduction: This section provides a background of the topic researched in this study. The main idea of this chapter is to explain the background of the problem, the objectives, and the contribution made by this project.

Chapter 2. Literature Review: This chapter provides information about the main subjects of this thesis: a comprehensive assessment of key factors, challenges, and awareness in implementing sustainable construction practices through kaizen methods in small and medium-sized enterprises (SMEs) in the Jimma Zone.

Chapter 3. Methodology: This chapter provides the plan of the research. In other words, this section explains the research paradigm, approaches, strategies, and data collection methods. This project uses a case study strategy to confirm or reject the propositions.

Chapter 4. Results and Discussions: This section provides the results for each stage of work and discusses the research study.

Chapter 5. Conclusion and Recommendation: This section provides the conclusion for each discussion of work and the recommendations of the research study.

CHAPTER 2

LITERATURE REVIEW

2.1 Concept and Definition of Kaizen

Scholars have defined kaizen differently. Accordingly, kaizen is described as the spirit of improvement founded on dedication and teamwork; it is equally applicable in social, familial, professional, and personal spheres (Brunet, 2000). "The goal of Kaizen in the workplace is continual (and comparatively costly) improvement involving all employees, managers, and upper management" (Imai, 1986). The term "kaizen" refers to a process of continuous improvement of the work and is a compound word involving two concepts: Kai (means change) and Zen (means for the better).

Darius (2011) further explained the concept of KAIZEN as a compound word involving two concepts: Kai (change) and Zen (Good, go to better), loosely translated as “change to the better “or continuous improvement. Kaizen is a way of thinking, and it extends into personal life as a “life philosophy”: “Tomorrow must be better than today.”

According to Imai, the Kaizen philosophy distinguishes Japanese management from Western concepts. It focuses on a process-oriented way of thinking as opposed to a Western focus on innovation and result orientation. Kaizen activities have developed and spread among other Japanese manufacturers as they gained fame in the international market for high-quality products and later to the rest of the world (Development & Forum, 2009).

The phrase “change for the better” implied any change that resulted in improvement. It could be quality or other factors that customers or an organization consider valuable. Such as innovation, ease of use, on-time delivery, durability, operations flexibility, customer satisfaction, and low cost (Zimmerman, 1991). In fact, Kaizen stands by the philosophy that it is unnecessary to look for explosive or sudden changes to improve organizations; any improvement or reform will bring productivity enhancement if it is continuous and constant (Thessaloniki, 2006).



Figure 2.1 Kaizen Umbrella Figure

Source: Imai (1986, P.4)

As shown in Figure 2.1, Kaizen is an umbrella concept covering most of those “uniquely Japanese” practices “like customer orientation, TQC (total quality control), robotics, QC circles, suggestion systems, automation, discipline in the workplace, TPM (total productive maintenance), Kanban, quality improvement, zero defects, small-group activities, cooperative labor-management relations, productivity improvement, and new product development.” These principles and tools helped Japanese companies develop process-oriented thinking that assure continued improvement involving people at all levels. Imai reduced the principles and tools to one word under the Umbrella (Imai, 1986).

2.2 Productivity Cycle

As indicated in Figure 2.2, which shows the productivity cycle schematically (David, 1979), at any given time, an organization that is in the midst of an ongoing “productivity

program" may be involved in one of the four stages or phases: productivity measurement, productivity evaluation, productivity planning, or productivity improvement. Four phases are abbreviated as MEPI, where "M," "E," "P," and "I" stand, respectively, for Measurement, Evaluation, Planning, and Improvement; an organization that begins a formal productivity program for the first time can start with productivity measurement, and once the productivity levels are measured, and have to be evaluated or compared against planned values. Based on this evaluation, target productivity levels are scheduled for short- or long-term.

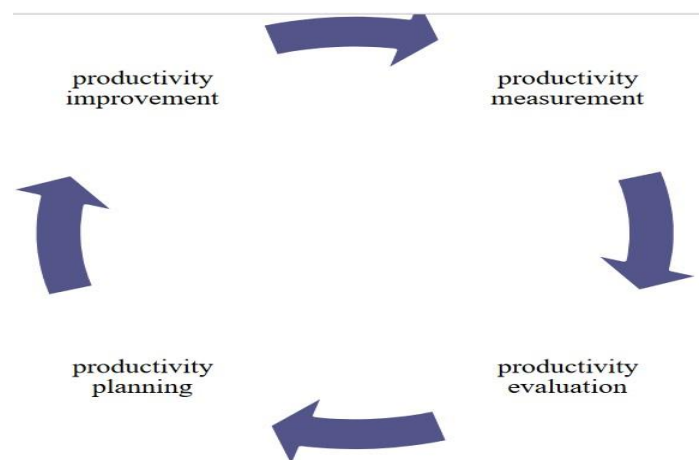


Figure 2.2 The Productive Cycle
Source: Researcher Design

Productivity measurement, evaluation, planning, and improvement, which form a continuous process, are abbreviated PMEPI (David, 1979). To achieve the planned targets, productivity improvement formally takes place. Productivity levels must be measured again to assess the degree to which improvement will occur next period. This cycle thus continues for as long as the productivity program operates in the organization. The productivity cycle concept shows that improvement must be preceded by measurement, evaluation, and planning. All four phases are important, not just productivity measurement or productivity improvement. Also, this cycle emphasizes the "process" nature of the productivity issue. A productivity program is not a one-time project but a continuous process (David, 1979).

Kaizen implementations within the organization develop important skills like problem-solving, teamwork, acquiring training, finding a solution independently, etc. Hence,

workers become thinking workers and are more conscious of their static position. This cumulative, gradual, and continuous change helps to realize large-scale innovations by implementing BPR or benchmarking (Assefa, 2014). Assefa also argues that a re-engineered enterprise introduced dynamism and awakened the organization from its traditional position. It might have acquired a culture for change and improvement, which is helpful to implement Kaizen. He also claimed that the other way around, after a radical change in the process, continuous improvement would perhaps be seen as contributing to adjustments.

2.3 Ethiopian Experience of Kaizen

The government of Ethiopia implemented organizational performance and effectiveness before implementing kaizen, called business process re-engineering (BPR), shortly after the introduction of a nationwide BPR. According to Mekonnen (2017), the government of Ethiopia has embarked on reforming its civil service organizations to improve the public sector service delivery system.

It was applied in government bureaus, an idea introduced to bring radical changes among state institutions. However, in the process, it virtually stalled them for months and is now widely deemed a failure. The Ethiopian government started advocating kaizen, a Japanese management philosophy, among private and state-owned companies; the idea was first brought to the attention of Ethiopia's late Prime Minister Meles Zenawi.

In this instant, the government of Ethiopia, inspired by the practicality of Kaizen policy and strategy, adopted an exemplary approach. In 2008, the government of Ethiopia, as a result, requested that the Japanese government help Ethiopia establish the Japanese management technique known as kaizen. Before implementing and fully institutionalizing the kaizen unit on a large scale, the Ethiopian Ministry of Industry and Trade (MOIT) reviewed about 63 companies in 2009 that were located within 100 km of Addis Ababa to ascertain their quality and productivity status from October 2009 to June 2011. After a preliminary diagnosis of the 63 companies, only 30 (i.e., 10 from metal, six from agro-processing, six from chemicals, four from leather, and four from textiles) were chosen as pilot projects. From this, the Ethiopian Kaizen Institute has awarded ten, five, and three companies good, best, and excellent status (EKI, 2017).

2.4 Kaizen Tools/ Basic Technologies to Promote Kaizen

2.4.1 5S's

Ishiwata (2009) defined the 5S's as a system of steps and procedures that can be applied to individuals and teams to arrange work areas in the best manner and condition to optimize performance, comfort, safety, and cleanliness.

Sorting: A process that involves selecting what you need to complete the job and removing everything else from your work area. It focuses on removing all unnecessary items from the workplace. Thus, applying it to workplaces will increase financial income by selling unwanted material.

Set in order: Straightening specifically customizes your workstation and surrounding area to meet your work area needs. Arrange the remaining items so they are easy to select, use, and return to their proper location. Hence, it helps to use time and material effectively and efficiently properly. It focuses on efficient storage and location methods. In simplest terms, “a place for everything and everything in its place.”.

Shine: Its emphasis is on removing dust, dirt, and grime. It focuses on cleaning up the place now that all the disorder and trash have been removed. One benefit of this step is to make the workplace cleaner and brighter, where everyone will enjoy working.

Standardize: Standardizing creates a work area free of checklists; if appropriate standards are put in place, it will be easier to maintain and continue improving. By implementing this, we ensure that the first three steps are maintained. The Japanese management concept boils down to one concept: maintain and improve standards, which help adhere to current technological, managerial, and operating standards while also improving current processes.

Sustain: The idea behind Sustain is that implementing the 5S will demand from workers the compact self-discipline connected with implementing and obeying the rules of regularity in cleaning and sorting. It leads to increasing the consciousness of staff, decreasing the number of non-conforming products and processes, improving internal communication, and, through this, improving human relations. It is also important to understand the need for routine inspections of using the 5S rule. This inspection is

executed by using a so-called checklist and creating, on its basis, the radar graph of the 5S, which serves as an estimation of the workplace. The inspection of the realization of the 5S rule is executed monthly by the chosen team implementing the 5S rule, the control team (Shubhangi & Gurway, 2016).

2.4.2 Waste (Muda) Elimination

According to Imai (1997), Muda is any non-value-added task. Eliminating muda can be the most cost-effective way of improving productivity and reducing operating costs. Imai classified seven muda (waste) in Gemba and categories: Waste Elimination is the muda or elimination of non-value-adding activities, which includes removing unnecessary waste caused by people and machines.

Muda of Overproduction

Is it a function of the mentality of the line supervisor to be on the safe side due to uncertainties of machine filers, rejects, and absentees? It results in raw material conception before they are needed, wasteful input of utilities and manpower, machinery additions, increased interest burdens, additional space to store, excess inventory, transportation, and administrative costs. As a result, trying to produce more than needed products creates misuse of raw materials, wasteful inputs of manpower and utilities, an increased burden on interest payments, added transportation, additional space required to store excess inventory, and administrative costs (Thawani, 2003; Thessaloniki, 2006).

Muda of Inventory

Products in the inventory do not add value to the organization; rather, they occupy warehouse space and demand additional facilities such as warehouses and forklifts. When market tests or needs change, product quality gets worse and may even become obsolete over time. Items in the inventory gather dust (no value added), and their quality depreciates. When an inventory level is high, nobody gets enough to deal with problems like quality, absenteeism, and machine downtime, which leaves little room for Kaizen. A lower inventory level, however, helps identify areas of problems and forces us to deal with issues as they arise. He also asserted that Kaizen is a mandatory daily activity when the inventory level goes down and reaches the one-piece flow line. An excess of

the final product, semi-finished product, raw materials, and spare parts in inventory contributes to the Muda of inventory. They do not add value. Instead, they add to the cost of operations by occupying space, requiring additional equipment and facilities such as warehouses and forklifts. As the products stored deteriorate over time, they could eventually become obsolete. As suggested by Thessaloniki (2006), Just-in-time (JIT) production systems help to solve the Muda of inventory.

Muda of Repair or Rejects (defects)

Rejects interrupt production and require expensive rework. In today's mass production environment, a malfunctioning, high-speed automated machine can spew many defective products before the problem is detected. As further discussed, too much paperwork and design changes will result in much rework. The Muda of repairs and rejects interrupts production. It contributes to a great waste of resources and effort. In addition, rejects increase inspection work, require expensive rework, or require additional time to repair (Thessaloniki, (2006).

Muda of Motion

Excessive movements by workers, like walking, lifting, or carrying heavy objects while searching for lost items, create waste. In short, motion is unproductive because it involves movements by workers not directly related to the job, such as poor workplace organization, resulting in poor ergonomics, for example, excessive bending or stretching (Mezgebe, Asgedom, & Desta, 2013). Thus, workers should avoid walking, lifting, or carrying heavy objects that require great physical exertion because they are difficult, risky, and represent non-value-added activities (Thessaloniki, 2006). Rearranging the workplace would eliminate unnecessary human movement and eliminate the requirement of having another operator do his or her work more efficiently

Muda of Processing

At every step in which a workpiece or piece of information is worked on, value is added and sent to the next process. Imai refers to the Muda of processing and modifying a workpiece or information. He also mentioned that inadequate technology or design and failure to synchronize processes lead to Muda in processing. As Thawani (2003)

suggested, eliminating muda in processing can frequently be avoided by combining operations or steps.

Muda of Waiting

Muda of waiting occurs when the hands of the operator are ideal due to line imbalances, a lack of parts, or machine downtime—monitoring the machine when the machine is performing a value-added job. The Ethiopian Kaizen manual refers to the muda of waiting due to ideal human and machine factors. As narrated by Thessaloniki (2006), lead time begins when the company pays for its raw materials and supplies and ends when it receives customer payment for products sold. Since lead time represents the turnover of money, a shorter lead time means better use of resources, more flexibility in meeting customer needs, and, of course, contributes to lowering operation costs.

Muda of Transportation

Though transportation in the workplace is an essential part of operations, moving materials or products adds no value. Stressed elimination of this muda will improve workplace operations. Unnecessary transport of damaged materials (muda) contributes to waste because transportation does not add value to the finished product. As stated by Thawani (2003), one way of minimizing waste is by incorporating the act of any process into the main line.

2.4.3 Standardization

Standardizing work means developing standards at which production must be performed. A simpler way to think about standards is that production will be done to set specifications. In Kaizen expressions, managers should implement the standardized-check-act (SDCA) cycle (Imai, 1997).

