

# **Enhancing Sustainable Competitiveness through Application of Kaizen Philosophy Practices in Ethiopian Manufacturing Industries**

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## **Abstract**

Kaizen is a broad concept of management philosophy which integrates production and quality management methodologies to achieve organizational excellence, success and competitiveness. It is implemented by many organizations including manufacturing, service and commerce industries. However, there is no exploratory study investigated its application and effect with the context of Ethiopian manufacturing industries. So, exploration of Kaizen practices is significant for the improvement of policies and strategies. Therefore, the purpose of this study is initially to explore the practices and effect of Kaizen, then developing a framework, and finally, identifying drivers (social and technical factors) experienced and barriers faced with the context of manufacturing industries of Ethiopia. Conducting extensive literature review and adopting methodologies, reviewing reports and developing SWOT analysis table, exploring practices, developing framework, identifying drivers and barriers using charts, diagrams and graphs; proposing way forward and implications from the study are the research approaches used in the study. The findings of the study demonstrate companies are implementing Kaizen following structured framework. The implementation enables to organize working places and achieved quantitative and qualitative results. Hence, the implementation consequences in saving and gaining a total of 158777469.7 ETH Birr and 44431.92 M<sup>2</sup> free spaces. Moreover, the mediocre achieved improvements of net profits, sales volume, productivity, delivery time, production volume, defect rate and customer satisfaction is 26.33, 33.02, 22.90, 33.98, 69.65, 49.29 and 67.92% respectively. Since, there is no previous study exploring Kaizen practices, therefore, this is the very first research provides valuable insights for company managers, practitioners, academicians and government.

## **Keywords**

Kaizen, Implementation Framework, Sustainable Competitiveness, Driver, Barrier, Exploratory

## **1. Introduction**

Manufacturing industries face various challenges coming out of global competition and rapid manufacturing technology changes. These industries have to meet their customers' expectations, stay in market and compete globally. So as to achieve these goals, manufacturing companies need to practice the superlative management philosophies (Suárez-Barraza and Miguel-Davila 2020), for example, kaizen is a comprehensive concept of management philosophy which integrates production and quality management methodologies (for example, LM, TQM, SCM, IM and LSS practices) for identifying, eliminating and preventing wastes to achieve organizational excellence (Imai 1986; Bhuiyan and Baghel 2005; Singh and Singh 2009; Berhe 2022; Berhe et al. 2023).

In the circumstance of Ethiopia, it is now more than a decade since kaizen was officially introduced, adopted and disseminated as a management philosophy by the Kaizen Excellence Center (KEC) (formerly known as Ethiopia Kaizen Institute), and the support of JICA-Ethiopia (Otsuka et al. 2018). In Ethiopia more than 800 organizations from manufacturing, service providers and institutions have implemented Kaizen philosophy (MIDI strategic plan 2022). Accordingly, some are benefited from the implementation by securing quantitative (monetary and non-monetary results) and qualitative results, even though, many are still facing challenges in sustaining Kaizen practices and maintaining substantial improvements, and even significant numbers of organizations are out of the implementation (Berhe et al. 2023).

Although there are a number of studies published on Kaizen, it is almost none preceding exploratory study with substantial data exploring the application of Kaizen practices in standpoints of manufacturing companies. As a result, there is lack of literature and no adequate evidence that narrates the practice of Kaizen philosophy and its effect on manufacturing industries with the status of their implementation, method of practice, drivers (social and technical factors) behind success, effect of practice and barriers of the practice perspective. Therefore, still exploratory study with significant data is needed to fill the research gap and completely understand the practice of Kaizen philosophy and its effect on manufacturing industries and to contribute to the body of knowledge.

Therefore, the study is addressed through the following research questions with the context of manufacturing companies of Ethiopia: RQ1. What are the effects of Kaizen implementation? RQ2. What is the Kaizen framework employed for sustainable competitiveness? RQ3. What are the drivers experienced and barriers faced during Kaizen implementation? The goal of this research is a threefold justification. First, it is to look at the practice of Kaizen philosophy and explore its effect on manufacturing industries. Second, developing a framework based on the investigation of the existing methods or practices. Third, identifying drivers (social and technical factors) which could bring effect on manufacturing industries by achieving both quantitative (monetary and nonmonetary) and qualitative results, and barriers hindrance for deploying and sustaining Kaizen methodology in the selected manufacturing companies of an under-researched country, Ethiopia. Moreover, this research will also explore the way forward to mitigate the barriers.

## **2. Materials and Methods**

The study adopted a mixed methods research with the category of sequential exploratory strategy. The sequential exploratory strategy involves a first phase of qualitative data collection and analysis, followed by a second phase of quantitative data collection and analysis that builds on the results of the first qualitative phase (Creswell, 2009). So, the study used qualitative data to identify Kaizen practices, for example, unique techniques, drivers, implementation framework and barriers; and quantitative data, for instance, motivations or key competitiveness indicators/measures to support the interpretation of qualitative findings.

When the researchers do not have enough knowledge to make conceptual distinctions or posit of an exploratory relationship between a problem and its factors, the researchers could employ exploratory study as a research methodology (Berhe 2022). Till this research carried-out, with the scope of the study, there is no study exploring the association between Kaizen philosophy practices and its effect on Ethiopian manufacturing industries. Berhe et al. (2023) developed an integrated framework and structured (six phase) implementation procedure with the trend of PDCA cycle. The framework covers unique techniques, drivers, roles of triple helix actors and motivations for enhancing sustainable competitiveness. Whereas, the implementation procedure includes: preparedness phase, conceptualization phase, planning phase under “Plan”; implementation and monitoring phase under “Do”; performance evaluation and verification phase under “Check”; and standardization, sustaining and policy management review phase under “Act”. Moreover, the aforesaid studies identified drivers (social and technical factors), attained improvements and barriers (internal and external obstacles). The authors emphasized that barriers ought to be removed for successful application of Kaizen methodologies in manufacturing companies to improve their performance. Moreover, this study adopted motivations or Key Competitiveness Indicators (KCIs) discovered by the aforesaid study, for example, monetary results (financial and marketing), non-monetary results (operational and innovation) and qualitative results. So, the study adopted the stated Kaizen practices to explore their implementation and the various positive effects attained during implementation.

Merely, manufacturing industries implementing Kaizen project with the support of KEC, JICA-Ethiopia and ILO are the target groups of the study. The sampling strategy selected for this research is non-probability sampling with the category of purposive, and previously driven statistical formula is used to select companies. The study used the following selection criteria's to decide on sample manufacturing industries: companies proceed with basic level Kaizen project; advanced level Kaizen project; participating for Kaizen award; winners of Ethiopia Kaizen award; participating in sustaining competitive and responsible enterprises (SCORE) project. Based on this, the researchers employed Yamane's earlier (1967) driven formula and able to get representative primary data as shown below. Similarly, this formula is also used by several previous studies (for instance, Berhe 2022).

$$n = N / (1+N (e)^2) \quad (1)$$

In this case, the studies consider the level of acceptable margins of error (e) 5% and assuming 95% of confidence level with sample size (n) = 66 (nominated companies) and population (N) = 80 (total number of companies implementing Kaizen in Addis Ababa). However, the study received documents including annual and project

technical reports, Kaizen award presentation by visiting a total of 32 manufacturing companies (three from metal, two from leather, one from agro-processing and twenty six from chemical); case study and best practices of Kaizen national award winners from Kaizen Excellence Center, even though the quality of the report varies from company to company, and it yields a document offering rate of 48%. This is due to some are unwilling to deliver the report and the others have no any report relating to Kaizen implementation. This percentage is considered to be enough as McDermott et al. (2022) argue the 20% response rate is still widely considered to be sufficient. In addition, the researchers also used triangulation method to check the reality and relate existing Kaizen practices (degree of implementation, the practice of social and technical factors, the barriers faced, and their implications to organizations sustainability) with the attained sustainable competitiveness results. Hence, the approach in this research follows five ways (Figure 1) in dealing with the practice of Kaizen for achieving organizational results.

