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Empirical investigation of integrated Kaizen philosophy (continuous improvement) practices application for enhancing sustainable competitiveness of manufacturing industries of Ethiopia

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Abstract: The purpose of this study is to investigate the combined application of Kaizen practices in selected manufacturing industries of Ethiopia. The study adopted a mixed methods research supported on survey and company observation. The findings revealed that Kaizen practices are found to be partially practiced with a minimum of 50%. Besides, by following structured framework, companies saved and gained a total of 3,175,549.39 USD, attained operational results of customer satisfaction, delivery time, defect rate, productivity, sales volume and net profits with 67.92, 33.98, 49.29, 22.9, 33.02 and 26.33% respectively. However, sustaining practices is a worry for some of the companies. Ever since, the existing practices rarely presented empirical evidence reinforcing theories pertaining to application of Kaizen practices for sustainable competitiveness, therefore, researchers realise that this is the very first research that may have value for triple helix actors: manufacturing industries, institutions and government policymakers in the context of a developing country.

Keywords: Kaizen practices; continuous improvement; integrated application; enhancing sustainable competitiveness; empirical investigation; Ethiopian manufacturing industries.

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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, companies need to practice the superlative management philosophies (Suárez-Barraza and Miguel-Davila, 2020), for example, Kaizen is one of the best management philosophy which is fundamental for organisations to enhance their competitive edge and business sustainability in the current dynamic business landscape (Kong and Muthuveloo, 2022; Berhe, 2022; Jaca et al., 2018). As Imai (1986) and Berger (1997) stated, Kaizen is a Japanese concept that was translated in the western as ongoing, 'continuous improvement – CI', (Malik et al., 2007; Singh and Singh, 2015) which could be applied in different aspects/roles in life, such as personal, social, and professional. Berhe (2022) also highlighted Kaizen professionally refers to improve every day, everyone (managers and front-line workers), and everywhere (any area, department or process in an

organisation). Moreover, other studies also discovered that Kaizen practice can secure innovation performance. For instance, Lizarelli et al. (2022) revealed further implementation of Kaizen (CI) practices are associated with better product and process innovation performance. Other study (Brunet and New, 2003) also highlighted Kaizen as an improvement strategy capable of ensuring excellence and operational innovation.

For the last 35 years, a number of organisations applied Kaizen in different perspectives, for instance, in Ethiopia, some have applied Kaizen based on the involvement and proposals from a quality control circle (QCC) and a suggestion system (Hagos and Kahsay, 2011); as a group of quality management and production systems, tools and techniques for identifying, eliminating and preventing wastes (Berhe, 2022); as a CI model integrated quality and production management methodologies such as total quality management (TQM), Just in Time (JIT) and Lean Six Sigma (LSS) (Sisay et al., 2021); JIT, TQM and supply chain management (SCM) (Dametew et al., 2020); 3T's (Toyota Production System/TPS, TPM and TQM) (Hailu et al., 2018b); JIT and TQM (Tesfaye and Kitaw, 2017; Dametew et al., 2017; Getachew et al., 2017); LM, TQM, SCM, innovation management (IM) and LSS (Berhe et al., 2023); as a set of management practice which integrates Lean Management (LM), a philosophy familiarised by 'The Machine that changed the World' in 1990 (Holweg, 2007), and innovation practices (Tilahun et al., 2020); in western (USA) and Asian countries (Japan) as simply an approximation to management approaches such as the LM, the TPS, and TQM or company wide quality control (CWQC) (Suárez-Barraza et al., 2011); in Europe (Portugal) as a management philosophy which integrated quality and IM systems for innovation development (Lopes et al., 2022). Thus, for the purpose of this study, the definition of Kaizen/CI is a management philosophy which integrates a production and quality management methodologies, for instance LM, TQM, SCM, IM and LSS practices.

Currently, these methodologies have been implemented in many organisations, operating in many different industries. Despite its wide application, CI implementation success rates vary strongly (Antony et al., 2020; Chakravorty, 2009; Kumar et al., 2008). Moreover, after several decades of research, evidence on causes for (un)successful CI implementation remains scarce and anecdotal in nature (Bhamu and Singh Sangwan, 2014; Hilton and Sohal, 2012; Kumar et al., 2011).

The variation in success rates is largely attributed to the complexity associated with achieving a consistent and organisation-wide adoption and application of improvement methodologies (Kwak and Anbari, 2006). The CI implementation process comprises several management challenges, such as creating the need for change, setting adequate goals and performance metrics for all involved in the change process, and subsequently managing the organisational change process, known as CI implementation (De Mast et al., 2013). Still manufacturing industries faces various challenges despite the literature proposes a variety of guidance to support management decision making in such CI implementation processes in the form of lessons from many case studies (Primo et al., 2021; Sunder et al., 2020; Amrani and Ducq, 2020; Sunder and Kunnath, 2020; Fogliatto et al., 2020) and CI implementation and maturity models (Lameijer et al., 2017).

CI practices have attracted the interest of many researchers from diverse areas. Several researchers come out with many success stories regarding discrete and joint practice of CI methodologies for instance, organisations benefits from practice of LSS (Sreedharan et al., 2019; Singh and Rathi, 2019; Ben Ruben et al., 2017; Albliwi et al., 2015a, 2015b); practice of TQM results in attaining quality performance in Indian (Talib et al., 2013), in Malaysia (Arumugam et al., 2008), in Australian (Prajogo and Brown,

2004), in Singapore (Brah et al., 2002), in Pakistan (Shafiq, 2011), and in Ethiopia (Aderaw, 2019); Indian process industries have reduced waste and increased quality through implementation of LM (Panwar et al., 2015), and other study conducted by Masudin and Kamara (2018) described JIT, TQM and SCM practices in both manufacturing and service industry individually and jointly impact organisational performance. Moreover, the World Bank Enterprise Survey on Ethiopia, found that IM practices improves firm performance (Admasu, 2017; World Bank Group, 2016), and the studies confirm 68% of large firms, 49% of medium enterprises and 42% of small enterprises reported product or process innovation (Admasu, 2017; World Bank Group, 2016).

While numerous studies also have revealed that almost two-third of the CI methodology (TQM) implementation program failed to achieve any result (Miller et al., 2009; Rich, 2008; David and Strang, 2006), and others find mixed results of TQM success (Nair, 2006; York and Miree, 2004; Kaynak, 2003; Prajogo and Sohal, 2001). Likewise, previous empirical research investigates the effect of TQM on performance. Some authors find positive results (Arumugam et al., 2008; Shenaway et al., 2007; Prajogo and Sohal, 2003), other researchers fail to find any significant link (Powell, 1995), and some studies even identify an inverse association (Yang et al., 2009; Kannan and Tan, 2005; Rahman and Bullock, 2005; Prajogo and Sohal, 2004).

Furthermore, the findings of Wakchaure et al. (2014) demonstrate the importance of implementing TQM, JIT, TPM and SCM synergistically to enhance overall performance of the manufacturing plants. In other study carried-out by Cua et al. (2001) also confirmed that the components of JIT, TQM and TPM integrated framework (each methods unique practices, and socially and technically-oriented practices) are mutually supporting in achieving high levels of manufacturing performance. Berhe (2022) explored the application of Kaizen philosophy for enhancing organisation performance with the context of Ethiopian selected chemical companies, but, the author only targeted the practices of TPS, TPM and TQM. He did not consider the unique techniques of LM, SCM, IM and LSS. Besides, the author discovered different frameworks based on the PDCA cycle for basic and advanced Kaizen implementation. Taddese (2017) also explored the application of TQM for innovation. In this case, the study focused on three TQM factors: human factor, technology factor and information factor to see the effect on process and product innovation in selected Japan, India and Thailand companies, but, the study missed the operational and business effects gained by integrated application of LM, TQM, SCM, IM and LSS practices. Most recently, Berhe et al. (2023) have verified the effectiveness of integrated CI (LM, TQM, SCM, IM and LSS) implementation in selected Ethiopian manufacturing industries, but, the study faced challenges in getting ample and empirical data. In addition, the study focused only in verification of the implementation process, and it does not consider the circumstance of drivers or success factors experienced and barriers faced by the industries.