Once the standards are in place and followed, the workers will know there is a problem if there are deviations. It is a never-ending process and is better explained and presented by the PDCA cycle (plan means identify aspects and impacts by implementing goals and objectives; do means implement, including training and Operational control measures (check means assess the measurements and report results to decision-makers,

and act means to decide on changes needed to improve the process), known as the Deming cycle, shown in Figure 2.3 below.

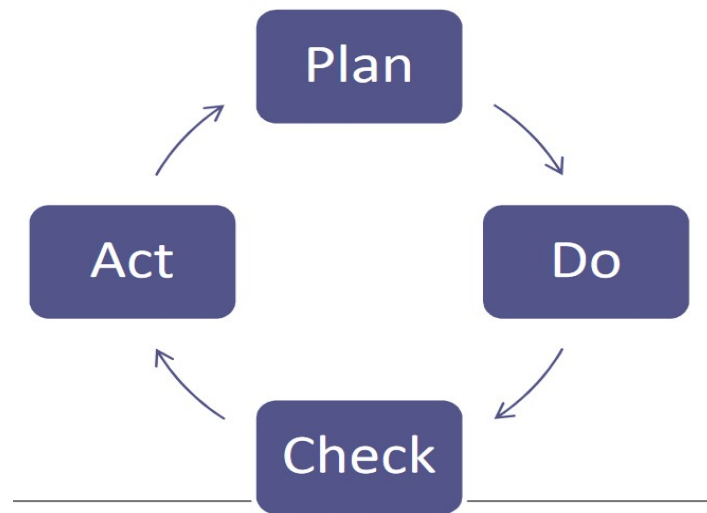


Figure 2.3 PDCA-Plan, Do, Check, and Act/Deming Cycle
Source: Researcher's own Creation Design

2.5 Ethiopian Micro and Small Enterprise Development Strategy

Concerning Gebrehiwot & Wolday (1997), the development strategy was reviewed and revised in response to urgently growing needs prevailing in the country. The revised micro- and small-enterprise development strategy in the Amharic version was formulated in 2010 and officially endorsed by the cabinet in January 2011. The revised MSEs strategy involved the whole planning exercise, including situation analysis, review of relevant development policies related to the sub-sectors, analysis of currently available means of intervention, formulation of the revised strategy, including re-defining MSEs, discussion of micro and small enterprises contribution toward the national economy, setting up updated policy directives and targets, as well as an institutional framework and supporting mechanisms and schemes, and budgetary arrangements. In so doing, five countries were benchmarks for the study, including India, Malaysia, the Philippines, Indonesia, and Japan. Regarding strategy, among various findings and policy recommendations made, micro and small enterprises are re-defined (Yodit, 2015).

Table 2.1 A New Definition of Micro and Small Enterprise

Source: Former MOTI, Revised Micro and Small Enterprises Development Policy and Strategy (draft)

Term	Sector	Capital	No. of person
Microenterprises	Industry	Not exceeding Birr100,000	≤ 5
	Service	Not exceeding Birr 50,000	≤ 5
Small- enterprises	Industry	Birr 100,001 to Birr1,500,000	6 to 30
	Service	Birr 50,001 to Birr 500,000	6 to 30

The study further suggested the development scenario of MSEs by attempting to categorize MSEs into three groups: (A) broadly. Start-up, (B) growth, and (C) maturity, following various aspects of the capabilities of human resources development, infrastructure facilities and development, financing, information management, marketing, and technological research and development. The revised strategy presents a sequential scenario to bring MSEs from a start-up state to growth, expecting that MSEs at the maturity stage may enter the medium and large companies category for further growth. To assist MSEs in this development scenario, the revised MSEs development strategy attempts to articulate supporting schemes, including a governance system and role demarcation among public agencies, including MOE, TVET, the National Bank, and other stakeholders, a monitoring system, a legal framework relating to business registration and licensing, as well as procedures and mechanisms to assess financial skill development and upgrading, management consultancy skills, marketing supports, clustering and incubating supports, technological development support, information management support, institutional capacity building support, and women and youth support. The revised strategy attempted to categorize MSEs by the type of businesses or sub-sectors of industries (Henok, 2016).

Table 2.2 Categories of Prioritized SME in Terms of Type Industry

Source: Former MOTI, Revised Micro and Small Enterprises Development Policy and Strategy (draft)

No	No Group	No Group Sub-sector
1	Manufacturing	1. Textile and apparel 5. Leather Goods. 2. Agro-processing 6. Electrical and electronics. 3. Metal Engineering 7. Packaging and 4. Woodworking 8. Food and beverage.
2	Agri-business	☐ Urban agriculture is linked with processing. ☐ Modern commercial poultry linked with processing. ☐ Modern commercial animal husbandry is linked with processing. ☐ Apiculture is linked with processing. ☐ Modern animal feed processing.
3	Construction	☐ Rural road works. ☐ Low-cost housing construction. ☐ Production and supply of construction materials.
4	Trade	• Local products wholesale. • Raw materials suppliers to SMEs. • Exclusively local products retail shops
5	Service	☐ ICT ☐ Maintenance support for the strategic industries. ☐ Eco-tourism. ☐ Cooperative-based resort. ☐ Low-cost rural transport. ☐ Storage container and packaging services

2.6 Analytical Framework

Kaizen is a system of continual undertaking by an organization to improve its business activities and processes, always improving the quality of products and services so that customers are satisfied. Kaizen can be built in and run with an integrated and company-wide approach through the collaboration of all levels of the organization, including top management, middle managers, and front-line employees. The commitment, genuine participation, and motivation of all three actors are critical factors. Kaizen normally places the foremost importance on improvements at the front-line workplaces as the foundation of all the improvement efforts.

According to EKI (2016), Kaizen contains three pillars: kaizen tools, kaizen systems, and kaizen philosophy. Kaizen tools like 5s and Kaizen Board 7cc are important for

implementing Kaizen. Kaizen systems are an integral part of an established management system that aims to involve employees in Kaizen. Kaizen improved productivity and quality, better safety, faster delivery, lower costs, and greater customer satisfaction. Furthermore, employees find work easier and more enjoyable, resulting in higher employee morale and lower turnover. Outcomes include reduction in waste in areas such as inventory, waiting times, transportation, worker motion, employee skills, overproduction, excess quality, and in-processes; improvement in space utilization, product quality, and use of capital; communications; production capacity; and employee retention; and immediate results. Instead of focusing on large, capital-intensive improvements, Kaizen focuses on creative investments that continually solve large numbers of small problems.

The real power of Kaizen is in the ongoing process of continually making small improvements that improve overall processes and reduce waste. Kaizen will reduce costs, space requirements, and cycle time. Of course, since it is continuous, as soon as one set of problems is solved, new problems occur, which must be overcome. By going through this process, the production system becomes stronger and stronger (Henok, 2016).

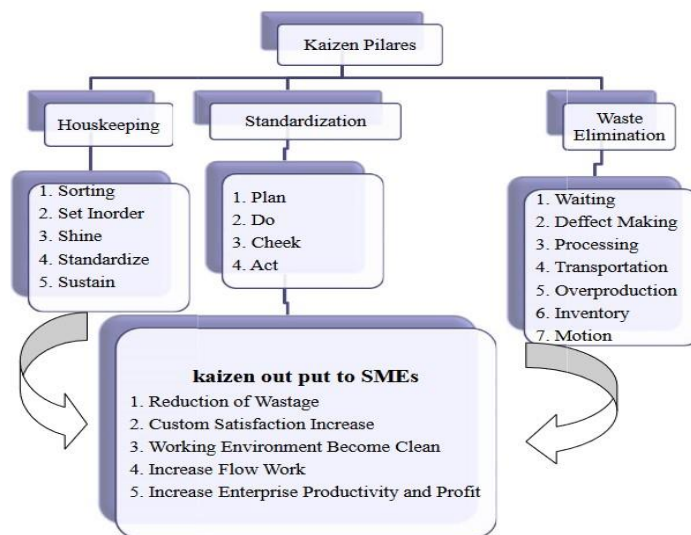


Figure 2.4 Analytical Framework
Source: Researcher Creation Design

2.7 The Potential Application of Kaizen in the Construction Industry

Kaizen is concerned with reducing waste in a particular process by incrementally addressing the existing process before or when it occurs. The processes here may be in the project planning or construction phase. Although kaizen has not been used in most construction industries, a kaizen model was developed by Vivian et al. (2015) based on an action research strategy using 76 building projects in Brazil. The results showed that the overall cost of the building decreased drastically for the project. Kaizen was applied during construction to reduce costs. Kaizen costing is the cost-reduction mechanism of kaizen during production. The model developed by Vivan et al. (2015) also eliminated the myth of standardization for production in construction during the action research process. Authors such as Kaur and Kaur (2013),

Martin (1993) and Smadi identified using kaizen and kaizen costing for offsite building components and construction manufacturing. The case studies were conducted in the metal industry at a large construction and concrete company by Savolainen (1999) and empirically discussed the understanding and adoption of kaizen processes. The findings reveal that the Kaizen adoption process is iterative, and the speed of implementation differs between these two companies. Omotayo and Kulatunga (2017) developed an IDEF0 model for applying kaizen in construction. Omotayo and Kulatunga (2017) proposed a plan-do-check-act approach in the key construction process phases, such as interim valuation, cash flow calculations, and monitoring of building material cost, plant, and labor. These implementations of the aforementioned construction process were not considered from a case study point of view. Imai (2012) authored a comprehensive approach to applying kaizen in the workplace, such as Gemba kaizen.

The continuous improvement approach is a managerial strategy for deciphering key problems within the workplace before they occur. Further studies of gemba kaizen in construction were conducted by Omotayo and Kulatunga (2017) within the confines of business process modeling and notation for improving small and medium-scale construction businesses. Using new techniques to enhance the productivity of construction companies is crucial in the current economic climate. Consequently, the criteria for adopting kaizen must be explored. The critical success factors (CSF) for analyzing the adoptable mechanisms for kaizen in the construction economies of

developed and developing countries may be similar. However, previous research and applications indicated a vast acceptance of kaizen in developing countries.

2.8. Divers for Implementing Kaizen in the Construction Industry

The strategies other researchers have suggested for implementing kaizen in countries worldwide can be applied to the Nigerian construction industry. These strategies can be categorized as they relate to the various sections of the kaizen process within a construction industry for the company and the construction process. Additionally, the CSF in this section is from third-world countries (such as China, Brazil, and India) similar to the Nigerian construction industry. Most third-world construction industries have similar challenges, such as cost overruns, project financing, and small and medium-scale construction companies facing stiff competition from multinational construction companies. The challenges faced by third-world construction companies are, therefore, very similar (Ballesteros-Pérez et al., 2015; Guo et al., 2016; Amoatey et al., 2015), allowing for consideration of strategic transferability.

Shang and Pheng (2013) investigated the challenges facing the implementation of Kaizen in Chinese construction companies by interviewing project managers. The findings show that Chinese construction organizations do not have a culture of exposing problems within the business because it can lead to losses. The nature of organizations in China is such that minor problems can be perceived as major problems, leading to covering up minor problems. Kaizen demands the identification of difficulties that can lead to waste and the elimination of them (Suárez-Barraza et al., 2011). Shang and Pheng (2013) further stated that most project managers in China decide to compress the project duration even though the project cannot be completed in such an unrealistic time frame.

The author also stated that Kaizen could not work in this instance because there would be intense pressure to finish a project without considering the quality. The final challenge involves the inadequacy of construction professionals with a pertinent understanding of how kaizen works. It was noted that Chinese construction companies are facing the challenge of a few construction professionals with a sense of kaizen. Although most construction companies envy the success stories of Japanese production, they do not have the required kaizen skills. Drawing from the experiences of Shang and

Pheng (2013) in implementing kaizen in construction companies in China, the CSF is related to identifying strategies for implementing kaizen as a strategy and kaizen costing in a company.

Although there are no directly identified implementation strategies for the Nigerian context, there are basic requirements for kaizen implementation in terms of CSF in developing countries such as Brazil, China, and India. Hang and Pheng (2013), Arya and Jain (2014), Puvanasvaran et al. (2011), Berger (1997), Chukwubuikem et al. (2013), and Magnier-Watanabe (2011) have identified several CSFs required for the implementation of Kaizen costing in a company. Some of these strategies could be called enablers, or CSF required for kaizen costing. These CSFs have been categorized as follows:

Organizational Structure: Magnier-Watanabe (2011) noted that “kaizen required a horizontal organization structure and opportunistic knowledge acquisition.” Kaizen requires a lot of communication and teamwork, and a less bureaucratic management structure. This allows a lot of information to flow within the organization, fostering an improved relationship between the employer and the employees. For kaizen costing to be effective, there is a need for an ad hoc, collective, and innovative system within the organization.

Construction Process Standardization: If Kaizen costing is used, the construction process must be improved to a more standardized method (Shang and Pheng, 2013). Most construction companies’ modus operandi depends on the nature of the project, organization policy, and regulatory bodies.

Government and Regulatory Bodies: Government policies, politics, and construction regulatory bodies influence various construction industries around the world. If these bodies do not approve kaizen costing as a means of post-contract cost control, they cannot be used. However, some construction regulatory bodies are very flexible and do not get involved in innovation within construction companies.

Contract Documentation and Procurement: The type of procurement process adopted can affect the project's cost. A design-and-build system will be different from the traditional procurement system. Therefore, contractors can have more resources to

implement kaizen costing during a project and create their team. Also, the level of involvement of stakeholders in the project goes a long way during the construction process. Clarity of exclusions and accuracy of estimates can also influence the time available for kaizen activities.