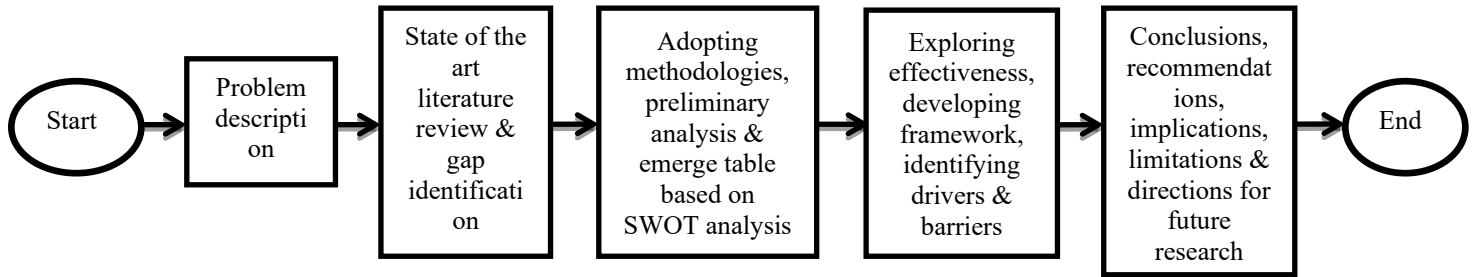


Figure 1. Flow chart for research methodology (the researchers)

### 3. Literature Review

In the last few decades, a considerable amount has been written about Kaizen (in Japanese) or synonymously continuous improvement (in western) (Berhe 2022). The authors highlighted Kaizen historically begins in USA and Japan during 1950 (after World War II) when Toyota first implemented through quality control circles (QCCs). Most recently, it becomes a fiery issue of recent scholars and industrial practitioner owing to the competitive advantage gained from Kaizen practice. However, the unavailability of a universal definition, existing of large number of definitions, and writings by scholars and practitioners in the field exhibit a certain degree of ambiguity and inconsistency (Singh and Singh 2009) and the ambiguous nature of the Kaizen also create problems for the successful implementation of its principles and practices, though Imai provided a definition of Kaizen.

For this reason, this study categorized these definitions into two. One is the broader definition and it means a management philosophy which encompasses production and quality management methodologies to achieve organizational excellence (Bhuiyan and Baghel 2005). Second is the narrower definition and it means an improvement of the workplace (“gemba”) derived based on the proposals from the workers on the basis of a quality control circle (QCC) and a suggestion system (Hagos and Kahsay 2011). Hence, for the purpose of this study, the broader definition of Kaizen philosophy is adopted. But, it is rare to find a study focusing on exploration of the practice of Kaizen (production and quality management methodologies) in Ethiopian manufacturing industries. So, it is necessary to deepen the knowledge of what is happening in Ethiopian manufacturing companies with the practice of Kaizen to cover the theoretical gap.

Few studies tried to identify Kaizen principles, for example, Berger (1997) proposed three Kaizen guiding principles (process-oriented; improving results; maintaining and improving standards). For understanding the concept of Kaizen, Berhe (2022) described three perspectives based on the analysis of previous studies. The first perspective is taking Kaizen as a management philosophy (Fonseca et al. 2018); the second perspective is Kaizen as a component of TQM; and the third perspective is Kaizen as a theoretical principle for improvement methodologies and techniques (Suárez-Barraza et al. 2011). Thus, for the purpose of the study, the outlook of Kaizen as a management philosophy and a theoretical principle for improvement methodologies and techniques is adapted and focused on the practices of Lean management (JIT, autonomation and TPM), TQM, SCM, IM and LSS of Kaizen/continuous improvement programs.

Several preceding studies recognized some unique practices or techniques for joint implementation of the above-mentioned Kaizen systems. By reviewing, Damanpour et al. (2009); Hailu et al. (2018a); Dametew et al. (2020); Chiarini and Kumar (2021); Sisay et al. (2021), the study identified most regularly cited unique techniques central for the practice of Kaizen philosophy. They are: Project management skill, Customer focus, Autonomous

maintenance, Planned maintenance, In station quality control, JIT delivery by suppliers, Statistical process control, Andon, Procurement, JIT schedule, 5 Whys/solve critical root cause of problems, Automatic stop, Pokayoke/error proofing, Cross-Functional Product Design, Machine-person separation, Innovation, (Project selection, prioritization, review and tracking), Pull system or Kanban System, Internal logistics, Value stream map, Proprietary equipment development, Setup time reduction or single minute exchange of dies, Distribution & material handling, JIT layout or equipment layout, New Technology Emphasis. Thus, for the purpose of the study, the identified unique practices are adopted to explore the practice of Kaizen philosophy in manufacturing industries.

Up till now, different names are used for drivers enable for successful Kaizen implementation, for example, facilitators (Marin-Garcia et al. 2018), critical success factors (González-Aleu et al. 2018), human and strategic oriented common practices (Hailu et al. 2018a), social and technical factors (Hailu et al. 2020), drivers related to social and technical factors (Berhe 2022), drivers and critical success factors (Nandurkar et al. 2014), enablers and common practices (Tesfaye and Kitaw 2017), most widely cited factors (Sisay et al. 2021), drivers (social and technical factors) (Berhe et al. 2023). The existing literature seems to agree on universal practices and identified practices by the aforesaid studies are not parallel. So, this study made an effort in organizing the practices in one framework and focus on drivers pertaining to social and technical factors. As a result, the study identified seven universal Kaizen practices as drivers for successful practice of Kaizen by categorizing leadership and people as social factors; process, strategy, partnership including supplier, problem solving approach and resource as technical factors. Thus, for the purpose of this exploratory study, the identified social and technical factors are adopted to explore the practices of these drivers in manufacturing industries of Ethiopia.

The other issue in practice of Kaizen philosophy is involvement of triple helix actors (company, institution and government). Previous study conducted by Tilahun et al. (2020) identified the roles of the triple helix actors in implementation of continuous improvement. For example, strong diagnosis and guidance system from government, commitment and initiatives from organization/industry, and trainings and follow-ups from institution. Moreover, several studies confirmed that sustainable management commitment is central for successful implementation of continuous improvement philosophies (Hailu et al. 2018a; Tilahun et al. 2020; Sisay et al. 2021).

Several studies including Alvarado-Ramírez et al. (2018); Goshime et al. (2018); Lina and Ullah (2019); Berhe (2022) have identified impediments to successful implementation of Kaizen philosophies in manufacturing companies. The identified barriers are categorized as internal and external barriers. The internal barriers are related to weak practices of the social and technical issues by manufacturing companies. Whereas, the external barriers are associated with the economic, social, cultural, demographic, environmental, political, legal, governmental, technological, and competitive trends and events that could significantly harm manufacturing companies.