However, there is no empirical and exploratory study investigating the practices of integrated CI programs with the focus of the above-mentioned methods (LM, TQM, SCM, IM and LSS) globally and in Ethiopia too. For this reason, it was difficult to get research works and adopt instruments analogous to the study in any countries including Ethiopian organisations context. So, this signifies that the current literature is in huge deficit of empirical evidence that describes the extent of integrated Kaizen philosophy (CI) practice (unique techniques and drivers experienced, attained motivations and

barriers faced during the implementation of integrated LM, TQM, SCM, IM and LSS methods) (Berhe et al., 2023).

From 1980s to 2010s, Kaizen has been transferred to developing countries such as Asia (Singapore and Thailand), Latin America (Costa Rica, Brazil, Argentina and Paraguay), Europe and Middle East (Hungary and Jordan), Africa (Tunisia, Egypt, Ethiopia, Ghana, Kenya, Tanzania, Zambia and Cameroon) as a part of Japan's Technical Cooperation (TC) projects aiming at knowledge transfer and institutional development (Otsuka et al., 2018). Based on "the book-applying Kaizen in Africa" published by Otsuka et al. (2018), the entire projects conducted in the above-mentioned developing countries result in achieving concrete outputs by trained several workforces and delivering consultancy services. These outputs further contributed to the annual growth rate of productivity, for example, in Singapore, which was 4.5% between 1980 and 1995. Based on the lessons learned from the above-mentioned developing countries, Ohno (2011) selects six criteria for successful Kaizen promotion as a national movement: they are:

- 1 strong personal commitment of the top leader
- 2 establishment of core organisations responsible for implementation
- 3 presence of supporting institutions and mechanisms
- 4 implementation of a massive campaign
- 5 provision of standardised training programs
- 6 enhancement of capability of the private sector.

Correspondingly, 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; Berhe, 2022; Hailu et al., 2017a; Admasu, 2015). In Ethiopia more than 700 organisations from manufacturing, service providers and institutions have implemented Kaizen philosophy (Hailu et al., 2020). Accordingly, some are benefited from the implementation by securing quantitative (monetary and non-monetary results) and qualitative results. For instance, Otsuka et al. (2018) and Berhe (2022) agreed on manufacturing companies of Ethiopia have saved millions of Ethiopian Birr and achieved improvements of various operational indicators including sales volume, productivity, production volume, machine productivity and others. However, many are still facing huge challenges in implementation, sustaining Kaizen practices and maintaining substantial improvements, and even significant numbers of organisations are out of Kaizen implementation. This is also supported by other studies, such as, Mauri et al. (2010), Zollo and Winter (2002) and Berhe (2022) as indicated although organisations have widely implemented Kaizen/CI, sustaining the momentum of Kaizen/CI activities has been a challenge.

As a result, the manufacturing sector remains in sluggish growth, poor operations, innovation and business management. The low performance and competitiveness of the sector have been major obstacles for promoting exports, domestic and foreign investments. For sustainable economic growth in Ethiopia, it is very indispensable to develop the manufacturing sector. As described above, several Ethiopian manufacturing industries have implemented different CI methodologies for continuously manage and

improve their operations to enhance organisational performance (Berhe et al., 2023). Based on the Manufacturing Industry Development Institute (MIDI) 2022 report, manufacturing industries have recorded both success and failure stories. But, there is no previous empirical study targeting on investigation and identification of the leading unique techniques, drivers or critical success factors (CSFs), potential motivations or attainable improvements and barriers that impede the successful implementation of CI methodologies such as LM, TQM, SCM, IM and LSS practices in an integrated approach.

Hence, Kaizen philosophy implementation should be explored to understand the circumstance of the practices and its effectiveness in improving manufacturing company's performance, this enables to discover the framework, to identify success factors experienced which could be taken as best practices in order to implement in other organisations. This action gives an opportunity for the triple helix actors (manufacturing companies, institutions, and governments) to take concrete actions on improving the strategies and policies.

However, globally, it is almost none preceding exploratory study with the scope of this research and even with substantial data presenting the implementation framework and success factors used for achieving significant improvements in standpoints of manufacturing companies including Ethiopia. As a result, there is no adequate amount of empirical evidence that narrates the practice of integrated Kaizen and its effect in manufacturing industries of Ethiopia with the status of their implementation, method of practice, drivers (social and technical factors) behind success, effect of practice and barrier of the practice perspective. And so, this point out that there is high scarcity of empirical evidence which is key research gap and as a result still empirical exploratory study is needed to completely understand the practice of Kaizen philosophy and its effect on manufacturing industries and to contribute to the body of knowledge.

The motive of the research, with the context of Ethiopia, Manufacturing Industry Development Institute (MIDI) is currently reorganised by incorporated six research and development (R&D) centres. Developing Kaizen implementation model is one of the roles and responsibilities of the institute as described in the strategic plan prepared in 2022. It is also one of the thematic areas to be addressed, and therefore, there is a need to conduct the study. So that, the findings of this research are fundamental for the institute which could use as a guideline for implementing and monitoring in manufacturing industries; and despite the fact that, enormous manufacturing industries implementing Kaizen, few of them are successful as tried to discuss earlier. So, the majority of the manufacturing industries required structured implementation framework to successfully practice Kaizen and achieve the required goals. Besides, it is also significant for manufacturing company managers, academics, private and government institutions which are on the journey of Kaizen philosophy practice. Thus, the research will emphasise on the practice of Kaizen philosophy and its effectiveness, the social and technical factors, and barriers for Kaizen dissemination within the Ethiopian manufacturing industry.

Therefore, the study is addressed through the following research questions:

- RQ1* What is the level of integrated Kaizen/CI practices application in manufacturing companies of Ethiopia?
- RQ2* What is the integrated Kaizen/CI framework employed for enhancing sustainable competitiveness of manufacturing companies of Ethiopia?

RQ3 What are the integrated Kaizen/CI practices applied and effects attained in manufacturing companies of Ethiopia?

Therefore, the goal of this research is a threefold justification. First, it is to empirically look at the extent of Kaizen philosophy application and effect in selected manufacturing companies. Second, developing an integrated framework based on the exploration 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 non-monetary) and qualitative results, and barriers hindrance for deploying and sustaining Kaizen methodology in selected manufacturing companies of an under-researched country, Ethiopia. Moreover, this research will also explore the way forward to mitigate the barriers. The remainder of the paper is as follows: Section 2 describes the literature, followed by research methodology in Section 3. The results and discussions are explicated in Section 4 followed by conclusion in Section 5. The implications and limitations with directions for future research are elucidated in Section 6 and 7 respectively.

2 Literature review

2.1 Definition and principles of Kaizen

2.1.1 Definition of Kaizen

In the last few decades, a considerable amount has been written about Kaizen, and 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.