Financial Risk Management: Quantity surveyors and project managers are mainly involved in managing the financial risk that can arise from price fluctuations, inflation, changes in the building design, variation, claims, theft, fraudulent practices, kickbacks, payment delays, and suppliers' and subcontractors' costs. These factors, along with the preliminary items of work, can affect the financial position of a construction project, thereby affecting the success of kaizen costing.

Communication and Teamwork: Kaizen costing activities on site cannot involve the cost or project managers alone but a Kaizen team. This team will have to work with every stakeholder, including the suppliers of building materials, clients, and subcontractors. Communication is essential during the implementation of Kaizen costing. Therefore, regular site meetings and post-project review meetings are necessary. In most cases where BIM is implemented during the pre-tender process, communication can be easier with other stakeholders.

Decision Making: The decision made by the cost or project manager during kaizen implementation and follow-up can affect the overall performance of kaizen costing. The contractor or management function in cost management has to make final decisions about claims or litigation that can affect the implementation process of kaizen costing. Shang and Pheng (2013) noted that the construction company needs to see "problems as opportunities" in order to make the best decisions during kaizen activities.

Relationship Management: In most situations where claims are raised by the subcontractor or contractor, relationship management is needed between the stakeholders. The availability of resources to execute kaizen costing during construction depends on the relationship between the contractor quantity surveyor and the client.

2.9 Sustainable Construction

The term sustainable construction was originally proposed to describe the construction industry's responsibility in attaining sustainability (Ogunbiyi & Oyedolapo, 2014). The concept of sustainable construction addresses three main pillars: environmental protection, social well-being, and economic prosperity (Steve & Odek, 2013). Sustainable construction integrates environmental, social, and financial considerations into business strategies and practices.

According to Steve and Odek (2016), sustainable construction is the set of processes by which a profitable and competitive industry delivers built assets (buildings, structures, supporting infrastructure, and their immediate surroundings) that enhance the quality of life and offer customer satisfaction; offer flexibility and the potential to cater for user changes in the future; provide and support desirable natural and social environments; and maximize the efficient use of resources. Given this, sustainable construction can achieve many benefits, including environmental, economic, social, health, and community benefits. The ecological benefits are improved air and water quality, reduced energy and water consumption, and reduced waste disposal.

2.9.1 Principles of Sustainable Construction

To make sure building developments are as sustainable as possible, environmental factors such as the seven (7) principles of sustainable construction. The principles cover Sustainable design, Durability, Energy efficiency, Waste reduction, Indoor air quality, Water conservation, and Sustainable building materials must be considered from the very earliest stages of the building establishment. These principles of sustainable construction are a method for contributing to a greener built environment while reducing our overall carbon footprint. These sustainable movements have become more and more prevalent since the release of the Climate Change Act (2013), the UK Government's 2025 strategy, which set a target of 50% reduction in greenhouse gas emissions in the built environment by 2025.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter discusses the research methodology employed to assess the key factors, challenges, and awareness in implementing sustainable construction practices through Kaizen methods in small and medium-sized enterprises in Jimma town construction projects. The research design, data collection methods, and analytical techniques are described in detail to provide a comprehensive overview of the approach taken in this study.

3.1 Research Area

The study area is conducted at Jimma Zone and Jimma town, southwestern Ethiopia, which is located in Oromia regional state and is 355 km distance from the capital city of Ethiopia.

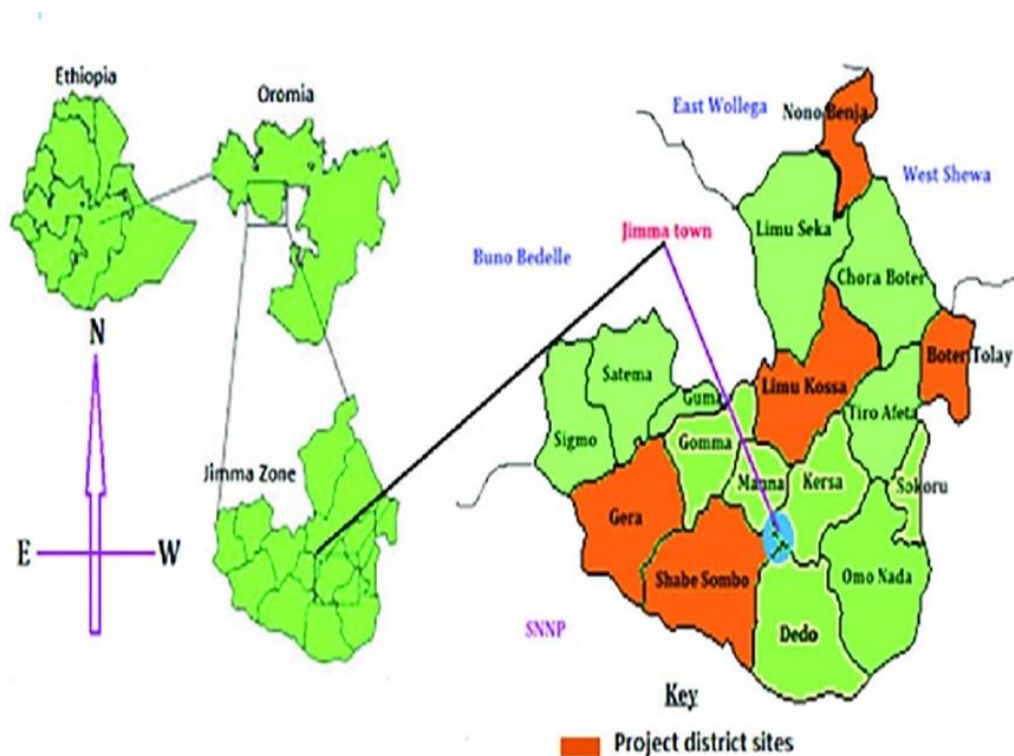


Figure 3.1 Map of the Jimma Zone Oromia, Ethiopia

<https://doi.org/10.1371/journal.pone.0235189.g001>

3.2 Research Design

The research design for this study can be a mixed approach, integrating both quantitative and qualitative methods. This design allows for gathering diverse data types, providing a comprehensive understanding of the research problem (Creswell, 2009). The study examines the key factors, awareness and challenges of implementing the Kaizen Method to attain sustainable construction practices. To achieve this goal, a descriptive survey research design has used.

As described by C.R. Kothari (1985), descriptive research focuses on ongoing processes, felt impacts, existing relationships, prevalent practices, beliefs, points of view, and attitudes held by individuals. In this study, a mixed-methods approach combining quantitative and qualitative techniques can be utilized to address the core research questions.

3.3 Study Variables

The research data can be collected mainly through interviews and questionnaires. Field observations through site visits will also be employed to gather data on high-waste-generating sustainable construction practices.

Dependent Variable:

- Implementation of Sustainable Construction Practices Through Kaizen Methods in SMEs.

Independent Variables:

- Awareness and Understanding of Sustainable Construction Practices
- Challenges Faced by SMEs in Implementing Sustainable Practices.
- Key Factors Influencing the Implementation of Sustainable Practices.
- Impact of Identified Factors and Challenges on Implementation.

3.4 Source of Data

This study can use both primary and secondary sources of data.

- The primary data sources are the construction industry bureau, job and creation records, enterprise owners and operators, TVET Deans and Vice Deans, and the Micro and Small Enterprise offices.
- Secondary data was obtained from books, journals, pamphlets, brochures, thesis papers, and documents from the job creation and construction industry bure.

3.5 Population and Sampling Method

3.5.1 Sample Size, Target Populations, and Techniques

The aim of the Comprehensive Assessment of Key Factors, Challenges, And Awareness in Implementing Sustainable Construction Practices Through Kaizen Methods in Small and Medium-Sized Enterprises (SMEs) in the Jimma Zone. For the quantitative study, the researcher can use a simple random sampling technique, where 50 SMEs were selected as the sample from 84 SMEs and 93 populations from a total of 420 people. Each enterprise was chosen entirely by chance, ensuring each member had an equal chance of being included in the sample.

Purposive or judgmental sampling techniques can be used for the qualitative aspect of the study. Purposive sampling is useful in these instances as it provides a wide range of non-probability sampling techniques for the researcher to draw on. When undertaking the qualitative aspect of the study, the researcher first purposively selected small and medium enterprises (SMEs) among the five (5) in Jimma Zone.

According to Kumar (1999), the size of the sample is determined by the population; based on this statement, the sampling approach Since the selected SMEs will be used to choose Aggroo Town, Saka Coqosa, Assandaboo, Dedoo, Sarboo, and Jimma Town, based on this, 50 respondents can be selected through simple random sampling from a total of 84 SMEs. This was include seven (7) SMEs from Jimma Town, five (5) enterprise owners from Saqa Coqorsa, ten (10) from Asandabo, six (6) from Sarboo, and thirteen (13) small businesses each from Aggroo Town. Eight (8) Dedo-based business owners will be chosen.

The number of interviewees was determined using semi-structured interviews based on related responses from the majority of respondents and 12 key informants. The sample size can be calculated using a simplified formula, as determined by Al-Moghany (2006).

$$SS = \frac{Z^2 \times P \times (1-P)}{C^2} \text{-----} \{Equation 3.1\}$$

Where SS = Sample size

Z = Z value (e.g., 1.96 for 95% confidence level)

P = percentage picking a choice, expressed as a decimal (0.50 used for sample size needed).

C = margin of error (9%)

$$SS = \frac{1.96^2 \times 0.05 \times (1-0.05)}{0.09^2} = 119$$

Correction for Finite Sample: -

$$Ss \text{ new} = 1 + \frac{\frac{SS}{POP} - 1}{\frac{SS}{POP}} \text{-----} \{Equation 3.2\}$$

Where: Total sampled of SME construction Sectors = 84 SME match the proposed contracting companies

$$Ss \text{ new SME} = 1 + \frac{\frac{119}{84} - 1}{\frac{119}{84}} \quad \text{Total SME Construction Sectors} = 50$$

a. SME Aggaro = 22

$$Ss \text{ new} = \frac{50 \times 22}{84} = 13 \text{ SME Construction Sectors}$$

b. SME Assandabo = 17

$$Ss \text{ new} = \frac{50 \times 17}{84} = 10 \text{ SME Construction Sectors}$$

c. SME Dedoo = 14

$$Ss \text{ new} = \frac{50 \times 14}{84} = 8 \text{ SME Construction Sectors}$$

d. SME Sarboo = 11

$$Ss \text{ new} = \frac{50 \times 11}{84} = 6 \text{ SME Construction Sectors}$$

e. *SME Saqaa* = 8

$$Ss \text{ new} = \frac{50 \times 8}{84} = 5 \text{ SME Construction Sectors}$$

f. *SME Jimma Town* = 12

$$Ss \text{ new} = \frac{50 \times 12}{84} = 7 \text{ SME Construction Sectors}$$

Where: Total sampled of in SME people in construction Sectors = 420 people match the proposed contracting companies

$$Ss \text{ new SME} = 1 + \frac{\frac{119}{420}}{1} \quad \text{Total people Construction Sectors} = 93$$

a. *People in SME in Aggaro* = 110

$$Ss \text{ new} = \frac{93 \times 110}{420} = 25 \text{ people in Construction Sectors}$$

b. *People in SME in Assandabo* = 85

$$Ss \text{ new} = \frac{93 \times 85}{420} = 19 \text{ people in Construction Sectors}$$

c. *People in SME in Dedoo* = 70

$$Ss \text{ new} = \frac{93 \times 70}{420} = 15 \text{ people in Construction Sectors}$$

d. *People in SME in Sarboo* = 55

$$Ss \text{ new} = \frac{93 \times 55}{420} = 12 \text{ people in Construction Sectors}$$

e. *People in SME in Saqaa* = 40

$$Ss \text{ new} = \frac{93 \times 40}{420} = 9 \text{ people in Construction Sectors}$$

f. *People in SME in Jimma Town* = 60

$$Ss \text{ new} = \frac{93 \times 60}{420} = 13 \text{ people Construction Sectors}$$

Based on the sampling method and criteria cited above, the researcher selected SME Fifteen (50) and Ninety-three (93) people in construction sectors in Jimma Zone.

3.6 Data Collection Procedure

The data collection for this research was methodically planned and executed to ensure the findings' accuracy, reliability, and validity. The study employed quantitative and qualitative data collection methods, using surveys, interviews, and document analysis to gather comprehensive data.

1. **Survey Distribution and Collection:** A structured questionnaire was designed to gather quantitative data from SMEs in the Jimma Zone. The survey targeted a representative sample of 50 SMEs, with 93 individuals (including SME owners, managers, and key informants) selected to participate.
2. **Distribution and Collection:** The survey was distributed across six woredas, including Aggroo Town, Saka, Coqosa, Assandaboo, Dedoo, Sarboo, and Jimma Town. Of the 93 distributed questionnaires, 89 were returned, resulting in a 95.69% response rate. The data collected were systematically coded and analyzed using SPSS Version 26.
3. **Interviews:** To supplement the survey data, semi-structured interviews were conducted with 12 key informants, including SME owners, managers, and stakeholders from relevant local offices. The interviews aimed to provide deeper insights into the challenges and opportunities in implementing sustainable construction practices through Kaizen methods.
4. **Document Analysis:** Relevant documents, such as policy guidelines, training materials, and sector reports, were reviewed to provide context and support the quantitative and qualitative findings.

3.7 Data Analysis and Presentation

The data analysis and presentation were structured to ensure the findings were interpreted accurately and aligned with the research objectives. Both qualitative and quantitative data were analyzed using appropriate methods, and the results were presented clearly to simplify understanding.