Several studies (Desta 2014; Tiwari 2017; Hailu et al. 2015, 2017b; Otsuka et al. 2018; Lina and Ullah 2019; Berhe 2022; Berhe et al. 2023) confirmed that manufacturing companies benefited from Kaizen philosophy implementation by attaining quantitative results (monetary: business-financial and marketing, and non-monetary: operational and innovation) and qualitative results. For example, Otsuka et al. (2018) confirmed that Ethiopian organizations implemented Kaizen starting from 2011 to 2016 gained monetary values such as, 2169.5 million ETH birr. In other study, Berhe (2022) also proved that chemical industries were benefited from the practice of Kaizen. They saved a total of 71,932,472.19 ETB, and the mediocre achieved improvements of productivity, production volume, machine productivity and sales volume were 2.77, 28.69, 10.14 and 31.53% respectively as nonmonetary results and some qualitative results. Thus, this study adopted quantitative results in preliminary analysis of the effectiveness of Kaizen Philosophy implementation in manufacturing companies of Ethiopia.

#### **4. Results and Discussion**

Based on the previous demarcation provided, the researchers collecting and carried-out a comprehensive investigation of the case company's strategic plan, annual report, project technical report, Kaizen award presentations, best practices of Ethiopia Kaizen award winners and best practices of sustaining competitive and responsible enterprises (SCORE) project implementation cooperatively conducted by International Labour Organization (ILO) and KEC. Consequently, SWOT (strength, weakness, opportunity and threat) analysis, cause and effect diagram, table, charts and figures were employed. Kaizen practices and their effect commonly stated by the case manufacturing companies were also identified. Thus, preliminary analysis of Kaizen philosophy implementation and its effectiveness; discussion on the framework employed for Kaizen implementation; the circumstances of Kaizen philosophy drivers (social and technical factors) and barriers faced by the case companies during the implementation of Kaizen philosophy is presented as follows.

#### **4.1. Kaizen Philosophy Implementation Preliminary Analysis on Manufacturing Companies**

Based on the research approach, the study extensively assessed documents including reports and presentations. As a result, Kaizen practices including activities, social and technical factors experienced, tools and techniques practices, improvements attained, challenges or barriers faced by the selected manufacturing companies are identified in Table (1). Before conducting SWOT analysis, the study identifying metrics used for assessing and measuring the current situation in relation to Kaizen practices and performance of selected case companies by compiling from quality

Table 1. Kaizen practices and its effect in manufacturing companies (compiled by researchers from companies and KEC report, 2022)

Description	Kaizen philosophy implementation and its effect on manufacturing companies performance			
Kaizen practice Phases	Plan (Preparedness; Conceptualization; Planning)	Do (Implementation and Monitoring)	Check (Performance evaluation and verification)	Act (Standardization, Sustaining and Re-Planning)
Kaizen functions activities	Seminars and workshops, Signing agreement with EKI, companywide assessment, Identifying problems; Customization of training materials, Arrangement of facilities, Selection of trainees, facilitating training (pre and post exam), Assigning Kaizen officer, Organizing Kaizen promotion teams, Leaders training, Diagnosing current situation, Action plan, Allocating appropriate budget, Consultant feedback, Kick-off	5S practice, Workplace and Operation standardization, Waste elimination, Managers morning market meeting, Kaizen promotion teams weekly meeting, Progress sharing, Consultant feedback	Consultant feedback, Measurement of results, Performance evaluation,	Rewarding system, Benchmarking of best practice, Exit plan
	Seminar and workshops, Sign an agreement, Highlight training to management, Kick off, Policy development, Theme selection, Selection and formation of cross-functional teams, Training (pre and post exam), Diagnosing, Setting target, Action plan	Cause analysis via listing of possible causes, Selection of critical root causes, Listing of possible solutions, Selection of best solution, Action plan, Implementation, Progress sharing	Comprehending the results, Measuring and evaluation, Comparison with target, Corrective action, if needed, and Revised the plan, Progress sharing	Action plan, Standardization, Training on new standards, Progress sharing, Final technical report, Closing ceremony, Rewarding, Scaling up
Social and technical factors	Leadership, people, process, strategy, resource, partnership, problem solving			
Kaizen tools and technique	Overview of Kaizen, 3Mu's (Muda, Mura and Muri), 5S (Sort, Set in order, Shine, Standardization, Shine), QCC, Selection matrix, 5S checklist, Gant chart; TQM, TPM, TPS, Industrial Engineering basics, 7 QC tools, QC story (or Problem solving technique or PDCA), Cross SWOT analysis, Policy management and deployment, process mapping, bar graphs, Gantt charts, Pareto analysis, Flow charts	5S, Muda, Standardization, 5Whys, 5W2H, Brainstorming; Problem solving technique or QC story or PDCA, FMEA, DOE, Autonomous maintenance, planned/preventive maintenance, equipment layout, new product development, single-minute exchange of die, Customer focus, Brainstorming, fish bone diagram, scatter diagram, Statistical process control, QCCs, Suggestion box, Suppliers audit, Team building methods, Quality cost systems, Benchmarking/Best practice,	SWOT analysis, Problem solving technique/QC story/PDCA, Pare to analysis, histogram, flow chart, line and bar graphs, Customer surveys,	Standardization, Control charts, Check sheet and 5W2H or Gantt charts
Monetary results	A total of 158,777,469.7 ETHB gained and saved (i.e. 132,716,817.7 ETHB gained by selling unlike materials and 26060652 ETHB cost saved) by employing improvement ideas, modifying and developing new innovative products; average improvement of sales volume-33.02%, net-profit-26.33%.			
Non-monetary results	The average improved 5S-99.55%; searching time-84.5%; accident rate-42.27%; transportation waste-86.62%; inventory waste-65.07%; productivity-22.9%; lead time-65.33%; machine down time-64.82%; production volume-69.65%; labor productivity-59.07%; machine productivity-31.51%; raw material productivity-56.58%; delivery time-33.98%; defect rate-49.29%; rework rate-54.72%; customer complaint-67.92%; absenteeism-26.6%.			
Qualitative result	Increased safety awareness, establishing corporate culture and teamwork, able to create Kaizen culture (evaluation, minutes, reporting, QCC members ranking); QCC builds ability for solving problems; QCC member's creativity and generating new improvement ideas is improved.; Employees working morale is improved; Workplace is well organized; Rewarding system is established and best performers are rewarded; Improved analytical skill; improved use of QC tools; improved data recording system; Improved establishing standards; improved team working; improved communication skill; Improved Kaizen knowledge; improved leadership skill; Improved Consultation, research and training skill			
Challenges	Internal and external factors. Internal factors relating to unpracticed social and technical factors and external factors relating to political-conflict, financial- deficiency of foreign currency, environment issues			
Companies :	Chemical: A1-MC, B2-GS, C3-AABG, D4-MPB, E5-AP(A.A), F6-KPI, G7-HAT, H8-MgC, I9-NC, J10-BSP, L12-BC, O15-MP, R18-RP, S19-TDI, T20-APF (Ad.), U21-OP, V22-AI, W23-AP, X24-YP, Y25-BsChs, Z26-EP, B'28-DP, C'29-BP, D'30-AR, E'31-JP, F'32-DC; Metal: K11-AdS, N14-WF, Q17-AMSP; Leather: M13-AsS, A'27-SL; Agro-processing: P16-KFPC			

improvement literature including Dana (2012). Thus, the précised SWOT analysis of selected case companies is provided as follows.