For this reason, this study categorised these definitions into two. One is the broader definition, and it means a management philosophy which encompasses production and quality management methodologies to achieve organisational excellence (Imai, 1986; Bhuiyan and Baghel, 2005; Singh and Singh, 2009; Berhe et al., 2023). While, the 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 QCC and a suggestion system (Hagos and Kahsay, 2011). Hence, for the purpose of the study, the broader definition of Kaizen philosophy is provided by (Imai, 1986; Bhuiyan and Baghel, 2005; Singh and Singh, 2009), and it covers practices of LM, TQM, SCM, IM and LSS methodologies (Berhe et al., 2023). But, it is rare to find a study focusing on empirical exploration of the practice of integrated 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.

2.1.2 *Kaizen philosophy principles*

Kaizen could be developed at three levels (Ohno, 2013): improve the way of using existing equipment (manual work Kaizen), improve machine tools or equipment (equipment Kaizen), and improve reversing process sequence (process Kaizen). Another classification of Kaizen is focus in management, groups, and individuals (Imai, 1986, Cheser, 1994). Kaizen management focuses on the logistical, process and strategic points of greatest importance, and provides the impetus to maintain progress and worker morale; quality circles, Kaizen teams, and Jishu Kanri groups, groups that use various statistical tools and methodologies to solve problems (Kata-Kaizen) represent Group Kaizen. Individual Kaizen is one aimed at improving and developing work through skills. Mechanisms such as Kaizen Teian (mechanisms of proposals or suggestions) or Kaizen-Coaching are used (Imai, 1986).

Practitioners and academics emphasised the importance of CI project initiatives (or Kaizen projects alike Kaizen events, Lean-Kaizen projects, Six Sigma projects, LSS projects, Shainin, and quality improvement projects (traditional improvement projects) to success in a competitive environment (Imai, 1986; Harry and Schroeder, 2000; Suarez-Barraza and Linhgam, 2008). In this case, well understanding of the principles of Kaizen is mandatory. However, it is rare to find studies identifying Kaizen philosophy principles, and even the existing lacks consistency. For example, Álvarez-García et al. (2018) and Carnerud et al. (2018) analysed systematic literature reviews of Kaizen articles. While, origins and characteristics of Kaizen philosophy was investigated by Mendez and Vila-Alonso (2018), Chung (2018) and Chiarini et al. (2018). Other studies (Fonseca and Dominguez, 2018) examined the case studies and implementation of Kaizen in manufacturing, and Chen (2018) in services organisations. Similarly, other studies (Alvarado-Ramírez et al., 2018; Jaca et al., 2018; Marin-Garcia et al., 2018) also identified the drivers and barriers in Kaizen application. Besides, González-Aleu et al. (2018) evaluated Kaizen events and their CSFs.

But, few studies tried to identify Kaizen principles, for example, Berger (1997) proposed three Kaizen guiding principles such as process-oriented, improving results, and 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 (Imai, 1986, 1997; Fonseca and Dominguez, 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 LM, TQM, SCM, IM and LSS methodologies.

2.2 *Unique techniques of integrated Kaizen philosophy (CI) methodologies*

Several preceding studies, conducted from 1995 to 2021, commonly recognised unique techniques for joint implementation of Kaizen programs. After reviewed these studies, the research identified most regularly cited techniques central for the practice of Kaizen for example, Chiarini and Kumar (2021) identified the most important unique techniques of LM are value stream mapping (VSM), lean office, lean metrics-visual management, just-in-time (JIT)-pull system, production levelling-Heijunka, 5S, cellular manufacturing,

single minute exchange of die (SMED), Jidoka-Automation, Kanban, total productive maintenance (TPM), Poka-Yoke-mistake proofing. Others also recognised unique practices for the old version of LM-TPS including JIT production system and Jidoka in particular. In view of that, the recognised JIT unique practices as the primary pillar of TPS are: set up time reduction and pull system/Kanban (Flynn et al., 1995; Cua et al., 2001; Nandurkar et al., 2014; Dametew et al., 2017; Getachew et al., 2017; Tesfaye and Kitaw, 2017; Hailu et al., 2018b; Sisay et al., 2021), JIT daily schedule adherence (time) (Dametew et al., 2020), JIT layout/equipment and JIT delivery by suppliers (Cua et al., 2001; Nandurkar et al., 2014; Hailu et al., 2018b; Sisay et al., 2021). While, other authors (Hailu et al., 2018b) identified automatic stop, andon, person machine separation, poka-yoke, in-station quality control, and root cause analysis/5whys as unique practices of the second pillar of TPS, automation or Jidoka in particular for implementation of TPS.

Other earlier studies also commonly identified TPM unique practices independently since it is considered as one unique technique of LM by Chiarini and Kumar (2021) as described above. Based on this, the considered unique practices of TPM are: autonomous maintenance and preventive/planned maintenance by Nakajima (1988), Cua et al. (2001), Nandurkar et al. (2014) and Hailu et al. (2018b), proprietary equipment development by Cua et al. (2001), Nandurkar et al. (2014) and Hailu et al. (2018b). Other authors (Milling et al., 1998; McKone et al., 1999) also identified the first TPM unique practice. Correspondingly, the TQM unique practices recognised by several preceding studies (Flynn et al., 1995; Nandurkar et al., 2014; Getachew et al., 2017; Tesfaye and Kitaw, 2017; Hailu et al., 2018b; Sisay et al., 2021) are customer focus, process management/statistical process control, supplier quality involvement/management /supplier integration, and cross-functional product design. Other authors (Cua et al., 2001; Baye and Raju, 2016) also identified the first three listed TQM unique practices. Dametew et al. (2020) also recognised only three SCM unique practices. These are internal logistics management, procurement, and distribution and material handling. Other study conducted by Laureani and Antony (2012) recognised project management skill; project execution (selection, prioritisation, review and tracking); linking LSS to business strategy; linking LSS to the customer, linking to the suppliers; linking LSS to the process as unique practices for implementation of LSS program. In this case, the study argues project skill and execution need to be associated with utilisation of DMAIC methodology.

IM is generally described as the management of development and/or application of new ideas, knowledge, methods and skills that can generate unique capabilities and leverage the organisation's competitiveness as stated by Kim et al. (2012). The new capability could be different IM unique practices as identified by some preceding authors. These recognised unique practices are product, process, organisation and marketing (Damanpour et al., 2009); R&D technological, and management innovation (Fernandes et al., 2014). As stated by Kim et al. (2012) and Herrmann et al. (2007) these recognised innovation unique practices could be either incremental or radical innovation.

Furthermore, these identified unique techniques could be jointly implemented with the fourth industrialisation technologies (Industry 4.0 technologies). This is supported by Chiarini and Kumar (2021) as they said that the most important identified unique techniques of LM may have synergistic relationship with Industry 4.0 technologies. The authors defined Industry 4.0 as, it is a structured and complex model that encapsulates many digital technologies connected with each other to provide real time data to

manufacturing and service systems for analytics purpose by use of base technologies including internet of things (IoT), Big data collection and analytics, artificial intelligence (AI) and machine learning, cloud services, 3D printing, digital automation with sensors and smart sensors etc. Moreover, the authors investigated and demonstrated how Industry 4.0 technologies and LSS tools and techniques can be integrated to provide competitive advantages to organisations. They used the LSS powerful methodology, such as the define-measure-analyse-improve-control (DMAIC) stages to show which stages are the most affected by the Industry 4.0 technologies.

To sum up the above discussion, considerable amount of earlier studies identified unique techniques for different Kaizen methodologies. However, it is not provided in a single framework for the joint implementation of the above considered methodologies. Meanwhile, the unique techniques could also be integrated with the Industry 4.0 technologies. But, since the drive of this study is exploring the integrated Kaizen philosophy practice with the perspective of the unique techniques of LM, TQM, SCM, IM and LSS methodologies, other future researchers could focus on investigation of the joint implementation of these considered unique practices with Industry 4.0 technologies. With this regard, the study identified 25 unique practices in line with Berhe et al. (2023) for implementation 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, prioritisation, review and tracking), pull system or Kanban System, Internal logistics, value stream map, proprietary equipment development, setup time reduction or SMEDs, distribution and 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 their practice in Ethiopian manufacturing industries.