1. **Quantitative Data Analysis:** The quantitative data from the survey were processed using SPSS Version 26. Descriptive statistics were calculated to summarize the data, including frequencies, percentages, means, and standard deviations. The results were then presented in tables and graphs, allowing for a clear and concise visualization of the findings.
2. **Qualitative Data Analysis:** The qualitative data from the interviews were analyzed using related analysis. Key impressions were identified based on frequent patterns in the responses. These sayings were presented in a narrative format, providing deeper insights into the challenges and impacts of implementing sustainable construction practices through Kaizen methods.
3. **Integration and Presentation of Data:** The findings from both the quantitative and qualitative analyses were integrated to provide a complete view of the research problem. The results were presented understandably, with tables, graphs, and narrative descriptions to ensure the data was easily interpreted and related to the research objectives.

3.8 Reliability and Validity

Reliability: To ensure the reliability of the survey data collected for this study, Cronbach's Alpha was calculated for the key constructs measured in the questionnaire. These constructs include the awareness of sustainable construction practices, understanding of Kaizen methods, and the perceived challenges in implementation.

- Cronbach's Alpha Results:
 - Awareness of Sustainable Construction Practices: Cronbach's Alpha = 0.78
 - Understanding of Kaizen Methods: Cronbach's Alpha = 0.75
 - Perceived Challenges in Implementation: Cronbach's Alpha = 0.82

These Cronbach's Alpha values indicate good internal consistency across the items within each construct, suggesting that the survey items reliably measure the intended concepts (Tavakol & Dennick, 2011).

Validity:

- **Content Validity:** The content validity of the survey and interview questions was ensured through a thorough literature review and consultation with experts in sustainable construction and Kaizen methods.
- **Construct Validity:** The strong internal consistency indicated by Cronbach's Alpha also supports the survey's construct validity, ensuring that the items within each construct accurately measure the same underlying concept.
- **Triangulation:** Triangulating the quantitative survey results with qualitative insights from interviews further enhanced the validity of the findings, providing a comprehensive understanding of the research problem.

3.9 Ethical Considerations

To help with the research's data-gathering methods, a letter of cooperation is needed from the chair of restricted construction engineering and management at Jimma University, Jimma Institution of Technology. This letter can offer assistance or a demonstration to the SME chosen at random and on purpose to gather relevant papers and data from it and provide support in collecting data and information.

These were prioritized throughout the data collection process. Participants were informed of the study's purpose and obtained consent before data collection. The respondents' confidentiality was maintained, and the data was used solely for academic purposes.

CHAPTER 4

RESULTS AND DISCUSSIONS

This chapter reviews the data, including discussions of the quantitative results, by answering study-related questions and emphasizing the important conclusions from the questionnaire and interview. The analysis included paragraphs about job title, years of experience, and educational level. The results provided and evaluated in this chapter were obtained by statistical analysis of the data acquired from the questionnaire and interviews using Microsoft Excel.

4.1 Respondents and Enterprise Characteristics

The survey results presented in Table 4.1 highlight that from 93 questionnaires distributed, 89 were successfully returned, yielding an impressive response rate of 95.69%. The breakdown of responses by different Jimma Zone woredas highlights a significant trend:

Table 4.1 Returned Questionnaires from Respondents

No	Respondents	Total Distributed	Total Responded	Percent %
1	Agaroo	25	23	92
2	Assandabo	19	18	94.73
3	Dedo	12	12	100
4	Sarboo	15	14	93.33
5	Saqqa	9	9	100
6	JimmaTown	13	13	100
Sub-Total		93	89	95.69

Table 4.1 above indicates that the Dedo, Saqqa, and Jimma Town Woredas achieved a 100% response rate, indicating high engagement levels and possibly effective survey strategies. Contrastingly, Agaroo had the lowest response rate at 92%, which still reflects a strong return.

4.1.1 Demographic Information of the Respondents

Gender Distribution

The findings regarding gender shown in Table 4.2 indicate a predominant male participation within the surveyed SMEs in the Jimma Zone construction sector. Males constituted 66.3% of respondents, while females made up 33.7%. This disparity raises questions regarding gender inclusivity and the representation of women in the construction workforce.

Table 4.2 Distributions by Gender

Sex of the respondents	Frequency	Percent (%)
Male	59	66.3
Female	30	33.7
sub-total	89	100

Distribution by Age

The survey analyzed the age distribution of respondents, shown in Figure 4.1, crucial for understanding generational perspectives within the SME construction sector. The highest response rate came from individuals aged 26 to 35 years, making up 45% of the total respondents. This demographic is likely to be more adaptable to new technologies and implementation of the Kaizen method in sustainable construction practices.

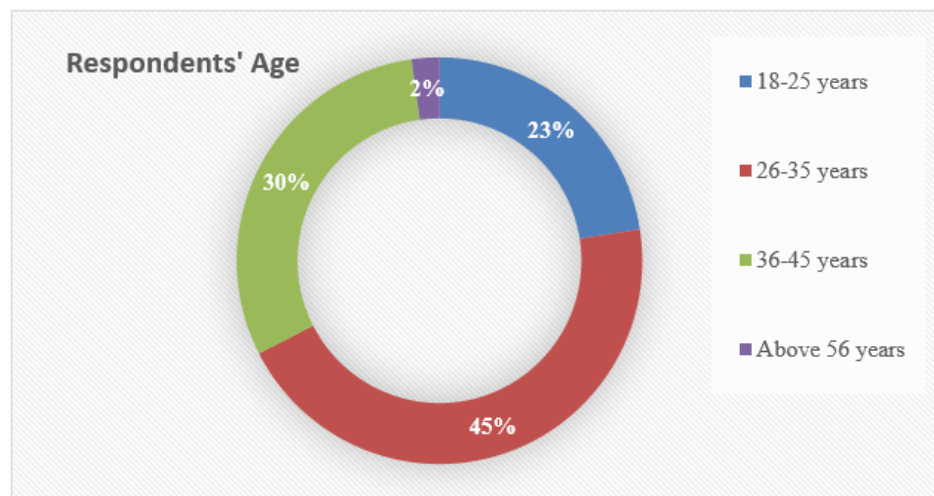


Figure 4.1 Age Distributions of the Respondents

Distribution by Education Level

The level of education was critical in this study, as chapter two indicated, as it exposed the respondents to theoretical concepts that may influence their job performance.

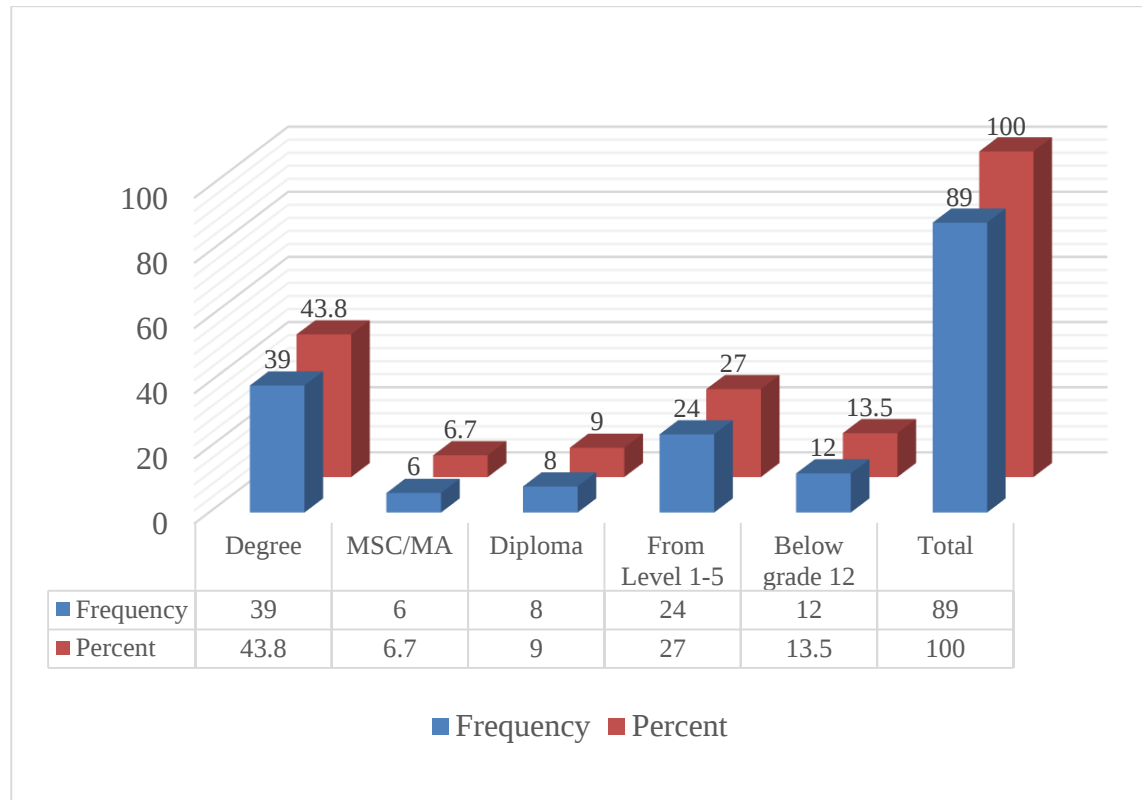


Figure 4.2 Respondents' Educational Level

Figure 4.2 illustrates education significantly influences job performance, particularly in SMEs. The results demonstrate that a substantial portion of respondents held graduate degrees, indicating a workforce with a solid foundation for implementing sustainable construction practices through modern practices.

4.1.2 Enterprise Profile

Years of Establishment

As shown in Figure 4.3 below, findings regarding the establishment year of enterprises indicate a trend: Most sampled enterprises were established between 2014 and 2016 (38%), followed by 2008 to 2010 (31%). This data suggests a healthy growth phase for

the SME construction sector, which is essential for understanding business permanency and sustainability within the construction industry.

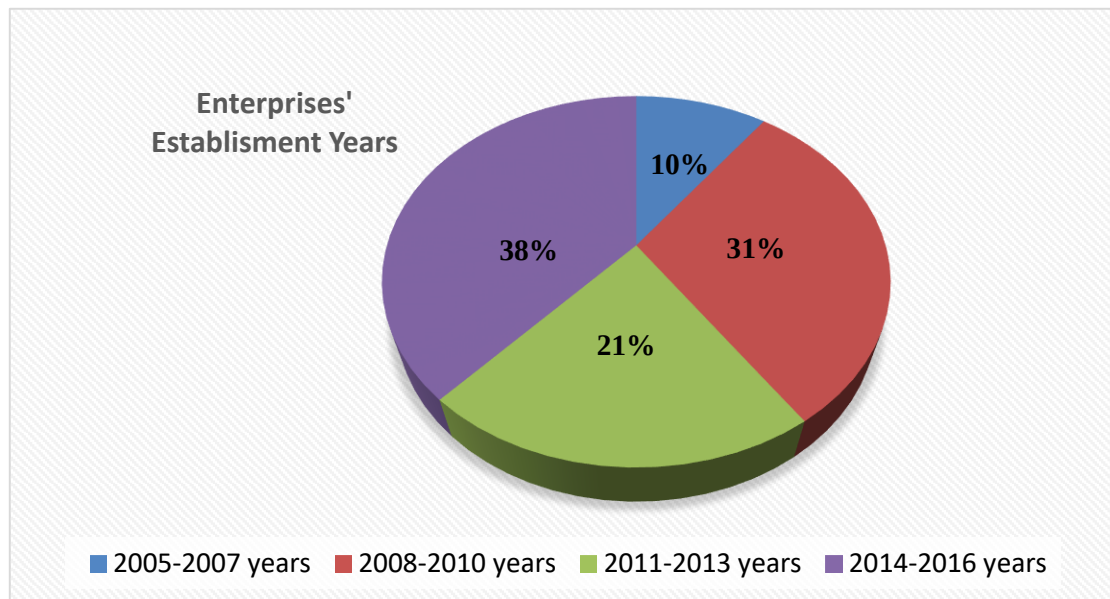


Figure 4.3 Establishments of Years of Enterprise

The survey highlights critical demographic trends crucial for understanding the dynamics within the SME construction sector in Jimma Zone. High response rates, especially among younger, educated males, suggest a potential for innovation and adaptability but highlight gender inequalities that necessitate attention for future workforce diversity initiatives.

Enterprise Size Classification and Respondent Distribution

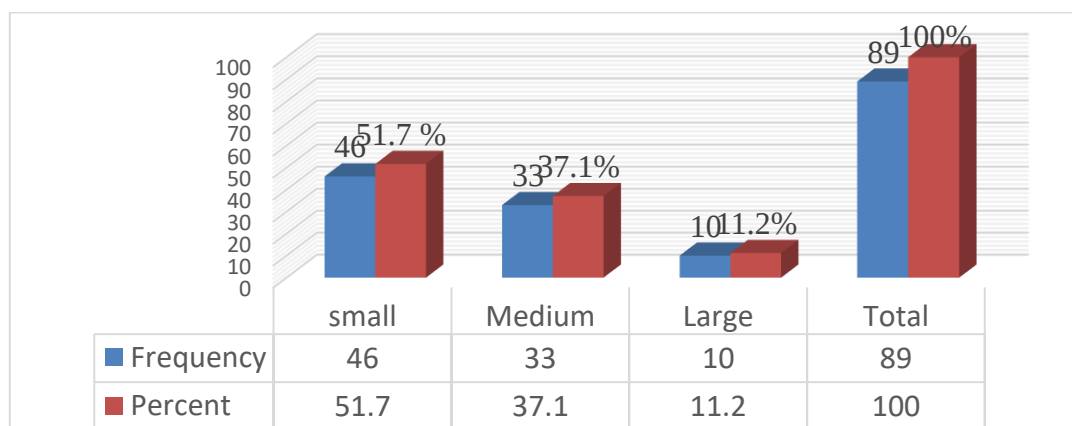


Figure 4.4 Category of Enterprises in Small and Medium Enterprises

As indicated in Figure 4.4 above, categorizing enterprises according to size indicates significant insights into the structure of small and medium enterprises (SMEs) surveyed in the Jimma Zone. Based on the returned questionnaires, the distribution is as follows: small enterprises: 46 responses (51.7%), medium enterprises: 33 responses (37.7%), and large enterprises: 10 responses (11.2%); this distribution indicates that the majority of the sampled enterprises are small, reinforcing the view that SMEs dominate the business landscape in this Jimma Zone.