#### **4.1.1. Strength of companies (internal factors/environment-positive factor)**

Existing of young and easily trainable labor; Cooperatively working and signed long term relationship agreement with EKI; Existing of experienced, skilled and motivated manpower (managers, experts, staffs, employees); Able to assess the existing market; Able to develop new products ; Able to use resources effectively; Delivering products to customers by providing affordable price; structured information sharing between managers and workers; able to practice few unique techniques of Kaizen systems (TQM, 5S activities, TPM); providing high attention to quality product; able to keep machine unavailability to lower rate; able to track KPIs and can provide reliable data; able to upgrade employees facilities (toilets, changing rooms and lunch areas); able to customer oriented.

#### **4.1.2. Weakness of companies (internal factors/environment-negative factor)**

Inconsistent HR development; Poor data recording & management system; knowledge & skill gaps; Existing of weak supply process & capacity variation; Poor quality of products; Poor market penetration; Unequipped product research and development; Unable to provide required resources for implementation; Poor marketing and sales system; Unable to scale-up Kaizen practices and product varieties/diversification; delay of product's promised delivery date; higher scrap rate in few of plastic products compared to quality objectives; lower machine utilization; improper plant layout; unable to display KPI's in any section; not analyzed causes of defects systematically; not use of SOPs regularly; unable to sustain and maintain Kaizen activities and substantial improvements; unable to practice with full commitment; inconsistent training development; inconsistent monitoring and evaluation; poor purchasing system; varying rewarding system; Discouraging Kaizen structure and experts salary and not organizing Kaizen office and hired Kaizen experts; varying involvement in practice.

#### **4.1.3. Opportunities for companies (external environment-positive factor)**

Large and increasing market demand; availability of sufficient educated manpower; availability of infrastructure; the existence of training and education providing institutions; acquisition of free training and consultancy service from EKI and JICA; long term educational support; Kaizen related third country training; seminars and workshops conducted by EKI and JICA; best companies benchmarking.

#### **4.1.4. Threats faced by companies (external environment-negative factor)**

Increased number of competitors; limited number of suppliers of raw materials; unstable political situation of the country; shortage of foreign currency; spare parts purchased from foreign cannot be found easily; increasing price of equipment from time to time; electrical power interruption or frequent power failure; covid-19 pandemic virus.

### **4.2. Preliminary Analysis of the Effectiveness of Kaizen Philosophy Implementation in Ethiopian Manufacturing Companies**

The implementation of Kaizen philosophy give rise to economic benefits as different authors agreed (Otsuka et al. 2018; Lina and Ullah 2019; Berhe 2022; Berhe et al. 2023). The benefits are either quantitative or qualitative or both. Here the researcher presented and discussed the effect of Kaizen philosophy implementation based on the identified performance indicators from company's final report and presentation, KEC's and ILO case and best practices book as stated in Table (1). This helps more for company managers, practitioners, academicians, and government to understand the effects seen easily and creates motivations for further execution of Kaizen. In response to RQ1, the study identified some improved Kaizen performance indicators from the report, and for comparison purpose, the analytical way of graphical representation associated with attained monetary values, free space, operational and business performance results including financial and marketing are described graphs in Figure (2), (3) and (4) as depicted below.

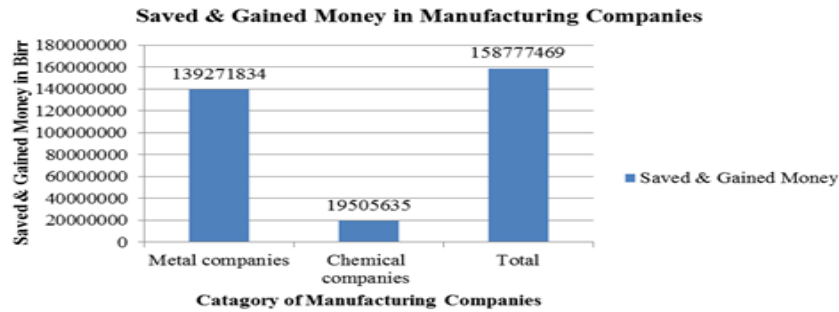


Figure 2. Money saved and gained from Ethiopian manufacturing companies (the researchers).

Figure 2 illustrates ten manufacturing companies, three from metal and seven from chemical, attained and saved costs with total amount of ETB 158,777,469.7, albeit the achievement varies from company to company. When the researchers compare the result, metal companies have saved and gained 88.78% of the entire money than chemical companies. From the entire money, 132,716,817.7 ETH birr (83.58%) was gained by eight companies, six from chemical and two from metal. This achievement was due to application of 5S, sorting in particular. During execution of this activity, non-important materials and equipment's were identified and sorted. Later, based on the decision of discarding committee, the unlike materials and equipment's were discarded by selling. This is supported by the aforementioned studies in addition to Desta (2014); Tiwari (2017); Hailu et al. (2015, 2017b) as the authors stated that costs could be saved and monetary value gained by execution of simple 5S tool. Moreover, Otsuka et al. (2018) proved Ethiopian organizations (manufacturing companies & service providers) gained more than two billion ETB by execution of Kaizen practices, 5S in particular. Similarly, Berhe (2022) also demonstrated Ethiopian chemical companies were attained more than seventy million ETB by doing the same activity. In most recent study, Berhe et al. (2023) highlighted that Ethiopian manufacturing industries were able to saved more than fourteen million ETB. Furthermore, 16.42% (26060652 ETH birr) of the whole monetary value was the cost saved from four companies, two from each subsector. Based on the companies report, this achievement was because of modification carried out in existing machineries (based on the improvement ideas proposed from QCCs), and then developing innovative products. For example, three companies (one from chemical, leather and metal) able to registered 55 improvement works and considered as innovated products. This is supported by Prajogo and Sohal (2003); Taddese (2017) as the authors described application of continuous improvement techniques results in product innovation. Consequently, six manufacturing companies, two from metal and four from chemical were attaining significant free working area. So, the graphical representation of this is given in Figure 3 as depicted below.

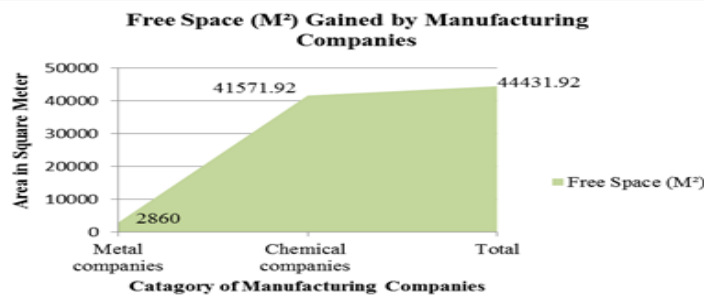


Figure 3. Free space gained in manufacturing companies (the researchers)

Figure 3. illustrates that the aforesaid manufacturing companies, in total, gained 44431.92 M<sup>2</sup> free working area. From the total, 93.17% of the whole free space is attained by chemical companies, while the rest (6.83%) is by metal companies. As per the report and site observation, this achievement was due to discarding of unwanted machines, materials, products and equipment's considered as defected and wastes of inventory found in different departments such as production floors, maintenance-workshops including garages, supply and finishing stores, and in the compound of companies. Moreover, the other performance improvement indicators attained by the companies is presented in Figure (4) as shown below.