2.3 Drivers to integrated Kaizen philosophy (CI) application

Similar to Section 2.2, several studies were also conducted and recognised various drivers as social and technical factors used for successful execution of Kaizen, such as, Prajogo and Sohal (2004), Suárez-Barraza et al. (2011), Psomas et al. (2014), Beshah and Kitaw (2014), Jalu (2015), Baye and Raju (2016), Gonzalez-Aleu and Van Aken (2016), Amrutkar and Kamalja (2017), Hailu et al. (2017a), Khanna et al. (2017a, 2017b), Rawashdeh (2018), Abdulmouti (2018), Jaca et al. (2018), Marin-Garcia et al. (2018), González-Aleu et al. (2018), Shafiq et al. (2019), Kumar (2019), Lina and Ullah (2019), Todorovic et al. (2019), Jong et al. (2019) and Janjić et al. (2019). For example, Suárez-Barraza et al. (2011) identified ‘the cornerstones’ for the practice of Kaizen in general: team work, eliminating muda and gemba management, education and training, commitment from top management, proposing and applying improvements, focus on process, and standards. Other authors (Tsfaye and Kitaw, 2017) recognised common factors for successful implementation of an innovative TQM and JIT integrated model. These are top management commitment, strategic planning, employee involvement, information and feedback, external linkages (external sources of technologies and knowledge-universities, foreign direct investment (FDI), Joint research, international collaboration), continual learning and technological capability accumulation and re-planning in addition to unique techniques.

Correspondingly, Getachew et al. (2017) also considered five human and strategic-oriented common practices such as committed leadership, strategic planning, cross-functional training, employee involvement, information and feedback for successful implementation of synergistic model of TQM and JIT. Khamkham (2017) also considered nine CSFs for successful implementation of the proposed integrated QM framework. These are, organisational structure, focus on customer, inking to suppliers, training and education, leadership support, effective communication, quality commitment, middle management involvement, and reviews and tracking of performance. The study carried-out by Dametew et al. (2020) also identified three common practices/factors for successful implementation of integrated JIT, TQM and SCM model. These practices are people involvement and strategic issues (leadership commitment, stakeholder and employee involvement and commitment, strategic planning, continuously monitor and control, training, feedback, external relations), modern systems (technology, innovation, flow, quality team, information, warehouse, performance evaluation, flexibility), resource utilisation and related issues (cost, awareness and training, waste controlling mechanism).

Sisay et al. (2021) recognised top management commitment and leadership, continuous performance management (CFR: conversation, feedback and recognition), tools of achieving organisational objectives and key results (measure that matters most, focus and commit priority, align and communicate team work, track accountability, and stretch for amazing), employee involvement, training and education, innovation, cultural change as success factors for successful implementation of TQM, JIT, and LSS integrated framework besides to unique techniques. Other studies, Hailu et al. (2020) and Berhe (2022) commonly identified six Kaizen practices as drivers for successful practice of Kaizen by categorising leadership and people as social factors; process, strategy, partnership including supplier and resource as technical factors. Besides, Berhe (2022) accepted problem solving approach as seventh driver of technical factor. Most recently, Berhe et al. (2023) recognised social factors: leadership and people management, and technical factors: process management, policy and strategy, partnership, resource management and problem solving approach as drivers for successful Kaizen philosophy execution.

To sum-up the above literature, there are considerable previous studies focusing on identification of success factors for successful implementation of Kaizen philosophy, though, the identified practices are not parallel and organised in one framework. Thus, for the purpose of this exploratory empirical study, the factors recognised by Berhe et al. (2023) are adopted and employed in the evaluation of the extent of their practice in manufacturing industries of Ethiopia.

2.4 Roles of triple helix actors in integrated Kaizen philosophy application

The other issue in practice of Kaizen philosophy is involvement of triple helix actors (i.e. organisation, institution and government). Previous study conducted by Berhe et al. (2023) and Tilahun et al. (2020) identified the roles of the triple helix actors in implementation of CI. For example, strong diagnosis and guidance system from government, commitment and initiatives from organisation/industry, and trainings and follow-ups from institution. Moreover, several studies confirmed that sustainable management commitment is central for successful implementation of CI philosophies (Hailu et al., 2018b; Tilahun et al., 2020; Sisay et al., 2021). For this case, there are some

indications, establishing bottom-up decision making process to allow front line workers to create innovative ideas to solve company problems, evaluation of ideas with respect to the effect of solutions, recognising and rewarding front line workers based on their contribution to the company's performance improvement, allocating appropriate resources including budget for implementation. The other crucial issue for indication of management's commitment is providing training and education to company managers and employees. Implementation of Kaizen initiatives, even as an integrated approach required skilled workers. For this reason, manufacturing industries need to cooperatively working with institutions to facilitate the training and education program. Furthermore, initiatives for change and improvement should be generated from frontline workers, and initiatives for consultations, new projects, and research for development thematic areas should be taken by manufacturing industries then institutions will take the responsibility to deliver as much as they can to enhance organisation performance.

Once the manufacturing industries are committed to facilitate the training program, institutions should able to deliver trainings to company managers and employees. Besides, the institutions supposed to check the result of the conducted training in terms of their skill level, practice on the real work place and its effect on achieving company's performance goals. Institutions may fail before their act of objectives, industries may become reluctant and loss hopes in those institutions when they ruin their plan of improvement. At this moment government, should intervene and play a leading role of supporting those elements in every dimension and reason of failure. Due to that a strong diagnosis and guidance system is required for implementation of the integrated Kaizen system that results in sustainable development.

2.5 Barriers to integrated Kaizen philosophy application

Several studies including Alvarado-Ramírez et al. (2018), Goshime et al. (2018), Lina and Ullah (2019), Berhe (2022) and McDermott et al. (2022) have identified impediments to successful implementation of Kaizen philosophies in manufacturing companies. For example, McDermott et al. (2022) discovered five top critical failure factors to CI, these are poor communication about CI from senior management, lack of training and education, resistance to culture change, lack of resources (financial, technical, human etc.), and lack of awareness of the need for LSS and its benefits among other barriers. After review of these articles, the study confirmed that barriers were categorised as internal and external factors. The internal factors are related to weak practices of the social and technical issues by manufacturing companies. Whereas, the external are associated with the economic, social, cultural, demographic, environmental, political, legal, governmental, technological, and competitive trends and events that could significantly harm manufacturing companies.

For instance, the social barriers commonly identified by the aforementioned studies are related to poor practice of leadership and people issues. The identified leadership weak practices are lack of formal commitment and support of top management, top-management attitude of thinking Kaizen as a short-term project, lack of adequate theoretical and practical training, lack of structured communication, lack of monitoring and evaluation, lack of recognition and reward, discouraging Kaizen structure and salary, rotation of management, lack of progress sharing. While, weak practices of people are lack of involvement of all employees, lack of employees commitment, low understanding of Kaizen and insufficient know-how, lack of skilled labour, weak team development,

resistance to change (custom, fear, etc.), shop-floor employee attitude, poor employee management, and lack of Kaizen culture.