Enterprise Size Categories

Small Enterprises: The data on the proportion of small enterprises and their role in the local economy reflect a familiar trend. With over half (51.7%) engaged in small enterprises, this trend demonstrates the vital role played by SMEs in economies across the region. The dominance of small enterprises may indicate a potential for development initiatives targeting this sector.

Medium Enterprises: This section indicates the data on medium enterprises and their potential for growth and support needs. At 37.7%, medium enterprises constitute a significant portion of the responses. This suggests that a practical segment of businesses may be on the border of scaling and could benefit from targeted support that adopts growth, innovation, and sustainability.

Limited Large Enterprises: Showing the data on large enterprises and highlighting their challenges and economic impact. The presence of only 11.2% of large enterprises among the respondents emphasizes the challenges and competitive pressures facing larger businesses in the zone. This might lead to considerations for policy adjustments to support the sustainability of larger firms better, which often have a broader economic impact but may struggle in a landscape dominated by small companies.

4.2 The Key Factors Influencing the Implementation of Sustainable Construction Practices Through Kaizen Methods in The Jimma Zone

This section presents the findings related to the key factors influencing the implementation of sustainable construction practices through Kaizen methods in the Jimma Zone. The focus is on critical elements such as Muda (waste elimination),

standardization through the PDCA cycle, and the 5S methodology, which are central to ensuring the successful adoption of Kaizen within small and medium-sized enterprises (SMEs) in the region.

4.2.1 Key Factors Muda (Waste Elimination) Activities

Application of Kaizen: Muda, or waste elimination, is important to the Kaizen idea. In this research, Muda was used to identify and evaluate various types of waste within the construction practices of SMEs. This includes, shown in Table 4.3, waste in unnecessary motion, overproduction, defects, waiting time, and more.

Table 4.3 Muda/Waste Elimination Activities for Kaizen Pillars

Muda /Waste/ Elimination Activities					
No	Pillars of 7M	Questions	N	Mean	S.D
1	Overproduction	The company does not produce products that are more than immediate use.	89	3.96	1.147
2	Unnecessary Inventory	Any raw material or work in process that does not exceed the company's needs.	89	3.56	1.365
3	Inappropriate Processing	Adding more value than the agreed standard work process procedures or systems	89	3.34	1.414
4	Unnecessary Motion	There is poor workplace organization, resulting in poor ergonomics, for example excessive bending or stretching	89	4.31	1.029
5	Excessive Transportation	No unnecessary movement of products, materials, or information results in wasted time, effort, and cost.	89	3.39	1.474
6	Defects	No defect production results in rework.	89	2.89	1.201
7	Waiting	Non-non-activity period for the operator or machine is reduced	89	3.09	1.276
Average				3.50	1.27

Findings:

Unnecessary Motion: The survey and observation data analysis revealed that unnecessary motion was a significant issue, with a mean score of 4.31. This waste was primarily due to poor workplace organization, leading to inefficiencies in how workers moved and interacted with materials and tools on-site, as shown in Table 4.3. Interviews with site managers confirmed that these inefficiencies were a recurring problem, often resulting from a lack of proper planning and workspace layout design.

Defects: The study found that SMEs had a relatively lower mean score for defects (2.89), indicating that while quality control measures were somewhat effective, there

was still room for improvement in reducing the rate of defects and rework presented in Table 4.3. Interview data suggested that although some SMEs had implemented quality control procedures, inconsistencies in their application led to varying defect rates.

Other Wastes: Waste related to overproduction, unnecessary inventory, and waiting was also identified, with varying levels of impact on the efficiency and sustainability of construction practices, refer to Table 4.3. Interview responses that highlighted inventory management and production scheduling challenges validated these findings.

Discussion and Implications: The high incidence of unnecessary motion suggests significant inefficiencies in the workspace layout and organization within SMEs in the Jimma Zone. This implication, supported by quantitative data and qualitative interview insights, points to improving workspace organization and making processes more efficient. This aligns with the Kaizen philosophy of eliminating waste to enhance productivity (Imai, 1986). By addressing these inefficiencies, SMEs can enhance productivity, reduce operational costs, and improve the overall sustainability of their construction practices.

The relatively lower incidence of defects suggests that while some SMEs have effective quality control measures, there is still room for improvement. This implication is drawn from the observed data and interview response, which highlighted inconsistencies in the application of quality controls. Improving these processes could further enhance the efficiency and sustainability of construction activities, as emphasized in Kaizen literature (Thawani, 2003).

Identifying other forms of waste, such as overproduction and unnecessary inventory, implies that SMEs must adopt more demanding inventory management and production planning strategies. These implications are based on the combined analysis of survey data and interview responses, suggesting that improvements in these areas are critical for reducing costs and improving resource utilization—key components of sustainable construction, as Shang and Pheng (2013) discussed.

4.2.2 Key Factor Standardization Activity through the PDCA Cycle

Application of Kaizen: The PDCA (Plan-Do-Check-Act) cycle was utilized to evaluate how SMEs standardize their processes and implement continuous improvements in their construction practices. This method allowed the research to systematically assess each process improvement phase and how well these phases were integrated into daily operations.

Table 4.4 Standardization Activities for Kaizen Pillars

Kaizen PDCA Cycle					
No	Standardization	Questions	N	Mean	S.D
1	PLAN	The company understands the current status and setting objectives and analyzes the data to identify challenges	89	3.99	1.006
2	DO	During construction, the company establishes countermeasures based on the data analysis.	89	3.63	1.238
3	CHECK	Confirming the effects of the countermeasures in the company.	89	3.80	1.068
4	ACT	Establishing or revising the standards to prevent recurrences, reviewing the above processes, and working on the next steps	89	3.75	1.100
Average				3.79	1.02

Findings are shown in Table 4.4:

Plan Phase: SMEs demonstrated a strong ability to plan, with a mean score of 3.99, indicating that they effectively set objectives and analyze data to identify challenges. Interview data supported this finding, with several managers expressing confidence in their ability to identify issues and plan accordingly.

Do Phase: The implementation phase had a lower mean score of 3.63, suggesting that while planning was strong, executing the planned activities effectively was challenging. Interviews revealed that resource constraints and unclear guidelines were common delays to effective implementation.

Check Phase: Monitoring and evaluation practices scored a mean of 3.80, showing that while some effort was made to check the results of implemented activities, it was not

always consistent. Interview responses indicated that SMEs often lacked formal monitoring systems, relying instead on unplanned reviews.

Act Phase: The Act phase, with a mean score of 3.75, indicated that SMEs were somewhat successful in revising standards and preventing recurrences, but there was still room for improvement in making these changes more systematic. This was mentioned in interviews, where managers noted difficulties in institutionalizing successful changes.

Discussion and Implications: The findings from the PDCA cycle analysis imply that while SMEs are skilled at planning, there are significant challenges in the execution and monitoring phases. As highlighted by quantitative data and interview responses, the gap between planning and implementation suggests that SMEs may struggle to translate their plans into effective actions without sufficient resources or clear guidance. This implication emphasizes the need for stronger operational support and better resource allocation during the implementation phase, consistent with the principles discussed in Kaizen literature (Shang and Pheng, 2013).

The challenges identified in the Check and Act phases imply that SMEs need to develop stronger monitoring and evaluation systems. The interview data, which relied on informal reviews, highlights this implication. By improving these systems, SMEs can ensure that implemented changes achieve the desired outcomes and that any issues are promptly identified and addressed. This is crucial for sustaining improvements and ensuring that the benefits of Kaizen practices are realized over the long term.

4.2.3 Key Factor 5S Activity 5S Methodology

Application of Kaizen: The 5S methodology (Sort, Set in Order, Shine, Standardize, Sustain), shown in Table 4.5, was applied to assess and improve workplace organization and efficiency in SMEs' construction sites. This methodology is essential for maintaining a clean, organized, and efficient workplace, foundational to sustainable construction practices.

Table 4.5 5S Activities for Kaizen Pillars Factors

5“S” activities					
N o	House Keeping	Questions	N	Mean	S.D
1	Sort	If the Enterprise Team clears all items, no value is added to the site	89	3.07	1.476
		If the Enterprise Sorting criteria are established (e.g., frequency of use, actual quantity needed buffer	89	3.82	1.083
		Average	89	3.38	1.279
2	Set in order	If the enterprise is set in order, what must be kept? Make things visible.	89	3.76	1.138
3	Shine	If the enterprise shines, everything that remains. Observations about the inspection activity were shared among team members.	89	3.25	1.359
4	Standardize	If the enterprise standardization and self-discipline. Standard operating activity procedure and Documentation record standard	89	3.31	1.353
5	Sustainable	If the enterprise sustains the clean/check routine and Sustains methods clearly defined, with responsibilities and target dates identified	89	3.07	1.185
Average			89	3.38	1.26

Findings:

Sort and Set in Order: The research found that SMEs were moderately successful in the Sort (mean score: 3.38) and Set in Order (mean score: 3.76) phases. However, there were challenges in maintaining these practices over time (refer to Table 4.5). Interview data indicated that while initial efforts to clear and organize were effective, sustaining these efforts was difficult due to a lack of ongoing oversight.

Shine and Standardize: The Shine phase, with a mean score of 3.25, and the Standardize phase, with a mean score of 3.31, indicated that while SMEs made initial efforts to clean and organize their sites, they struggled to establish and maintain these standards consistently (refer to Table 4.5). Interviews confirmed that standardization practices were often not fully integrated into daily practices, leading to inconsistency in implementation.

Sustain: The Sustain phase had the lowest mean score (3.07), highlighting the difficulty SMEs faced in keeping 5S practices alive over the long term (refer to Table 4.5).

Interview data further supported this, showing that sustaining 5S practices was often not prioritized once the initial setup was complete.

Discussion and Implications: The difficulty SMEs face sustaining 5S practices implies that while initial efforts to implement workplace organization and cleanliness may be strong, these improvements are often not maintained over time. This implication, supported by both quantitative findings and qualitative data from interviews, suggests that continuous oversight and reinforcement are necessary for the benefits of 5S practices to reduce, leading to a decline in workplace efficiency and safety. This aligns with the challenges of sustaining Kaizen practices discussed by Shubhangi & Gurway (2016).

The implications of these findings suggest that SMEs need to integrate 5S practices into their daily practices more effectively. The interview feedback highlights the importance of establishing dedicated teams or roles focused on maintaining 5S standards, which could help ensure these practices are sustained over the long term. Additionally, regular training and reinforcement of 5S principles could help to surround these practices in the organizational culture, making them a natural part of the workflow rather than a one-time effort.

Summary of Key Factors for Kaizen Method Implementation

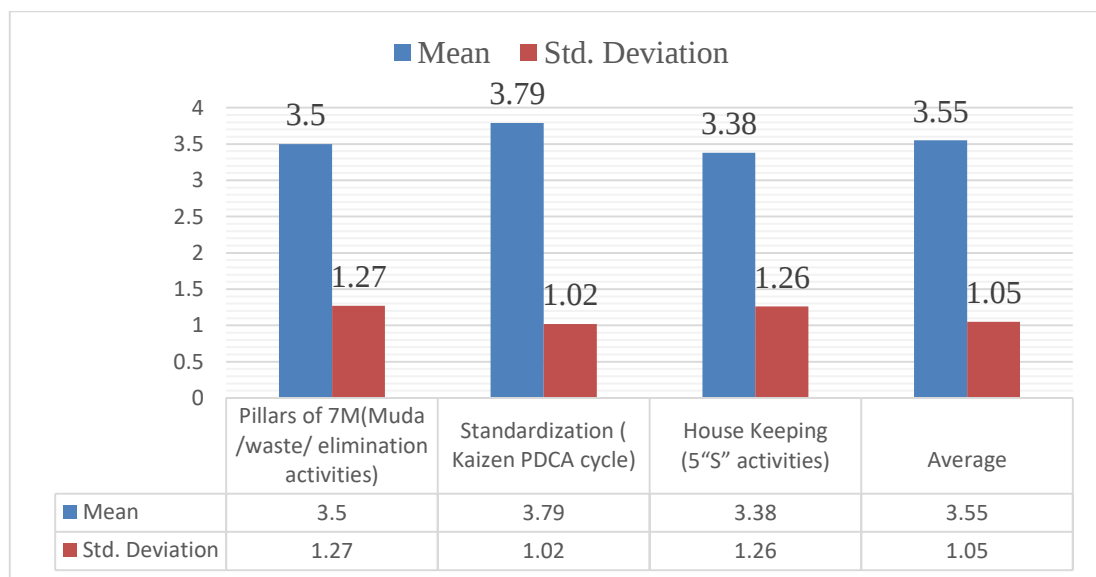


Figure 4.5 The Factors or the Kaizen Method Implementations

Application of Kaizen: The research analyzed key activities in implementing the Kaizen method, specifically focusing on the PDCA cycle, 5S activities, and the 7M pillars. The overall effectiveness of these activities was evaluated using the data presented in Figure 4.5 above, which shows the mean and standard deviation for each key factor.