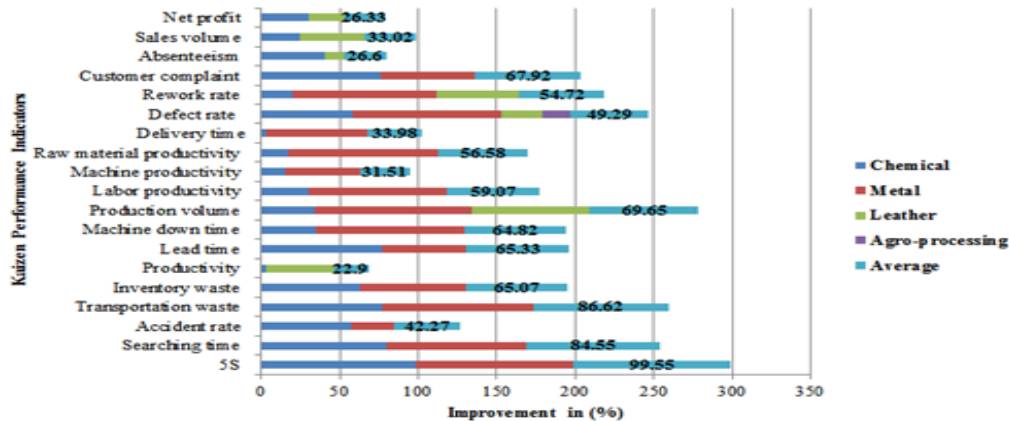


Figure 4. Operational, financial and marketing results in (%) attained by Kaizen application (the researchers).

Figure 4 illustrates manufacturing companies attain operational and business results. As per four companies report & observation, the highest achieved performance improvement is 5S with middling 99.55%. This is due to workplace organization and cleanliness conducted in three chemical companies and one metal company. This activity set-in-order in particular also results in improving searching time by 84.55%. While, operational measures such as production volume, customer satisfaction, labour productivity, defect rate, delivery time, absenteeism and productivity are improved by average of 69.65, 67.92, 59.07, 49.29; 33.98; 26.6 and 22.9% respectively. As a result, these achievements influence in improving the business by increasing the market for example, sales volume with 33.26%, and finance (net profit) with 26.33%. This is also supported by other studies such as Cua et al. (2001); Prajogo and Sohal (2003); Taddese (2017); Tesfay and Kitaw (2017); Masudin et al. (2018); Hailu et al. (2020) as the studies demonstrated organization performance pointers such as quality, delivery time, cost, flexibility and innovativeness (Cua et al. 2001); productivity, finance, customer results (Hailu et al. 2020; Masudin et al. 2018); marketing and production volume results (Masudin et al., 2018); people and society results (Hailu et al., 2020) could be achieved through application of continuous improvement methodologies.

### 4.3. Discussion on The Structured Framework of Kaizen Implementation in Manufacturing Companies

This section emphasis on detailed discussions of the identified Kaizen functions, activities, tools and techniques considered during the Kaizen implementation in Ethiopian manufacturing companies (see Table I). The discussion and interpretation of Kaizen philosophy implementation findings with the context of manufacturing companies is presented based on the selected and adopted methodology stated in the research approach section of the study; that is based on the trend of PDCA cycle considering four phases (Berhe et al. 2023). These phases are Plan (Preparedness; conceptualization and planning); Do (Implementation); Check (Performance evaluation & verification) and Act (Standardization, Sustaining and Re-planning). So that, in response to RQ2, it was found that the Kaizen implementation steps in each of the selected manufacturing companies were based on the PDCA cycle with different approaches. So, after conducting extensive assessment of the implementation process of Kaizen in the selected manufacturing companies, the study discovered standardized and structured Kaizen implementation framework (Figure 5) based on the trend of PDCA cycle consistent with Berhe et al. (2023) as adopted methodology. But, the identified unique techniques in section (3) are rarely practiced by the sample manufacturing companies, and merely very few unique techniques, for instance, autonomous maintenance, closely working with customers and suppliers, application of statistical QC tools were experienced as described in section (4.1.1).

### 4.4. Discussion on The Context of Social and Technical Factors of Kaizen Philosophy in Manufacturing Companies

Some previous studies conducted by Hailu et al. (2017b, 2020); Lina and Ullah (2019); Berhe (2022) revealed that identifying and exploring the incident of social and technical factors practice in manufacturing companies is significant for successful implementation of Kaizen philosophy. This aids the companies to focus and give an attention throughout the retro of implementation. The studies discovered leadership and people as social or human factors, and technology, information, structure, strategy, process, problem solving, partnership and resource as technical factors. Based on the discussion carried-out in section 4.3, some of the selected case companies of D4, E5,

G7, H8, I9, J10, L12, M13 and A'27 also practiced these identified success factors. Thus, in response to RQ3, based on the Kaizen case and best practice books, company's annual reports and presentations, the social and technical factors practiced by the manufacturing companies throughout the implementation were:

#### **4.4.1. Social factors**

**People** (employees had easy access to the relevant information and received up to date information regularly and freely by using production and Kaizen boards, formal processes of employees' briefing or communication were used regularly to find out employees' opinions and views; Specific Kaizen, technical and vocational, interactive skills training was offered to employees; all employees were involved in Kaizen implementation via organizing in QCCs and CFTs; Employees were encouraged to update their knowledge & skills; teamwork was a common practice within the company's CFTs, employees were received appropriate feedback, managers were recognized employees' achievements at work; managers were periodically evaluated the performance and satisfaction of employees; employees were created new ideas by using suggestion systems multi-skilled employees were created by using job rotations, labor union attitudes were good towards Kaizen philosophy implementation program).