Furthermore, process barriers are long purchasing time and longer lead time, unavailability of automated system, unavailability of real-time data, unstable customer handling, poor inventory control, operational invisibility, inconsistent data recording, weak cooperation of supporting processes, poor quality of products during production time and poor utilisation of statistical process control tools. The other obstacles linked to no periodic review of policies, inadequate implementation period, and obligatory level of implementation strategy and rotation of consultants from company to company are policy and strategy barriers faced by several manufacturing companies. Resource barriers are restriction of resources (time, money and personnel), high implementation cost, and lack of finances, weak ICT infrastructure, weak information sharing, and weak knowledge-based information management. Whereas, poor utilisation of PDCA cycle and quality control story, inappropriate theme selection are barriers related to utilisation of problem solving methodology. At the end, no linkage with universities, no technical cooperation, no evaluation of suppliers, suppliers not involved in quality initiatives and receiving poor quality of raw materials are partnership barriers experienced by manufacturing companies.

The external barriers identified by the manufacturing companies were political instability of the country, lack of financial supports from government; shortage of foreign currency, insufficient consultancy service offered by institutions, frequently power failure.

To sum up the above discussion, company top managements, department managers, employees and institutions were not give high attention during the implementation of Kaizen philosophy. Thus, this study explored in perspective of the above mentioned internal barriers associated with social and technical issues and external barriers faced by manufacturing companies during the implementation of Kaizen philosophy.

2.6 Application and effect of integrated Kaizen philosophy (CI) in Ethiopia

In Ethiopia, the Kaizen philosophy is considered as a policy instrument for improving quality and productivity which results in enhancing sustainable competitiveness. During the summer of 2008, the late Prime Minister of Ethiopia, H.E. Meles Zenawi, was discussing development issues with scholars from the Western and Eastern worlds (GRIPS, 2016; Mekonen, 2018). He got an opportunity to learn about Kaizen. After hearing about the productivity and quality improvement impacts of Kaizen as well as its contribution to the industrial development of Japan – initially based on the small and medium-sized enterprises (SMEs), he extended his request to JICA for further assistance. Just then, Kaizen was frequently discussed in high level policy dialogue forums assisted by JICA and the professional from the GRIPS Development Forum. Finally, a project entitled “The Study on Quality and Productivity Improvement (Kaizen) in the Federal Republic of Ethiopia” was designed by JICA in consultation with an Ethiopian counterpart and signed by the Ministry of Industry (MoI) and JICA on June 4, 2009 (Mekonen, 2018).

Based on the author, Kaizen was introduced to Ethiopia by Japan International Cooperation Agency (JICA) in 2009 and has since become a backbone instrument of reform. For transferring and disseminating the Japanese concept of Kaizen, philosophy of CI, institutional development is central. Based on it, the Ethiopia government established

Ethiopia Kaizen Institute (EKI) in 2011 and the MoI established a Kaizen Unit (KU) consisting of ten members and assigned a team leader. Kaizen has been widely accepted and implemented by numerous organisations. Five consecutive Kaizen projects have been implemented in Ethiopia by support of JICA since October 2009 to 2022. The first project was undertaken to confirm the transferability of basic Kaizen (Muda elimination, 5S, QCCs etc.); the second project was targeted at training of EKI consultants; the last three projects were designed to transfer the advanced level Kaizen knowledge (TQM, TPS, TPM, 7 QC tools, etc...). Overall, the Ethiopian experience has proved that differences in religion, culture, and diversity are not impediments to the transfer of the Kaizen concept to Africa and that Kaizen could bring about dramatic changes in companies and public institutions, despite the differences between the homogenous social fabric of Japan and the diversified ethnicities of Africa are one factor raised as an impediment to Kaizen transferability by scholars.

Later, the current Kaizen Excellence Center (KEC), formerly known as Ethiopia Kaizen Institute, alone customised the Japanese Kaizen in considering organisations' existing working culture, skill of employees and status of machines technology (Berhe, 2022). This is also supported by several studies (Kumar, 2019; Hailu et al., 2015; Desta, 2011; Waheed et al., 2010) as they highlighted the development, implementation and management of new philosophies is essential based on customisation of organisations existing situations.

Thus far KEC established, more than 700 organisations including manufacturing, service providers and capacity building institutions are implementing Kaizen in different approaches for continuously manage and improve their operations to enhance organisational performance (Hailu et al., 2020). Some of the companies implement Kaizen followed level based approach (for example, first basic Kaizen and then advanced Kaizen) with the support of EKI (Hailu et al., 2017b, 2018a; Berhe, 2022); some others implement the sustaining competitive and responsible enterprises (SCORE) project (problem solving approach or task achievement approach) with the joint support of KEC and International Labour Organization (ILO); some others also implement project based Kaizen (problem solving approach or task achievement approach) with the support of JICA; and some others implement Kaizen following problem solving approach by support of KEC.

Several studies (Desta et al., 2014; Tiwari, 2017; Hailu et al., 2015, 2017a; Otsuka et al., 2018; Lina and Ullah, 2019; Berhe, 2022) confirmed that manufacturing companies benefited from Kaizen philosophy implementation by attaining quantitative and qualitative results. For example, Otsuka et al. (2018) confirmed that Ethiopian organisations implemented Kaizen starting from 2011 to 2016 gained monetary values such as, 2,169.5 million ETB. 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% correspondingly as non-monetary results and some qualitative results. Moreover, most recently, Berhe et al. (2023) also verified that Ethiopian manufacturing industries attained the middling improvements of productivity, delivery time, quality, 5S practice, waste and accident rate by 61.03, 44, 52.53, 95.19, 80.12, and 70.55% respectively, and saved a total of 14,933,446 ETB by execution of Kaizen philosophy.

In Ethiopia, even though there were challenges in the transferability and dissemination of Kaizen, some were successful. The major success factors for successful

adoption of Kaizen as identified by Otsuka et al. (2018) were continuous support of JICA (importance of partnership); commitment of political leadership; clear vision, roadmap, and strategy; EKI management commitment and young Kaizen-cultured consultants; motivating career structure, pay and benefits. Whereas, the main challenges were mindset; securing the commitment of owners and managers; frequent turnover of managers and Kaizen leaders; distorted understanding of Kaizen; limitations of quick learning and expanding knowledge; information management.

Based on the above literature, some of the studies which review the practice of Kaizen and its effect are conducted in the context of Ethiopia. Still these studies have deficient in empirical analytical evidence on exploring the effects achieved by the practice of Kaizen philosophy in Ethiopian manufacturing industries context. Therefore, there is an opportunity to contribute to the body of knowledge related to the empirical evidence on practice of Kaizen to achieve both quantitative (monetary and non-monetary) and qualitative improvements.

3 Materials and methods

The main objective of this study is to investigate empirically the application of integrated Kaizen practices for enhancing sustainable competitiveness in the Ethiopian manufacturing industry. This needs quantitative study to offer empirical evidence, and qualitative study to explore the practices for further supporting the empirical evidence resulted from the quantitative study. Therefore, mixed methods research with the category of sequential explanatory strategy was chosen as a methodological approach (Creswell, 2009). So, the quantitative research was based on survey (Babbie, 2021; Creswell and Clark, 2017) and qualitative/exploratory research was also based on document review (Berhe et al., 2023; Berhe, 2022) to support the survey output. Moreover, Masood and Sonntag (2020) argue that survey provides a cross-sectional and deductive approach that can be used to generate quantitative/empirical and objective outputs. Whereas, document review provides an inductive approach to generate qualitative and subjective outputs such framework (Bryman, 2008). And so, researchers wanted to explore empirically the application of integrated Kaizen practices and its impact, and both survey and document review will help to gather this information. Thus, the research framework, instrument design, data collection, sample characteristics, and the research approach are presented as follows.