Findings:

PDCA Cycle: The average score for the PDCA cycle was 3.79, with a standard deviation of 1.02. This indicates that SMEs generally set goals, carry out plans, and make necessary adjustments. However, the score difference suggests that these activities are not always done constantly, indicating the need for more consistent monitoring and feedback across different projects.

5S Activities: The 5S activities had an average score of 3.38 with a standard deviation of 1.26, the lowest among the key factors. While some effort is made to keep workplaces organized and clean, it is not consistently done. The higher difference in scores shows that maintaining these improvements over time is challenging, especially in the long term.

7M Pillars: The 7M activities, which involve managing resources and operations, had an average score of 3.50 with a standard deviation of 1.27. This reflects a moderate level of effectiveness in using resources and managing waste. The lower variation in scores compared to other factors suggests that these practices are more consistently applied. However, there is room for improvement, especially in fully integrating them into everyday operations to improvement efficiency.

The overall average mean across these key factors is 3.55, with a standard deviation of 1.05, indicating a generally high level of resource utilization and waste management within the SMEs. Overall, the findings presented in Figure 4.5 suggest that while SMEs in the Jimma Zone are on the right track in implementing Kaizen methods, particularly in planning and resource management, there are clear opportunities for improvement in sustaining 5S activities and strengthening process monitoring. Addressing these areas could lead to better outcomes related to sustainable practices in construction projects, ultimately enhancing the efficiency and effectiveness of SMEs in this sector.

4.3 Challenges Facing Small and Medium-Sized Enterprises (SMEs) in Adopting Sustainable Construction Practices in The Jimma Zone

This section analyzes the challenges that small and medium-sized enterprises (SMEs) face when adopting sustainable construction practices in the Jimma Zone. The analysis is based on several key factors identified through implementing the Kaizen method, including resource constraints, education and training, commitment, involvement, communication, organizational objectives, management, strategic planning, and motivation. These factors are summarized in Table Appendix III, Analysis of the Challenges Facing the Kaizen Method Implementations Factors.

While multiple challenges were identified, this discussion focuses on three key issues—resource constraints and financial challenges, education and training for workers, and commitment and involvement—because these factors significantly impacted adopting sustainable practices. These challenges were selected not just based on their mean values but also because they align closely with the study's objectives and are critical for understanding the broader implications of sustainable practice adoption by SMEs.

It is acknowledged that other factors, such as Motivation, Strategic Planning, and Communication, also had relatively high mean values. However, the selected challenges were prioritized because they address SMEs' foundational delays in implementing sustainable practices. By focusing on these key areas, the discussion provides a balanced analysis that integrates statistical data with the broader importance of the research objectives.

4.3.1 Resource Constraints and Financial Challenges

Resource constraints and financial challenges are highlighted in this discussion because they represent the most immediate and impactful barriers to adopting sustainable construction practices. With adequate financial resources, SMEs can invest in necessary materials, technologies, and human capital, making implementing Kaizen and other sustainable practices difficult. The significance of these challenges is reflected in the high mean scores recorded in Table 4.6, indicating widespread concerns among SMEs.

Table 4.6 Resource Constraints and Financial Challenges
(Extracted from Table Appendix III)

❖ <i>Resource Constraints and Financial Challenges</i>				
No	Factors Analysis	N	Mean	Std. Deviation
1	If budget limitations impact the Enterprise on investing in sustainable construction practices	89	4.16	.824
2	If the Enterprise is the SME strategy for overcoming resource constraints and financial challenges.	89	3.83	.907
3	If the Enterprise is challenged in allocating human resources and time for implementing the Kaizen method	89	4.07	1.126
4	Currently, the company needs more time to implement Kaizen activities.	89	4.31	1.029

The mean scores in Table 4.6 highlight that budget limitations, with a mean score of 4.16, and the lack of time to implement Kaizen activities, with the highest mean score of 4.31, are critical issues for SMEs. The standard deviations, particularly 1.029 for time constraints, suggest some response variability, indicating that while the challenge is recognized, its impact may vary among enterprises.

These findings are consistent with existing literature, where Smith (2018) emphasizes that financial limitations are a significant barrier for SMEs, preventing them from investing in necessary sustainable technologies (Smith, 2018). The high mean scores for resource constraints underline the urgent need for financial support and strategic resource allocation to improve the adoption of sustainable practices. The implications of these findings suggest that policymakers and industry stakeholders should prioritize providing financial assistance and time management strategies to help SMEs overcome these barriers.

4.3.2 Education and Training for Workers

Education and training equip SMEs with the skills and knowledge to implement sustainable construction practices. This challenge is selected for detailed discussion because a lack of proper training and skilled manpower was identified as a significant barrier, directly affecting SMEs' ability to adopt and maintain Kaizen methods. The

literature further emphasizes the importance of education and training, highlighted by its role in successful sustainable practice adoption.

Table 4.7 Education and Training for Workers
(Extracted from Table Appendix III)

❖ Education and Training for Workers			
Factors	N	Mean	Standard Deviation
The lack of regular workforce training has influenced your company's principles of Kaizen improvement outcomes.	89	3.44	1.261
Skilled manpower is one of the capacity constraints to withstand Kaizen	89	3.25	1.180
Experience in using appropriate methodology, techniques, and tools for problem-solving is needed.	89	3.26	1.319

The mean scores in Table 4.7 indicate that many SMEs need more training to implement Kaizen effectively. The individual mean scores, such as 3.44 for the lack of regular workforce training and 3.25 for the constraints related to skilled manpower, reflect critical areas where SMEs struggle. The standard deviations indicate some variability in the responses, suggesting differences in how these challenges are experienced across SMEs.

This finding is consistent with the literature, where Jones and Green (2020) discuss how the absence of proper training frameworks significantly hampers the adoption of sustainable practices, leading to a reliance on outdated methods (Jones & Green, 2020). With regular training and a skilled workforce, SMEs can adopt and sustain Kaizen methodologies, affecting their ability to achieve long-term sustainability goals. The implications of these results suggest the need for comprehensive training programs to enhance the capacity of SMEs, ensuring they are equipped to meet the demands of sustainable construction.

4.3.3 Commitment and Involvement

Commitment and involvement are critical factors in the successful implementation of sustainable practices. This discussion focuses on these challenges because the level of commitment from employees and management involvement is pivotal to the ongoing success of Kaizen initiatives. The relatively high mean scores for commitment, as

shown in Table 4.8, indicate its importance. In contrast, the slightly lower scores for involvement suggest areas where improvements could significantly enhance the effectiveness of Kaizen implementation.

Table 4.8 Commitment and Involvement
(Extracted from Table Appendix III)

❖ <i>Commitment and Involvement</i>			
Factors	N	Mean	Standard Deviation
SME members' work commitment has been improved as a result of implementation of kaizen	89	4.33	0.560
Employee commitment and innovativeness are some of the Challenges facing the Kaizen method's sustainable construction principles	89	4.18	1.018
Employees' attitudes towards teamwork have been improved.	89	4.06	0.909
A site manager is involved in and supports the adoption of kaizen in SMEs.	89	3.07	1.476
Having a positive attitude to involve laborers in problem-solving, quality & productivity improvement actively	89	3.82	1.083

Table 4.8 shows that commitment levels are generally high, with the mean score for improved work commitment being 4.33 and for employee commitment and innovativeness being 4.18. These high scores reflect a strong base of commitment among employees, which is crucial for the success of Kaizen activities. However, the lower mean score of 3.07 for site manager involvement indicates that managerial engagement needs improvement. The standard deviations, particularly 1.476 for site manager involvement, suggest significant variability in how SMEs perceive or implement managerial support.

These findings align with the literature, where Brown et al. (2017) note that consistent and active management and employee involvement are crucial for the successful implementation of Kaizen (Brown et al., 2017). The relatively lower scores for managerial involvement suggest that efforts to improve this aspect could significantly enhance the overall effectiveness of Kaizen initiatives. The implications point to the need for organizational strategies that promote employee commitment and stronger managerial engagement and involvement.

Overall Findings:

The analysis of SMEs' challenges in adopting sustainable construction practices in the Jimma Zone highlights three key areas: resource constraints and financial challenges, worker education and training, and commitment and involvement. These challenges are critical barriers to the successful implementation of sustainable practices.

Resource constraints and financial challenges show that SMEs need help to invest in necessary materials and technologies, making financial support and better resource management crucial. **Education and training** gaps indicate that SMEs need more effective training programs to equip their workers with the skills required for sustainable practices. Lastly, while **commitment and involvement** are strong among employees, better engagement from management is needed to ensure the success of these initiatives.

These findings suggest that addressing these challenges is essential for helping SMEs adopt sustainable practices. Policymakers, industry leaders, and SME managers should work together to provide the support, training, and strategies needed to overcome these barriers. By focusing on these areas, we can help SMEs contribute to a more sustainable and strong regional construction sector.

This section has provided a detailed analysis of SMEs' key challenges in the Jimma Zone when adopting sustainable construction practices through the Kaizen method. The focus on resource constraints, education and training, and commitment and involvement highlights the areas where SMEs struggle the most. These challenges align with broader issues identified in the literature and suggest that targeted interventions are necessary to support SMEs in overcoming these barriers. For a complete overview of all factors analyzed, refer to Table Appendix III, Analysis of the Challenges Facing the Kaizen Method Implementations Factors.

4.4 Impact of Identified Factors and Challenges on the Implementation of Sustainable Construction Practices Through Kaizen Methods in the Jimma Zone

This section evaluates the impact of the key factors and challenges identified in the previous sections on implementing sustainable construction practices through Kaizen

methods within SMEs in the Jimma Zone. The study's objectives include understanding how these challenges influence the effectiveness of Kaizen practices in promoting sustainability and identifying areas where further support or intervention may be required. The factors under evaluation include Muda (waste elimination), standardization through the PDCA cycle, and the 5S methodology. These factors are critically influenced by the challenges of resource constraints, education and training, and commitment and involvement, highlighted in the findings from section 4.2 and discussed in section 4.3.

4.4.1 Impact on Continuous Improvement and the PDCA Cycle

Resource constraints, including financial and time limitations, significantly disrupt the Plan-Do-Check-Act (PDCA) cycle, which is fundamental to Kaizen. The failure to allocate sufficient resources during the planning and execution phases reduces the potential for continuous improvement in sustainable practices. This is evident from the high mean score of 4.16 for budget limitations and 4.31 for time constraints, as shown in **Table 4.9**. The data for this table was extracted from Table 4.6 in Section 4.3, where the challenges associated with resource constraints were initially discussed. The data suggests that without targeted financial support or strategic resource allocation, SMEs may struggle to realize the full benefits of Kaizen, leading to delayed or incomplete improvement initiatives.

Implications: This greatly impacts the PDCA cycle, delaying the ongoing refinement of processes central to sustainable practices. This challenge suggests that policymakers and industry stakeholders must provide stronger financial support mechanisms and time management strategies to facilitate SMEs' continuous improvement efforts.

Table 4.9 Summary of Mean Scores Related to Resource Constraints and PDCA Cycle Disruption
(extracted from Table 4.6 in Section 4.3)

❖ <i>Resource Constraints and Financial Challenges</i>				
No	Factors Analysis	N	Mean	Std. Deviation
1	Budget Limitations	89	4.16	.824
2	Time Constraints	89	4.31	1.029

4.4.2 Impact on Waste Elimination (Muda)

The challenges related to education and training directly affect the SMEs' capacity to implement waste elimination strategies effectively, which is crucial for Kaizen. The moderate mean scores of 3.44 for the lack of regular workforce training and 3.25 for constraints related to skilled manpower, as presented in Table 4.10, were also extracted from Table 4.7 in Section 4.3. These scores reflect critical areas where SMEs struggle. These limitations interrupt employees' ability to identify and eliminate waste, a core objective of Kaizen, leading to inefficiencies and increased operational costs.

Implications: Failure to effectively eliminate waste reduces operational efficiency and undermines SMEs' sustainability goals. Addressing the gaps in training and skill development is essential for SMEs to fully influence Kaizen methods for waste reduction, which is vital for sustainable construction practices.

Table 4.10 Summary of Mean Scores Related to Education, Training, and Muda
(extracted from Table 4.7 in Section 4.3)

❖ <i>Education and Training for Workers</i>			
Factors Analysis	N	Mean	Std. Deviation
Lack of Regular Workforce Training	89	3.44	1.261
Constraints Related to Skilled Manpower	89	3.25	1.180

4.4.3 Impact on Organizational Culture and Employee Engagement

The inconsistency in managerial involvement within SMEs, as evidenced by the lower mean score of 3.07 for site manager support, reflects broader leadership challenges in sustainability initiatives. Table 4.11, extracted from Table 4.8 in section 4.3, indicates that while there is an initial level of employee commitment, with a high mean score of 4.33, the inconsistency in managerial support can lead to a disconnect between the actions of employees and the overall sustainability goals of the organization. This disconnect risks discouragement of the effectiveness of Kaizen practices, as strong leadership and management engagement are critical for encouraging a culture of continuous improvement.

Implications: For Kaizen to succeed and sustainable practices to take root within SMEs, there must be a cultural shift prioritizing sustainability at all levels of the organization. This shift requires stronger managerial engagement and leadership to fully participate in Kaizen practices in the organizational culture. By addressing the inconsistency in managerial involvement, SMEs can enhance their capacity for continuous improvement, ensuring that sustainability initiatives are supported and effectively implemented.