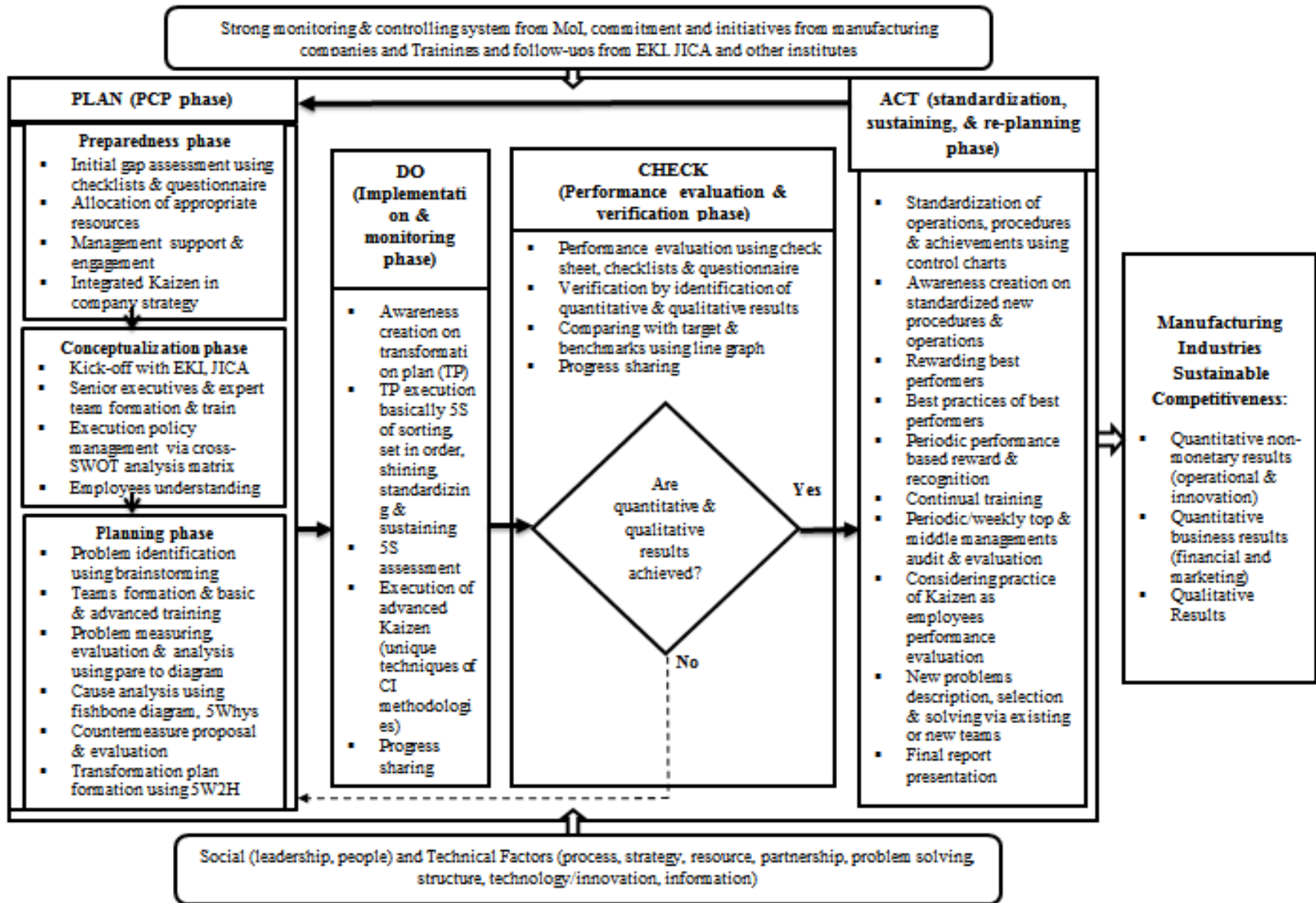


Figure 5. Framework of Kaizen philosophy implementation (the researchers)

**Leadership** (managers were involved in development, deployment, evaluation and review of strategies; managers were working closely and cooperatively with customers, suppliers and stakeholders; Managers were committed on review and evaluation of customer satisfaction; companies were providing encouraging facilities and kick-off session for starting of Kaizen implementation, companies were hold different awareness creation activities and trainings to develop employee's capacity, companies were allocated resources and created conducive working environment, as a result there were healthy relationship among employees and managers, managers provided on time feedback; managers were collected, evaluated, declared, implemented employees' new improvement ideas and examined its impact, managers were established recognition and reward system and accordingly, employees were motivated, rewarded and benefited by establishing salary increment strategies, managers were give employees authority of independence on their work, managers were responsible on public socio-economic development and environmental protection; managers were encouraged and participated in Kaizen philosophy implementation, managers were continuously acquired and updated their knowledge that is valuable for the company; Managers gave authority to employees for them to take decisions about their jobs; Managers were ensured that employees and suppliers are aware of the company's long- term plans; managers were periodically evaluated the performance and satisfaction of employees, managers were present themselves as role models for the employees; managers were developed process follow-up system after implementation, managers were encouraged and motivated employees to bring new improvement ideas, managers were viewed quality as more important in comparison to the cost of products, managers were measured and evaluated the process an effect of Kaizen practices, companies were benchmarking best practices of other best companies, managers were continually clarifying and communicating each team member's job duties and functions). However, these practices were vary from company to company and became challenges to other manufacturing companies.

#### 4.4.2. Technical factors

**Processes, products and services** (companies were established proper procedures and performed different jobs accordingly; companies were systematically recorded & measured achievements & losses within analytical analysis; companies were practiced integrated management systems; Employees were aware of the parameters of different processes which are needed to be controlled for effective operation; Performance of production processes was monitored; Development and innovation of production processes was emphasized; The research and development (R and D) department was continuously working on the development & improvement of the products; Production processes were capable of producing products according to design specifications; Proper systems were in place to deal with customer complaints; companies were able to use updated technology machineries and innovate new products).

**Policy and strategy** (companies were developed strategic plan; companies were considered present and future needs of customers/stakeholders; companies were exercising policy management and developed different policies and strategies with respect to their company mission and vision, these companies were also identified themes to be solved; the companies deployed the identified policies, strategies and themes to departments where cross functional team members came from; companies were used performance measurements and research outputs for update of policies and strategies; companies, KEC and JICA were periodically evaluate the implementation process and performance metrics against the set objectives and targets; the companies established and conducted progress sharing sessions (where general manager, management members, KEC, JICA experts and cross functional team members are invited).

**Partnership** (companies are developed supplier partnership and making long term relationships in relation to getting high quality of raw materials; companies were given preference to quality over cost while making purchase agreements with suppliers; companies are creating external linkage, closely and cooperatively working with different institutes including KEC, JICA, ILO, MoI, MIDI, TGIRDC, LLPIRDC, FBIRDC, MTEIRDC, CCIIRDC by making long term relations vis-à-vis training, consultancy, research and long term education; companies best performers were promoted and given chance of master's program (Abe's initiative) to improve their educational capacity which were prepared by JICA and Ethiopia Kaizen Institute; companies were periodically evaluated the performance of suppliers; companies have a system for the involvement of suppliers in quality improvement and new product development; companies were trained the suppliers regarding quality improvement).

**Resource** (required resources and updated information are provided to all employees to perform their jobs; companies were efficient on management and usage of facilities; they utilized free spaces of buildings for extra work; companies were established training and development center; companies were allocate appropriate budgets based on the request of teams; companies were effective in management of financial resources; the companies were

modified and repaired the existing resources of materials, machineries and equipment's; companies were improved handling of resource materials; the companies were also considered Kaizen in their structure, companies were organized Kaizen offices and hired skilled experts, companies human resource plans were based on planning of human resource development and empowerment, companies were tried to reduce the harmful effect of its activities on the environment).

**Utilization of problem solving methodology** (based on the discussion carried-out in the context of structured framework of Kaizen implementation, few manufacturing companies of G7,H8, I9, J10, L12, M13, A'27 were able to practice the quality control story with the trend of PDCA cycle (i.e. problem solving approach) in different approaches. For example, theme selection, understanding current situation, target setting, planning activities problem causes analysis and determine root causes, develop countermeasures categorized within planning cycle. Besides, implementation of countermeasures under do cycle, and comprehending or confirm results under check cycle and standardize process-sustain the gain is under act cycle of Deming wheel. Additionally, the companies were also applied various tools and techniques including soft techniques of brainstorming, 5 whys, 5W2H, KJ method, selection criteria's and seven QC tools of check sheet, pare to diagram, flow chart, cause and effect, scatter diagram, histogram and control chart based on the steps of QC story or problem solving system.