3.1 Research framework

For the qualitative study, Berhe (2022) highlighted 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. Surprisingly, till this research carried-out, there is no quantitative (empirical) study investigating the association between integrated Kaizen philosophy practices (including unique techniques, social & technical factors, execution procedure, roles of triple helix actors, elimination of barriers), and its effect (alike operational, innovation and business performance) in Ethiopian manufacturing industries. So, for general assessment of the practice, study adopted the implementation framework discovered by Berhe et al. (2023). With this in mind, the study adopted unique techniques

identified in Section 2.2 used by some studies; drivers (social and technical factors) employed by Berhe (2022); motivations or key competitiveness indicators (KICs) such as operational and innovation (non-monetary), and business (monetary) results as employed by Cua et al. (2001), Prajogo and Sohal (2003), OECD (2005), EFQM (2011), Taddese (2017), Tesfay and Kitaw (2017), Masudin and Kamara (2018) and Berhe (2022); roles of triple helix actors as proposed by Berhe et al. (2023) and Tilahun et al.(2020). Therefore, this research developed a research framework (Figure 1) which links application of integrated Kaizen philosophy practices and sustainable competitiveness measures.

3.2 Research instrument design

For quantitative study, the survey instrument was developed & divided into two sections (see Appendix 1). The first part was to acquire general information about the respondents and their organisations. The second section was dedicated to eliciting information about various aspects of integrated Kaizen/CI practices such as unique techniques, drivers (social and technical factors), sustainable competitiveness results (motivations), barriers experienced within the organisation. With this in mind, the study also selected document review instrument, and adopted methodology & practices as described in research framework development Section 3.1.

3.3 Data collection

The researchers employed a survey for primary data collection, and document review for collection of secondary data. The study targeted at manufacturing industry professionals working in quality, production/operation, product development, sales and marketing, human resource, Kaizen office and other functions in selected manufacturing industries executing Kaizen philosophy in Ethiopia. In this case, the researchers utilised selection criteria's to decide on sample manufacturing industries and respondents. The criteria's are companies proceed with basic and advanced level Kaizen project; companies participating for Kaizen award; winners of Ethiopia Kaizen award; participating in SCORE project; and managers took Kaizen training; participating in either basic or advanced Kaizen project implementation; and have more than ten years' experience in Kaizen implementation. This enables to increase survey response rates (Dillman et al., 2009) allowed for increased contact with potential participants (Stokes et al., 2019).

Company managers were contacted to participate in this study through e-mails personal messaging system (McDermott et al., 2021; Sony et al., 2020a, 2020b). A pilot study was conducted during the survey development process to ensure the design and approach was appropriate. The e-mail survey protocol was first piloted (Boynton and Greenhalgh, 2004) with 18 professionals. The professionals' participated in the e-mail survey protocol pilot were researchers who have published more than ten articles on CI, and CI professionals (managers) who have more than ten years of experience in implementing Kaizen in their organisations. The purpose of piloting the survey was to validate the instrument and ensure that the questions aligned with the research questions set by the researchers (Couper and Miller, 2008). The comments and feedback from the pilot study were subsequently used to review the survey questions and make the questions more readable and relevant to the research.

Similarly, after compiling the company annual technical reports, the accuracy of the data was also confirmed by companies Kaizen office, and KEC planning desk, even though most of the KCIs were not registered. Moreover, the sampling strategy selected for this research is mixed such as probability sampling with the category of simple random sampling to select respondents using previously driven statistical formula for e-mail survey, and non-probability sampling with the category of purposive to select manufacturing companies in order to receive documents for review. Based on it, the study received secondary documents such as annual reports, project technical reports, Kaizen award presentations and strategic plan merely from a total of 32 companies such as three from metal, two from leather, one from agro-processing and 26 from chemical (see Appendix 2). Though the quality of the report in particular varies from company to company, and other companies were unwilling to offer the report and the others have no any report. After selecting the companies as per the above stated criteria, then the researchers.

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

The study consider the level of acceptable margins of error (e) 5% and assuming 95% of confidence level with sample size (n) = 355 (nominated respondents) and population (N) = 3,200 (total number of core employees working in 32 manufacturing companies). Accordingly, the revised survey questions was sent out to 355 company managers, supervisors and Kaizen officers who are working in their respective organisations in multiple departments as mentioned above. Distributing to a wide variety of functional managers will enable the researchers to gather knowledge from a high calibre of experts from the survey participants, who are responsible for various aspects of management in their respective manufacturing industries.

3.4 *Sample characteristics*

A total of 308 valid responses were collected, yielding a response rate of 86.76%, and a percentage considered to be high above average (Saunders et al., 2009; Khamkham, 2017), and even 4.3 times higher than the 20% response rate considered as sufficient by Easterby-Smith et al. (2012). The reliability of the survey was measured using Cronbach's alpha (CA) coefficient as described in Table I. Besides, the functional areas they working in (Figure 3), their position, and working experience of the survey respondents (Table 2) were given in Section 4.2 below. Thus, 72% of the respondents were department managers, and 75% of respondents had over two years of experience.

3.5 *Research approach*

The approach in this research follows five ways (Figure 2) in dealing with the practice of integrated Kaizen for achieving sustainable competitiveness. The first approach is describing problem justification, research questions formulation and stating objectives. The second move toward is searching models, frameworks, concepts, case studies, surveys using searching engines with the context of manufacturing industries, extensively literature review and identifying adapted methodologies. The third move is adapting instrument and methodologies, searching companies, nominating respondents and visiting companies, survey and collecting relevant primary and secondary data's, analysing the

data, developing SWOT analysis. The fourth move is verification of the impact of integrated Kaizen execution, investigating integrated Kaizen practice, and as a result developing integrated framework, investigating drivers (social and technical factors), and examining barriers faced during integrated Kaizen implementation through analysing, interpreting and synthesising using SWOT analysis, charts, diagrams, graphs and tables. The final move is proposing the way forward based on the findings from the investigative study to emphasise the link between Kaizen practice and its effect on manufacturing companies by discussion in proper approach to build up the conclusions, implications (theoretical, practical and managerial) and recommendations for the companies and government, and future study in reference to study limitations presented for the academicians, researchers and practitioners.

4 Results and discussion

4.1 Reliability test result

The quality of the instruments used in the questionnaire is assessed by a reliability test (Khamkham, 2017). Other authors (Christmann and Van Aelst, 2006) also underlined that CA is a popular method to measure reliability, in quantifying the reliability of a score to summarise the information of several items in questionnaires. So, the study employed CA to measure internal consistency of instruments used to evaluate integrated Kaizen practices. But, several authors accept different coefficient values of CA to consider the items being measured are consistent and reliable, for instance, Field (2009) recommended CA coefficient value ideally must be greater than 0.7. While, Hailu et al. (2017a) argued the minimum acceptable value of CA is 0.6. So, the study adopted the CA coefficient value commended by Field (2009). Based on this, the study measured the reliability of the survey, and the CA coefficient was found to be 0.837 as described in Table 1.

Table 1 illustrates that the CA coefficient obtained for the entire unique techniques, drivers (social technical factors), motivations (competitiveness indicators), and barriers of initial items that are 0.851, 0.883, 0.825, and 0.837 respectively. Bisgaard (2007) agree that removing some items from the questionnaire results on improving the CA coefficient value, however, the researchers found that not important eliminating the variables since the entire existing variables CA coefficient was greater than 0.7, the internal consistency was maintained (Field, 2009). Therefore, the results for the entire items are reliable and acceptable.