Table 4.11 Summary of Mean Scores Related to Managerial Involvement and Employee Commitment
(extracted from Table 4.8 in section 4.3)

❖ <i>Commitment and Involvement</i>			
Factors	N	Mean	Standard Deviation
Employee Commitment and Innovativeness	89	4.33	0.560
Site Manager Involvement	89	3.07	1.476

4.4.4 Broader Implications for Sustainable Construction Practices

The combined impact of these challenges on implementing Kaizen methods suggests that while SMEs have a foundation of commitment and a willingness to engage in sustainable practices, significant barriers remain. These barriers not only break the effective application of Kaizen but also prevent SMEs from fully realizing the benefits of sustainable construction practices.

Implications: To overcome these barriers, targeted support in financial resources, training, and managerial engagement is essential. By addressing these challenges, SMEs in the Jimma Zone can better influence Kaizen methods to achieve their sustainability goals and contribute to the region's broader sustainable development objectives.

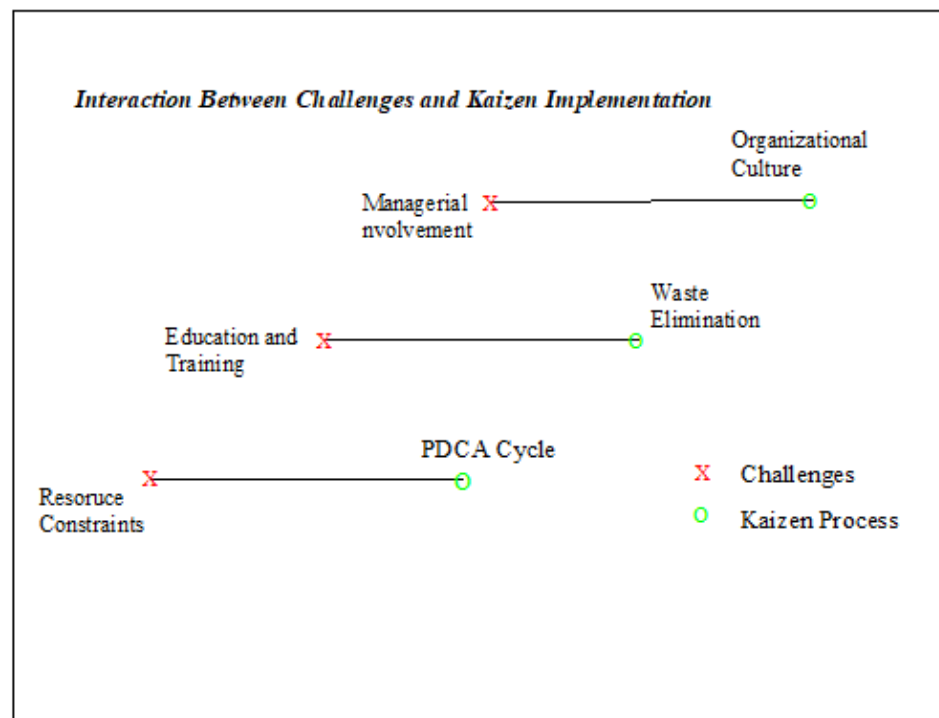


Figure 4 6 Interaction Between Challenges and Kaizen Implementation

Figure 4.6 illustrates the interaction between the key challenges identified (resource constraints, education and training, and managerial involvement) and the Kaizen processes (PDCA cycle, waste elimination, and organizational culture). The connections depicted emphasize how these challenges impact the effectiveness of Kaizen in achieving sustainable construction practices. The Figure creates the information discussed in section 4.3 and visually represents their implications for Kaizen implementation.

4.5 Awareness of Sustainable Construction Practices among SMEs in the Jimma Zone

This section evaluates the awareness and understanding of sustainable construction practices among small and medium-sized enterprises (SMEs) in the Jimma Zone. Perceptions are drawn from quantitative survey data and qualitative in-depth interviews with selected workers and stakeholders. Understanding SMEs' baseline knowledge and perceptions regarding sustainable practices is crucial for determining the effectiveness

of Kaizen implementation and identifying areas where further training and education are necessary.

4.5.1 Awareness of Sustainable Construction Practices

The survey data reveals that awareness of sustainable construction practices among SMEs in the Jimma Zone is relatively moderate. As summarized in Table 4.12 below, the findings indicate that many respondents have a basic understanding of sustainable construction concepts. However, there is a distinguished gap in comprehensive knowledge, particularly regarding specific practices and their implementation. The data was gathered from the survey conducted as part of this research.

Interviews with stakeholders further showed that while there is a general awareness of sustainability, the unlimited understanding required for effective implementation is repeatedly lacking. Stakeholders emphasized the need for continuous education to bridge this gap.

Implications: The moderate awareness levels suggest that while SMEs are familiar with sustainability, they may lack the detailed understanding necessary to implement sustainable practices fully. This gap could delay the effectiveness of Kaizen initiatives aimed at improving sustainability. Therefore, targeted educational programs focusing on the specifics of sustainable construction methods and their benefits are recommended to enhance SMEs' capacity to adopt these practices.

Table 4.12 Awareness Levels of Sustainable Construction Practices

Awareness Category	Number of Respondents	Percentage (%)
High Awareness	23	25.8
Moderate Awareness	48	53.9
Low Awareness	18	20.3

4.5.2 Understanding of Sustainable Construction Practices

The understanding of sustainable construction practices among SMEs, as shown in Table 4.13, reflects a similar trend in awareness. While several respondents demonstrate a basic understanding, deeper comprehension of how to apply these practices in daily operations is limited. For example, fewer SMEs are familiar with integrating sustainability into project planning and resource management. This table is also drawn from the survey data.

Interviews further highlight that although some SMEs are aware of sustainable construction, their practical application of these practices is often inconsistent. Respondents noted the need for continuous education and stronger guidelines to implement sustainable practices effectively.

Implications: The limited understanding of sustainable construction practices indicates a need for more detailed training and capacity-building initiatives. This will enable SMEs to be aware of sustainable practices and implement them effectively, thereby improving the overall sustainability of the construction industry in the Jimma Zone. Without this deeper understanding, promoting sustainability through Kaizen methods may decrease short of their potential.

Table 4.13 Understanding Levels of Sustainable Construction Practices

Understanding Category	Number of Respondents	Percentage (%)
High Understanding	20	22.5
Moderate Understanding	45	50.6
Low Understanding	24	26.9

4.5.3 Challenges in Promoting Awareness and Understanding

The primary challenges in promoting awareness and understanding of sustainable construction practices among SMEs include limited access to training resources, a lack of tailored educational programs, and minimal engagement with sustainability initiatives at the policy level. These challenges, as highlighted in interviews and documented by survey data, significantly delay the widespread adoption of sustainable practices. Interviews with key stakeholders revealed that these challenges are further

combined by a lack of clear communication channels and insufficient collaboration among concerns in the construction supply chain.

Implications: Addressing these challenges requires a different approach that includes increasing access to relevant training programs, developing educational materials tailored to the needs of SMEs, and encouraging greater policy support for sustainability initiatives. Overcoming these delays is essential for ensuring that SMEs in the Jimma Zone can fully engage with sustainable construction practices and realize the benefits of Kaizen methods in this situation.

Overall, the assessment of awareness and understanding of sustainable construction practices among SMEs in the Jimma Zone shows moderate knowledge, with significant gaps in the deeper understanding and application of these practices. To enhance the effectiveness of Kaizen methods in promoting sustainability, it is critical to address these knowledge gaps through targeted training, education, and policy support. The findings highlight the need for continuous improvement in both awareness and practical application of sustainable construction principles, aligning with the broader goals of sustainable development in the region.

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CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This research aimed to conduct a comprehensive assessment of the implementation of sustainable construction practices through Kaizen methods within small and medium-sized enterprises (SMEs) in the Jimma Zone. The study focused on identifying key factors, analyzing challenges, evaluating the impact of these factors on sustainable practices, and assessing SMEs' awareness and understanding of sustainable construction.

The study identified key factors critical to successfully implementing sustainable construction practices through Kaizen methods, such as resource constraints, managerial involvement, and training and education. These factors significantly influence the efficiency and effectiveness of Kaizen practices within SMEs. The findings suggest that addressing these factors is crucial for enhancing the sustainability of construction projects in the Jimma Zone.

The research highlighted various challenges SMEs encounter in adopting sustainable construction practices, including financial constraints, inadequate training, and lack of commitment. These challenges were significant barriers that delayed the effective implementation of Kaizen methods. The study's findings highlight the need for targeted involvement, such as improved financial support and stronger training programs, to overcome these challenges.

The study also evaluated how the identified factors and challenges impact the implementation of Kaizen methods. The results showed that resource constraints and inadequate managerial involvement greatly impacted SMEs' ability to implement sustainable practices effectively. These findings emphasize the importance of a supportive environment that adopts continuous improvement and engagement at all organizational levels.

The assessment of awareness and understanding revealed that while there is a basic awareness of sustainable construction practices among SMEs, there is a significant gap in deeper understanding and application. This gap poses a challenge to successfully adopting Kaizen methods, as it limits the potential for continuous improvement and sustainable growth.

Hence, the study concludes that successfully implementing sustainable construction practices through Kaizen methods in SMEs in the Jimma Zone depends upon addressing key factors such as resource allocation, training, and managerial involvement. The challenges identified, including financial constraints and knowledge gaps, must be effectively managed to enhance the sustainability of construction practices. This research provides a basis for future initiatives to promote sustainable construction through Kaizen in similar contexts.

5.2. Recommendation

Based on the findings of this research, several key areas have been identified where targeted involvements could significantly enhance the implementation of sustainable construction practices through Kaizen methods among SMEs in the Jimma Zone. The following recommendations are proposed to address the challenges and influence the opportunities identified in the study.

1. Enhance Financial Support for SMEs Given the significant impact of financial constraints on adopting sustainable practices, it is recommended that government agencies and financial institutions collaborate to provide more accessible financing options for SMEs. This could include low-interest loans, grants, or subsidies to promote sustainable construction practices.

2. Improve Training and Education Programs To bridge the gap in understanding and application of sustainable construction practices, it is essential to develop and implement comprehensive training programs tailored to the needs of SMEs. These programs should focus on both the technical aspects of sustainable construction and the practical application of Kaizen methods.

3. Strengthen Managerial Involvement and Leadership The research highlighted the importance of strong managerial involvement in successfully implementing Kaizen

practices. It is recommended that SMEs prioritize leadership development and ensure managers have the necessary skills and knowledge to drive sustainable practices within their organizations.

4. Foster Continuous Improvement through Regular Monitoring and Evaluation

To ensure the long-term success of Kaizen initiatives, SMEs should establish regular monitoring and evaluation mechanisms. These systems should be designed to track progress, identify areas for improvement, and ensure that the gains made through Kaizen are sustained over time.

5. Promote Awareness of Sustainable Construction Practices Finally, it is recommended that awareness campaigns be launched to promote the benefits of sustainable construction practices among SMEs. These campaigns should highlight the economic, environmental, and social advantages of sustainability, encouraging more SMEs to adopt these practices

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APPENDIX: I

Questionnaire Survey for Thesis paper on

Challenges of Implementing the Kaizen Method to Achieve Sustainable Construction
Principles: A Case of Small and Medium Enterprises in Jimma Zone

Dear respondents, your participation in the study is completely voluntary. I am Kassahun Gemechu and postgraduate student of the above mentioned Jimma University and currently under taking a research on “Assesement of Implementing the Kaizen Method to Sustainable Construction Jimma Zone. Your enterprise is chosen for the research studying The attached questionnaire and interviews are designed to assess the challenges of Implementing the Kaizen Method to Achieve Sustainable Construction Principles: kaizen supported Small and Medium enterprises in specific of Construction sector. I would appreciate if you could help me by responding to the attached questionnaire. For this purpose, data will be collected through questionnaire and interview. The survey data will be analyzed on a collective basis hence confidentiality is maintained.

Thank you for your assistance

Kassahun Gemechu

Phone Nomber : 0917323545

Email : kasahungemechu460@gmail.com

Part 1

I. About Enterprise

A). Name of Enterprise_____

B). Establishment Year

I. 2005-2007 years. ☐ II. 2008-2010 years. ☐ III. 2011-2013 years. ☐ IV. 2014-2016 years. ☐

II. Area of Enterprise Engaged

a). Aggaro ☐ b). Assandabo ☐ c). Sarboo ☐

d). Dedoo ☐ e). Saqaa ☐ f). JimmaTown ☐

III. Rank of Enterprise:

a). Small. ☐ b). Medium. ☐ c). Large. ☐

IV. Kindly indicate your gender

a). Male. ☐ b). Female. ☐

V. Age of respondent

a). 18-25 years ☐ b). 26-35 years ☐ c).36-45 years ☐

d). 46-55 years ☐ e). above 56 years ☐

VI. Educational level of Respondent

a). Degree ☐ b). Diploma. ☐

c). From Level 1-5 ☐ d). Below grade 12 ☐

Part II; The key factors influencing the implementation of sustainable construction practices through kaizen methods in the Jimma zone.

Questionnaire fulfilled by enterprise owners and operators on practice of Kaizen Please read each statement carefully and choose the answer corresponds and put tick (✓) mark in only space provided for each questions from options in the table below based on your level of agreement or disagreement in the following rating scale to show your agreement or disagreement The option represents.