To sum-up the above literature, manufacturing companies were experienced social and technical factors during the implementation of Kaizen philosophy in order to attained the aforementioned quantitative (monetary and non-monetary) and qualitative results regardless of the degree of social and technical issues practiced in each companies. In the same way, the findings of several studies conducted by Amrutkar and Kamalja (2017); Lina and Ullah (2019); Kumar (2019); Hailu et al. (2017b, 2018b, 2020); Berhe (2022) are also consistent with the aforesaid findings.

#### **4.5. Discussion on The Context of Kaizen Implementation Barriers in Manufacturing Companies**

At this time, several preceding studies (Hailu et al. 2017b, 2015; Lina and Ullah 2019; Abebe and Singh 2019; Betgeorgise and Mindaye 2020; McDermott et al. 2022; Berhe 2022) gave attention on investigation of the circumstance of barriers or Critical Failure Factors (CFFs). As stated by these studies, barriers are practices that are impediments to attain objectives. Most recent study conducted by Berhe (2022) revealed that the main reasons for failure of sustaining Kaizen practices in selected chemical companies were unpracticed Kaizen philosophy practices relating to social and technical issues. From the company's report and observation, it was observed that companies are facing big challenge on practicing Kaizen issues, sustaining Kaizen practices and maintaining substantial improvements due to various reasons. These reasons were internal associated with unpracticed social and technical issues by companies, and external challenges linked to government policies and country situation. However, challenges are varying from companies to companies and some of the barriers identified were the drivers for other companies. So, in response to RQ3, identified barriers are grouped in to two: internal and external challenges. The internal challenges (from company side) are categorized under seven groups as depicted in Figure (6).

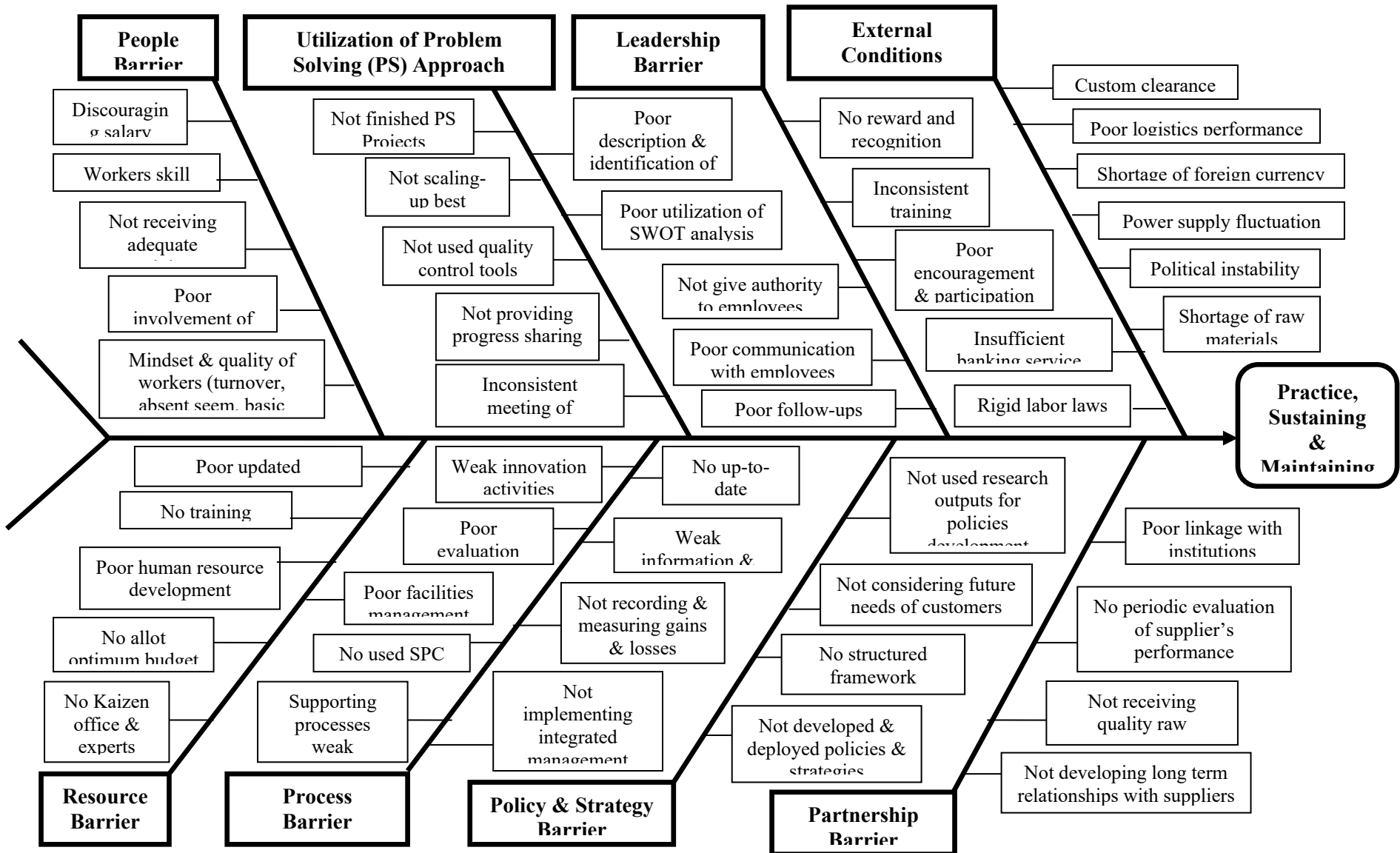


Figure 6. Causes for practicing and sustaining Kaizen philosophy practices, and maintaining substantial improvements (the researchers)

## 5. Conclusion

As per the discussion carried out in the aforementioned sections, the exploratory study made on manufacturing companies has come about with major findings; and the study drawn the subsequent conclusions based on the findings stated in the above. The study utilized SWOT analysis and developed general perspective regarding to the status of Kaizen practice on case companies. This exploratory study gives adequate understanding on practice of Kaizen using structured framework; practice of social and technical factors; the tangible and intangible effects achieved after implementation; barriers faced during practice of Kaizen and proposed solutions for tackling challenges relating to implementation, sustaining practices and maintaining substantial improvements. Hence, the research findings indicate that practice of Kaizen on manufacturing companies bring on achieving quantitative (monetary and non-monetary) and qualitative results. However, the implementation and attained results varies from company to company.

In response to RQ1, the implementation consequences in saving and gaining a total of 158,777,469.7 ETH Birr and 44431.92 M<sup>2</sup> free space. Moreover, the mediocre achieved improvements of net profits, sales volume, productivity, delivery time, production volume, labor productivity, machine productivity, defect rate, customer satisfaction, accident rate and absenteeism is 26.33, 33.02, 22.9, 33.98, 69.65, 59.07, 31.51, 49.29, 67.92, 42.27 and 26.6% respectively. In response to RQ2, in Ethiopia, different approaches were used for Kaizen implementation. Some manufacturing companies were implementing Kaizen philosophy in a level based strategy: first basic Kaizen, and next advanced Kaizen, and others follow problem based Kaizen implementation strategy. But, in both cases, manufacturing companies applied four main phases (Table I) based on the trend of PDCA cycle. Preparedness; conceptualization and Designing under Plan; Implementation of both basic and advanced Kaizen practices to solve the identified problems under Do; Stabilization or performance evaluation under Check, and Standardization, Sustaining & Re-Planning under Act. Even though, the first phase could be provided as preparedness, conceptualization and planning phases.