4.2 Descriptive analysis of respondent's general information

The section provides the key findings of the questionnaires received from the respondents. The aim of this part of the survey is to present a clear picture of the respondent's background regarding to their functional area they work in, position, work experience, and industry type. Based on this, the majority of the respondents (82%) were working in chemical, 9% in metal, 6% in leather, and 3% in agro processing manufacturing industry based in Ethiopia. As shown in Figure 3, the respondents came from a broad range of functional areas within their organisations. These functional areas were all functions associated with technical and supporting services to manufacturing from raw material supply and product development right through to production into

marketing functions. The majority of respondents (75%) worked directly with manufacturing and Kaizen, and the respondents came from support areas such as quality & Kaizen office, and technical such as production and product development.

Next, respondents were asked to state their position within the functional area they work in, and 56% were managers, 25% supervisors and 19% Kaizen experts. In relation to the number of years of experience of the survey respondents, the finding was given in Table 2. The respondents were also asked about their length of experience within the manufacturing industry, and 96% of respondents had over two years of experience.

4.3 *Descriptive analysis of unique techniques practiced on manufacturing industries*

In response to *RQ1*, and with regard to types of unique techniques of the LM, TQM, SCM, IM and LSS methodologies practiced within the selected Ethiopian manufacturing industries, respondents were asked to answer the question, “Which unique techniques of CI methodologies are you practicing within the organisation in which you work?” This was based on the five level likert scales: not practiced at all = 1, low practiced = 2, moderate practiced = 3, practiced = 4, high practiced = 5. The study merged practiced and high practiced percentage values for evaluating the extent of the practice, and the result in terms of percentage of unique techniques practiced is shown in Figure 4.

Figure 4 illustrates that only 11 unique techniques such as in station quality, planned maintenance, 5whys, JIT delivery by suppliers, autonomous maintenance, JIT schedule, customer focus, machine-person separation, pokayoke/standardised procedures, JIT layout, cross-functional product design from LM and TQM methodologies were supported by 50% and above. This signified that relatively LM and TQM methodologies were better practiced in manufacturing industries. However, pull system production, Automatic stop, Project management (DMAIC-skill), VSM, Andon, Innovation, proprietary equipment development, and project execution using DMAIC unique techniques were less supported by 21, 19, 19, 16, 14, 12, 10, and 9% in that order. This result implies that the extent of IM and LSS CI methodologies practice were in a small amount in selected Ethiopian manufacturing companies. From the researchers informal discussion & observation, the main reason is the support institutions Kaizen implementation strategy aggressively focus merely on 5S, and QC story problem solving. They did not consider unique techniques recognised by the study, and even unique techniques supported by 50% and above were also not well and consistently practiced. So, this implies that investigation of Kaizen techniques implementation in the companies is central. Besides, supporting institutions need to revise their implementation strategy and recognise the unique techniques identified by the study. Thus, for supporting the result, and in response to *RQ2*, the study assessed the process of integrated Kaizen/CI methodologies execution within the selected manufacturing industries by adopting a SWOT analysis metrics and methodologies previously developed.

So, based on demarcation provided, the researchers collecting and conducted a comprehensive investigation of company’s strategic plan, annual report, project technical report, Kaizen award presentations, best practices of Ethiopia Kaizen award winners, and cases of SCORE project implementation as cooperatively delivered by ILO and KEC. Consequently, strength, weakness, opportunity and threat (SWOT) analysis and figures were employed, and practiced techniques and an execution framework was identified and developed respectively in next sections as described below.

4.3.1 Preliminary analysis of integrated Kaizen implementation on manufacturing industries

A SWOT analysis (or SWOT matrix) helps an organisation to identify the internal and external factors that are favourable and unfavourable to achieve its objectives, for example, unique techniques, process, drivers (social and technical factors), effects, and barriers (Berhe, 2022). So, this study employed SWOT analysis and identified these practices for verification of the survey results. The study identified metrics (criteria's or standards) used for preliminary assessment of Kaizen practices in selected case companies. So, by compiling from quality improvement literature and Dana (2012), the identified metrics for strength-cultural connections, established relationships, advantages of the business, capabilities, special expertise/knowledge and experience, reputable, marketing and location, innovative aspects and possibilities, resources, and price; for weaknesses-improvements needed, what to avoid, inadequate facilities, poor IT infrastructure, gaps in capability and service areas, cash flow problem, quality problem, market penetration, and missing resources, management or staff problems, barriers to access, and damaged reputation; for opportunities- changes in population needs and workforce, availability of new funding; market, availability of new technology, production innovation, technology innovation, new partnerships, training programmes, geographical expansion, trends could foresee, and strengths that could be opportunities; for threats - obstacles, competition, cash-flow problems, new technology threats, loss of key staff and increased workforce shortages, market changes, adverse changes in national requirements/regulations. Therefore, the summarised SWOT analysis of selected case companies is provided as follows.

Pertaining to strength (internal environment and positive factors), companies experienced several positive issues, and to mention few of them-relatively Kaizen/CI culture established (for example, few companies held consistent QCCs weekly meeting, organisation and cleanliness, monthly progress sharing, utilised and updated Kaizen board, and required information is shared), availability of young and easily trainable workforce, cooperatively working with institutions such as (EKI, JICA and ILO), availability of skilled and experienced (managers, experts, staffs and employees), capable of utilised Kaizen/CI methodologies and practiced some of the drivers, capable of assess the market, capable of improve and develop new products, capable of use resources effectively, delivering products to customers by providing affordable prices, able to upgrade employees facilities (toilets, changing rooms and lunch areas), capable of attaining relatively substantial quantitative (monetary and non-monetary) and qualitative improvements. Thus, for further clarification, these listed positive factors are discussed in Section 4.4 and Section 4.5 for verification of the findings received from respondents perception based survey.

In connection with weakness (internal environment and negative factors), some companies faced various problems, but to mention some – existing of knowledge and skill gaps, weak supply process and capacity variation, weak information and data analysis, poor data recording and measurement, poor ICT infrastructure, inadequate network service, unable to maintain, scale-up and sustain Kaizen practices, limited product varieties, poor linkage with institutions in few of the companies, poor quality of products, poor market penetration, unequipped R and D, unable to provide resources for implementation in few of the companies, weak customer and supplier integration, low technology utilisation and innovation practice, poor marketing and sales system, partners

not involved in quality initiatives, received poor quality of raw materials. The researchers understood that these problems were associated to social and technical issues which need to be practiced. Therefore, for further clarification, these problems are considered in barriers faced by the manufacturing companies, and the details are presented in Section 4.6.

With regard to opportunities (external environment and positive factors), availability of large and increasing market demand, availability of sufficient educated manpower, availability of infrastructure, availability of new manufacturing technology equipment's, availability of new/innovative products, existence of local and foreign institutions support on (R&D, training and education), acquisition of free training and consultancy service (from EKI, JICA and ILO), short and long term educational support from JICA (to Japan), seminars and workshops conducted by EKI & JICA, availability of best performer companies for benchmarking. Finally, concerning to threats (external environment and negative factors), the entire companies were challenged by the following external environment – increased number of key staffs (mangers, experts, supervisors and operators) left the company, increased number of competitors from foreign in particular, limited number of suppliers of raw materials, unstable political situation of the country, shortage of foreign currency, inadequate logistics, bank and revenue services results in consuming long time to receive raw materials and loan, increased price of resources from time to time, frequent power failure, COVID-19 pandemic virus.