- ❖ **(7Muda)** stands for seven muda(wastage): Such: Overproduction, Unnecessary inventory, Inappropriate processing, Unnecessary motion, Excessive transportation, Defects, Waiting
- ❖ **PDCA:** Plan, Do, Check, Act
- ❖ **House Keeping:** for 5s activities such: Sort, set in order, Shine, Standardize, Sustainable

Pillars of 7M	Muda /waste/ elimination activities	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
		1	2	3	4	5
Overproduction	The company does not Produced more than immediate use.					
Unnecessary Inventory	Any raw material or work in process that not exceed what company needs.					
Inappropriate Processing	Adding more value than the agreed standard work process procedures or systems					
Unnecessary Motion	There is no poor workplace organization, resulting in poor ergonomics for example excessive bending or stretching					
Excessive Transportation	There is no unnecessary movement of products, materials or information resulting in wasted time, effort and cost.					
Defects	There is no defect production that results in rework.					

Waiting	Non activity period for operator or machine is reduced					
Standardization	Kaizen PDCA cycle could be?	1	2	3	4	5
PLAN	The company understanding the current status and setting objectives and analyzing the data in order to identify challenges					
DO	During construction process the company establishing countermeasures based on the data analysis.					
CHECK	Confirming the effects of the countermeasures in the company.					
ACT	Establishing or revising the standards to prevent recurrences and reviewing the above processes and working on the next steps					
House Keeping	5“S” activities	1	2	3	4	5
Sort	If the Enterprise Team, clear all items none value added from the site					
	If the Enterprise Sorting criteria established (e.g frequency of use; actual quantity needed-no buffer					
Set in order	If the enterprise set in order what must be kept. Make things visible.					
Shine	If the enterprise shines everything that remains. And Observations shared among team members about inspection activity.					
Standardize	If the enterprise standardization and self-discipline. Standard operating activity procedure and Documentation record standard					
Sustainable	If the enterprise sustains the clean/check routine and Sustain methods clearly defined, with responsibilities and target dates identified					

Part III: Analysis the challenges facing small and medium-sized enterprises (SMEs) in adopting sustainable construction practices in the Jimma zone.

Use the scale below to appropriately answer the following questions by ticking (✓) accordingly.

1= Strongly Disagree, 2= Disagree, 3= Neutral 4=Agree, 5= Strongly Agree

No	The Analysis of challenges on implementing the Kaizen method in SMEs.	Strongly	Disagree	Neutral	Agree	Strongly
		1	2	3	4	5
I	Resource Constraints and Financial Challenges					
1	If the Enterprise are impact of budget limitations on investing in sustainable construction practices					
2	If the Enterprise are challenges in allocating human resources and time for implementing the Kaizen method					
3	If the Enterprise are the SMEs Strategies for overcoming resource constraints and financial challenges .					
4	There is no enough time for the company to currently implement Kaizen activities.					
II	Education and Training for Workers					
1	Luck of regular training of workforce has influenced the principles of Kaizen improvement outcome in your company.					
2	Skilled manpower is one of the capacity constraint to withstand Kaizen					
3	There is no experience using an appropriate methodology, techniques and tools for problem solving.					
III	Commitment					
1	SME members work commitment has been improved as a result of implementation of kaizen					
2	Employee commitment and innovativeness is one of the Challenges facing Kaizen method sustainable construction principles					
3	Employees attitude towards teamwork has been improved.					

4	There is an interest in changing or adopting Kaizen activities					
IV	Involvement					
1	There is a site manager's involvement and support towards the adopting of kaizen in SME.					
2	Having positive attitude to actively involved labors in problem solving, quality & productivity improvement					
3	There is no enough expertise involvement on how to implement Kaizen activities.					
4	Employer feedback enhancing our company's kaizen implementation.					
V	Communication					
1	There is a good communication and coordination between stakeholders and workers.					
2	There is regular feedback and communication system between site engineer and daily labor.					
VI	Organizational objectives					
1	Employee work Culture has been improved as a result of implementation of kaizen method in sustainable construction principle					
2	There is good supervisor responsibility to encourage and facilitate positive change in your project.					
3	Lack of infrastructure can effect of the Kaizen method in SMEs.					
4	Kaizen improve the project working process.					
5	Kaizen implementation improves safety and health issues					
VII	Management					
1	your top manager is support about kaizen issue.					
2	processes have been documented with measures to understand performance of kaizen output.					
3	Ineffective performance measures of Kaizen is affect Kaizen success					
4	There is periodical evaluation of 5S activities with PDCA and other tools for further improvements					
VIII	Strategic planning					
1	your company has clear corporate strategies for continuous improvement.					
2	The company has a long-term plan and follow up on a day-to-day activity.					
3	Establish policies has enabled to sustain Kaizen improvement outcome.					

VI V	Motivation					
1	There is a rewards and recognition system to motivate workers to increase performance					
2	Daily labors are satisfied with their jobs and be interested in working to continuously improve their performance					
3	Monetary incentives, such as bonuses and salary or wage increases workers moral					

Part IV: Assess the awareness and understanding of sustainable construction practices among SMEs in the Jimma zone.

In-Depth Interview Questions

Thank you for making the time for this interview. The purpose of this interview is to gain how continuous improvement (kaizen) principle is applied into your project company.

Date.....

Project Company Name.....

Position

Job Title.....

Qualification: MA/MSC. ☐ BA/BSC. ☐ Other. ☐

1. How would you describe your level of awareness and experience of kaizen method in sustainable construction principles in your construction company?
2. How would you assess the collaboration and coordination among stakeholders in your construction supply chain towards sustainable practices?
3. How does your organization identify and select sustainable suppliers and materials? What are the criteria and processes involved?
4. How would you assess the market demand for sustainable construction practices in your region or industry segment?
5. What cultural shifts are required within the construction industry to foster

widespread adoption of the Kaizen method for sustainable construction?

6.How can the Sources of information and education provided by the kaizen Philosophy for SMEs be added to the guidelines for sustainable construction principles?

APPENDIX II

Small and Medium Enterprise in Jimma Zone Construction Sectors Respondents.

About Enterprise					
NO	Name of SME Responded	Establishment Year	Area of SME Engaged	Rank of Enterprise	People Responded
1	Mammad and Hiriyoote Isaa	2014-2016 years	Saqaa	Small	2
2	Miskuu and Atamam	2014-2016 years	Saqaa	Small	2
3	Kaalid and Hiriyoote Isaa	2014-2016 years	Saqaa	Small	2
4	Muniiraa and Fooze	2014-2016 years	Saqaa	Small	2
5	Dani'eel and Saara	2014-2016 years	Dedo	Medium	2
6	Galataa and Hamzaa	2014-2016 years	Dedo	Medium	2
7	Rayiis and Foozee	2014-2016 years	Dedo	Small	2
8	Izaddiin and Maaru	2011-2013 years	Aggaro	Medium	2
9	Hayilee and Daraar	2011-2013 years	Saqaa	Medium	1
10	Firewuu and Muluge	2014-2016 years	Aggaro	Small	1
11	Ibsaa and Adanee	2014-2016 years	Aggaro	Small	2
12	Sintayyoo and Naji	2011-2013 years	Aggaro	Medium	2
13	Gurmessaa and Heraa	2014-2016 years	Aggaro	Small	2
14	Ummar and Sinboonee	2014-2016 years	Aggaro	Small	2
15	Aminu,Hikma and Hayat	2008-2010 years	Aggaro	Medium	2
16	Waneeshet and Efire	2011-2013 years	Aggaro	Medium	2
17	Muniiraa and Mahammad	2011-2013 years	Aggaro	Medium	2

18	Abdii and Daawwit	2011-2013 years	Aggaro	Medium	2
19	Ahimad and Daawwit	2008-2010 years	Aggaro	Medium	2
20	Miftaa and Sayidaa	2011-2013 years	Aggaro	Small	1
21	Guddinaa	2008-2010 years	Asandabo	Medium	2
22	Naadhi Daama	2011-2013 years	Asandabo	Medium	2
23	Rida,Naazif fi Ab	2014-2016 years	Asandabo	Medium	2
24	Suliifi and Sulxaan	2011-2013 years	Asandabo	Medium	2
25	Baahir and Baakiri	2014-2016 years	Asandabo	Medium	2
26	Abdurama and Yeshaxil	2008-2010 years	Dedo	Small	1
27	Awol, Galana and Hiwot	2008-2010 years	Dedo	Small	1
28	Birhanu and Mohammed	2008-2010 years	Dedo	Small	1
29	Maryama and Abrari	2008-2010 years	Dedo	Small	2
30	Indalee and Kaalid	2008-2010 years	Aggaro	Medium	1
31	Ra'iis and Caaltuu	2008-2010 years	Dedo	Small	1
32	Mahaammadii and Taha	2014-2016 years	Sarbo	Medium	2
33	Umarii and Jamaal	2014-2016 years	Sarbo	Small	2
34	Tofiq,Madadi and Anuwar	2008-2010 years	Sarbo	Small	2
35	Darjee and Tadalech	2008-2010 years	Sarbo	Small	2
36	Motummaa and Debisa	2008-2010 years	Sarbo	Small	2
37	Misbaahuu and Bultuu	2011-2013 years	Sarbo	Small	2
38	Suluman and Sulxaan	2014-2016 years	Asandabo	Small	2
39	Mohammadsanii and Xaaya	2014-2016 years	Asandabo	Medium	2
40	Badhaatuu	2014-2016 years	Asandabo	Medium	2
41	Guddinaa	2014-2016 years	Asandabo	Small	1

42	Abdii Boruu	2014-2016 years	Asandabo	Small	1
43	Banteamlake and Mikiyas	2005-2007 years	Jimmaa Town	Medium	1
44	ATZ	2005-2007 years	Jimmaa Town	Large	2
45	Abraham and Tigist	2005-2007 years	Jimmaa Town	Large	2
46	Ayishaa	2005-2007 years	Jimmaa Town	Large	2
47	Almayoo and Darese	2008-2010 years	Jimmaa Town	Medium	2
48	Wubshettii and Warqu	2005-2007 years	Jimmaa Town	Large	2
49	PLC	2008-2010 years	Jimmaa Town	Large	2
50	Tigist and Henok	2008-2010 years	Jimmaa Town	Large	2
Total people respondents					89

APPENDIX III

Analysis of the Challenges Facing the Kaizen Method Implementations Factors

No	Factors Analysis	N	Mean	Std. Deviation
❖ Resource Constraints and Financial Challenges				
1	If budget limitations impact the Enterprise on investing in sustainable construction practices	89	4.16	.824
2	If the Enterprise is the SME strategy for overcoming resource constraints and financial challenges.	89	3.83	.907
3	If the Enterprise is challenged in allocating human resources and time for implementing the Kaizen method	89	4.07	1.126
4	Currently, there is not enough time for the company to implement Kaizen activities.	89	4.31	1.029
<i>Average</i>		89	4.092	0.97
❖ Education and Training for Workers				
1	The lack of regular workforce training has influenced your company's principles of Kaizen improvement outcomes.	89	3.44	1.261
2	Skilled manpower is one of the capacity constraints to withstand Kaizen	89	3.25	1.180
3	There is no experience using an appropriate methodology, techniques, and tools for problem-solving.	89	3.26	1.319
<i>Average</i>		89	3.31	1.25
❖ Commitment				
1	SME members' work commitment has been improved as a result of implementation of kaizen	89	4.33	.560
2	Employee commitment and innovativeness are some of the Challenges facing the Kaizen method's sustainable construction principles	89	4.18	1.018
3	Employees' attitudes towards teamwork have been improved.	89	4.06	.909
4	There is an interest in changing or adopting Kaizen activities	89	4.17	.907
<i>Average</i>		89	4.186	0.848
❖ Involvement				
1	A site manager is involved in and supports the adoption of kaizen in SMEs.	89	3.07	1.476
2	Having a positive attitude to involve laborers in problem-solving, quality & productivity improvement actively	89	3.82	1.083
3	There is not enough expertise involved in implementing Kaizen activities.	89	3.76	1.138
4	Employer feedback enhances our company's kaizen implementation.	89	3.25	1.359

		Average	89	3.475	1.264
❖ Communication					
1	There is good communication and coordination between stakeholders and workers.	89	3.79	1.473	
2	Regular feedback and communication between the site engineer and the daily labor exist.	89	3.82	1.336	
		Average	89	3.805	1.404
❖ Organizational objectives					
1	Employee work Culture has been improved as a result of the implementation of the Laizen method in sustainable construction project	89	3.10	1.431	
2	A good supervisor encourages and facilitates positive change in your project.	89	3.64	1.290	
3	Lack of infrastructure can affect the Kaizen method in SMEs.	89	3.26	1.534	
4	Kaizen improves the project working process.	89	3.31	1.427	
5	Kaizen implementation improves safety and health issues	89	2.69	1.458	
		Average	89	3.2	1.428
❖ Management					
1	Your top manager is supportive of the Kaizen issue.	89	2.89	1.201	
2	Processes have been documented with measures to understand the performance of kaizen output.	89	3.09	1.276	
3	Ineffective performance measures of Kaizen affect Kaizen success	89	3.87	.932	
4	There is periodic evaluation of 5S activities with PDCA and other tools for further improvements	89	3.63	1.238	
		Average	89	3.37	1.161
❖ Strategic Planning					
1	Your company has clear corporate strategies for continuous improvement.	89	3.80	1.068	
2	The company has a long-term plan and follows up on a day-to-day activity.	89	3.75	1.100	
3	Establishing policies has enabled the sustainability of Kaizen's improvement outcome.	89	3.38	1.426	
		Average	89	3.64	1.198
❖ Motivation					
1	There is a rewards and recognition system to motivate workers to increase performance	89	3.82	1.083	
2	Daily laborers are satisfied with their jobs and are interested in working to improve their performance continuously	89	4.07	.654	
3	Monetary incentives, such as bonuses and salary or wages increase workers' moral	89	3.25	1.359	
		Average	89	3.71	1.032