In response to RQ3, the aforesaid Kaizen results are achieved through applying structured framework (see sub-section 4.3 and Figure 5), practice of different social and technical factors (see sub-section 4.4). The social factors are people management and leadership, and technical factors are problem solving methodology, process management including product and service, policy and strategy, partnership and resource management as identified in this study. However, this exploratory study finding also confirmed that even though companies were achieving considerable results, they could not able to sustain the Kaizen practices and maintains the attained substantial improvements, and even significant number of companies was also cease the implementation. The main reason for this was internal and external factors (see sub-section 4.5 and Figure 6). In relation to internal factors, companies unable to practice some of the Kaizen activities identified as barriers during implementation, and external factors government policies and country situation forced companies to stop implementation as presented on the fishbone diagram of this study.

## 6. Recommendations

Based on the concluding remarks, all companies are highly recommended that they should able to implement Kaizen philosophy practices: unique techniques described in section 3, following structured (six phase) implementation framework developed (see Figure 5), fully practice of social and technical factors (see sub-section 4.4), roles of triple helix actors (see Figure 5), eliminating the identified internal and external barriers (see Figure 6), and sustaining the aforesaid Kaizen practices and maintaining substantial improvements (motivations) (see sub-section 4.2).

## 7. Implications of the research

This is the only wide-ranging study exploring the practices and effect of Kaizen philosophy with the context of manufacturing industries of Ethiopia. Therefore, this study contributes to the Kaizen body of knowledge by providing Kaizen philosophy practices, for example, unique techniques of Kaizen methodologies (LM, TQM, SCM, IM and LSS), drivers of social and technical factors, implementation framework, roles of triple helix actors, barriers need to be eliminated and motivations/KCIs. It was discussed in the introduction section and identified in section 3 of the study that gaps exist in the literature on exploration of Kaizen implementation and its effect with the perspective of implementation process of unique techniques, methodology used, drivers experienced, barriers faced and empirical evidence for the effectiveness of the implementation with the context of the manufacturing industries. Based on it, the study has tried to fill these gaps. Thus, the most important contributions of this research to the existing Kaizen (CI) body of knowledge are provided in relation to theoretical, practical and managerial implications as follows:

### **7.1. Theoretical implications**

This research contributes to the existing Kaizen philosophy literature by providing information about its history roots, definition and principles, and implementation phases including main activities, social and technical factors (drivers), tools and techniques, and internal and external barriers which have different impact on industries performance applying it to the Ethiopian manufacturing companies. Thus, the study identified implementation framework for Kaizen implementation (see sub-section 4.3.); twenty five unique techniques (see section 3); seven drivers with two social and five technical factors of Kaizen (see sub-section 4.4); tools and techniques (see Table I and Figure 5); internal and external barriers (see sub-section 4.5 and Figure 6). Moreover, the study also provided various motivations/KCIs with the category of operational, innovation and business (financial and marketing) results attained by selected manufacturing companies (see sub-section 4.2).

### **7.2. Practical implications**

In relation to practical implications, this study discovered a framework for Kaizen implementation in manufacturing industries to enhance sustainable competitiveness, operational, innovation and business performance results in particular. The framework encompassed different Kaizen practices such as drivers, roles of triple helix actors, Kaizen actions grouped under six phases with the trend of PDCA cycle and consistent with Berhe et al. (2023). These are Plan (Preparedness; conceptualization; and planning); Do (Implementation of both basic and advanced Kaizen practices to solve the identified problems with monitoring); Check (Performance evaluation & verification) and Act (Standardization, Sustaining & Re-Planning). So, companies should follow this structured framework for the implementation of the developed framework. In the implementation, companies should primarily implement basic Kaizen tools (5S, standard operating procedure, muda identification, elimination and prevention), and then unique or advanced techniques including autonomous maintenance, planned/preventive maintenance, layout improvement, establishing quality in station as applied by selected manufacturing companies.

Besides, the framework is successful by practice the identified drivers of social factors (people and leadership) and technical (process, policy & strategy, problem solving approach, resource and partnership) factors. Still the competitiveness is secured when the triple helix actor's able perform their roles (company's initiative and commitment, institutes training and follow-ups, and government monitoring and controlling). Therefore, manufacturing industries should holistically implement the practices encompassed in the developed framework rather than on a fragmentary basis to enhance competitiveness pertaining to tangible (quantitative results of monetary and non-monetary), and intangible (qualitative) results. In addition, companies ought to introduce the framework to the entire employees through awareness and training, employees need to participate in Kaizen practice either in QCCs or CFTs as a teamwork basis, and in this regard, top and middle management should authorize them to use the full potential of their knowledge and skill. At last, companies ought to give weight to the Kaizen implementation novelties from the lessons learned with the context of developing country of Ethiopia: considering Kaizen in organization structure, expert team building, ensuring resource capability, development of policies and strategies by management, level based practice of Kaizen programs, monthly progress sharing, received triple helix actors as per their roles, and establishing performance based rewarding system.

### **7.3. Managerial implications**

In relation to managerial implications, the study developed a framework which could be used as an implementation procedure or a guideline for the company managers in order to practice in the existing or other companies. Besides, the study contributes to a better understanding on the practice of Kaizen could impact in enhancing manufacturing industries competitiveness. But, for achieving the quantitative and qualitative results, company managers should give attention to the practice of identified drivers of social and technical factors. The leadership should be committed and supportive, managers should be effective in management and development of people, managers should develop and deploy policies & strategies; managers should cooperatively working with institutions and government though establishing long term relationship or partnerships, the process should be managed and controlled by employing statistical process control tools, resources should be managed through planning, scheduling and allocating people, money and technology to Kaizen implementation program or project, and the managers should follow the problem solving approach methodology based on the developed implementation procedure. At the last, but not the least, the identified barriers should also be eradicated by the managers in practice of the drivers of social and technical issues as described in the cause and effect diagram of the study.

On the whole, it is imperative to annotation that manufacturing industries sustainable competitiveness can be attained by application of Kaizen philosophy framework. So, managers should understand and focus on the identified Kaizen practices including unique techniques, social and technical factors, structured implementation



procedure to determine it as a company's framework, which is consistent with the modern view of Berhe et al. (2023); Berhe (2022); Sisay et al. (2021); Dametew et al. (2020); Tilahun et al. (2020); Kumar (2019); Todorovic et al. (2019); Lina and Ullah (2019); Hailu et al. (2018a); Tesfaye and Kitaw (2017); Getachew et al. (2017); Khanna et al. (2017a, 2017b); Amrutkar and Kamalja (2017), signifying that practice of Kaizen can effect competitiveness in relation to operational, innovational, and business (financial and marketing) results.

## 8. Limitations and directions for future research

The limitations of the present study provide directions for future research as follows. Owing to the unavailability of annual and technical report from manufacturing companies, only thirty two companies (the majority-chemical) are targeted by the study. Even, the quality of the report received from the selected companies is poor, and some key competitiveness indicators were not well recorded. Albeit, there are more than 100 manufacturing companies implemented Kaizen till this study conducted. Therefore, researchers for future study can focus on the topic to find best findings to contribute to academics, practitioners and government including Kaizen Excellence Center for the purpose of implementation of Kaizen on other manufacturing industries, service providers and educational institutions. In addition, researchers in the future could apply the framework to explore the practice of Kaizen philosophy could enhance sustainable competitiveness.

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