4.3.2 *Exploration of integrated Kaizen/CI implementation process in selected manufacturing industries*

The study adopted an implementation procedure developed with the trend of PDCA cycle by Berhe et al (2023) as discussed on the research methodology section of the study. The phases are plan (preparedness; conceptualisation and planning); do (implementation and monitoring); check (performance evaluation and verification) and act (standardisation, Sustaining and Transformation). So that, in response to RQ2, it was found that integrated Kaizen execution steps were based on the PDCA cycle with different problem solving approaches. For example, companies supported by merely KEC followed diagnosis, training, pre-implementation plan, execution, and evaluation; supported by JICA-Ethiopia tracked with theme selection, diagnosing, target setting, action plan, cause analysis, countermeasure execution, result checking, standardisation and next plan; while, companies cooperatively supported by ILO and KEC followed baseline assessment, team formation, training provision, case description (gap analysis and root cause analysis), countermeasure execution, result measurement and confirmation. Thus, to solve this discrepancy, the study discovered structured integrated Kaizen implementation framework based on adopted methodology through extensive exploration of the practices experienced in selected manufacturing industries, and the details of each phases are presented as follows.

The first succession is 'plan', and it considered preparedness, conceptualisation and planning actions. Preparedness covered conducting preliminary gap assessment and benchmarking, examining resource capability, receiving management support and engagement, considering Kaizen implementation in company's strategy. The conceptualisation also includes holding kick-off, facilitating senior management and expert team formation and training, policy development and deployment, and employees

understanding and motivation. Moreover, planning considered selection of pilot project, formation of QCCs/CFTs, selection of KPIs, appropriate tools and techniques, and employees training. Therefore, by considering this issues, the researchers investigated the implementation process, as a result, the study confirms the entire manufacturing companies were assessed the current situation in relation to Kaizen practices and performance results. However, none of the company's benchmark, except Q17 as the company compares OEE (28.10%) with the world class (85.00%).

Manufacturing companies executed SCORE project such as M13, N14, O15, P16, Q17, and R18 employed only yes or no closed end checklist, and assessed baseline and identified improvement areas associated with workplace cooperation, quality management practices, lean production and industrial engineering techniques. Whereas, G7, H8, J10, L12, M13, W23, X24, Y25, A'27 and Z26 used SWOT analysis tool, and identified weak points (see Section 4.3.1) connected with human, strategic, operational, technology, and information practices. Consultants from institution customised training materials, and delivered highlight training to senior executives and experts team. In this case, 131 management and experts trained on TPS, TQM, TPM, 7QC tools and QC story (problem solving approach).

Few companies such as G7, H8, I9, J10, L12, M13, W23, Y25, Z26, and A'27 developed mission, vision, policies, strategies and thematic areas need to be improved using cross-SWOT analysis. For instance, L12 focused on improvement of customer satisfaction, decreasing manufacturing cost and improve capacity utilisation. While, improving workplace organisation, enhancing quality and productivity, and decrease Tyre scrap were targets developed by G7. Other company (A'27) also identified strategies such as improving knowledge and skill gap, capacity deviation, weak supply process, R&D, expanding leather goods, and marketing and sales system; and policies alike reduction of cost of production, improving quality of product, improving delivering time, increased product diversification and reducing inventory stock. Moreover, these companies were commonly identified potential problems (themes), and teams associated with the problems were nominated and made aware for further training and implementation.

The top management designated pilot areas and suitable KPIs, and then initiated employees training program and facilities, and selection of trainees, even though this varies company to company. Next to this, employees took five days basic (5S) and more than ten days advanced (TQM, TPS, TPM, 7QC tools) training. As a result, 501 top and middle management (i.e. 407-basic and 94-advanced), 31 experts, 7336 employees, and 193 members of cross-functional team were trained, consequently, 932 QCCs and 21 CFTs were organised as per the report of companies such as A1, B2, C3, D4, E5, F6, G7, H8, I9, J10, K11, M13, N14, O15, P16, Q17, R18, S19, T20, U21, V22, W23, Z26, A'27, B'28, C'29, D'30, E'31 and F'32. Besides, team leaders and facilitators were also taken practical training relating to utilisation of formats, measuring and record data's. Latter, companies assessed 5S (sorting, set in order, shine, standardise and sustaining) including safety, for example, the average evaluation result before implementation was 40.54% for companies A1, B2, G7 and K11. In this case, management was allocated budget, provided feedback, and carried-out Kick-off implementation together with institutions with the case of basic Kaizen practice.

The second succession is 'Do', and it considers implementation and monitoring actions. Based on the recognised KPIs, teams identified potential problems, and then they measured, evaluated and analysed problems using Pareto diagram. After completion of

these actions, teams were fixed attainable targets and developed action plan using line graph and 5W2H respectively. Subsequently, cause analysis using brainstorming and then recognised critical root causes (CRCs) were also done by teams. In this case, company L12 used tree diagram, company M13 employed fish bone diagram, and company A'27 used fishbone diagram, 5Whys analytical tool and failure mode effect analysis (FMEA) technique using effect/severity, frequency/occurrence, and detectability/controllable parameters to rank and select the CRCs.

Moreover, teams have discussed on counter measures and listed many possible solutions. Latter, they selected best solutions by employed three fundamental criteria's: feasibility, effectiveness and employees involvement. The solutions were focused on establishment of systems such as execution of 5S activities, workplace and operation standardisation, in station quality control, autonomous maintenance, preventive/planned maintenance, cross-functional product design, JIT delivery by suppliers, modification of equipment layout, process management by employing statistical process control tools, involvement of customers and suppliers in quality management, daily schedule adherence, following pull system, elimination of efforts (unlike internal and external activities of machine) continually increasing production set-up time, utilisation of problem solving approach to solve cause of problems, inserting devices enabling automatic stop to prevent producing defective products, and preparation of working procedures or mistake proofing devices to secure the working process. At the end, teams developed counter measure action plan using 5W2H technique. Manufacturing companies G7, H8, I9, J10, L12, M13, W23, Y25, Z26, and A'27 conducted progress sharing in collaboration with institutions including KEC, JICA-Ethiopia and ILO, and received valuable comments for improving the project work. Merely company, A'27 managers were presented the project activities as Khamkham (2017) argue the involvement of middle management and stakeholders is very central for successful completion of CI project.

The aforementioned companies were provided awareness and refreshment training to employees associated with the proposed countermeasures, and executed countermeasures such as basic Kaizen-5S activities. Accordingly, companies have organised working places. Most of the companies prepared a 30 second rule shadow box, developed a movable and fixed Kaizen board, utilised Kaizen board, labelled workshops and office file cabinets, arranged warehouses and work in progress materials, developed and practiced Kaizen suggestion box, evaluated and displayed Kaizen progress statuses, employees and production performance trends, developed and used file cabinets, marked production and warehouse walk ways and parking areas, human-machine separated using colouring system, arranged machines (layout improvement), conducted morning market meeting by managers, weekly meeting by QCCs and CFTs, and monthly progress sharing among company managers and CFTs including KEC and JICA-Ethiopia, and ILO for each of the projects supported by these institutions. Besides, managers were provided appropriate resources (for example, allotted ample budget), regular monitoring and controlling the implementation process, established feedback accepting and delivering system, and institution's consultation and follow up service, employees genuinely participated in implementation, procedures developed and carefully implemented, teams implemented improvement ideas and developed innovative products, established Kaizen office by considering in their organisational structure (example, companies A'27, E5, T20, I9, G7, H8, M13), four basic autonomous maintenance actions such as cleaning, inspection, lubrication and bolt-tightening executed and standardised.

Moreover, these companies executed preventive/planned maintenance actions, closely working with customers and suppliers, relevant data's and information were recorded and analysed using simple statistical tools even though this action is not well conducted by the majority of companies, managers following problem solving approach using QC story formula with the trend of PDCA cycle, quality information was also sharing to employees, communication between managers, and managers and employees were effective even though it was challenge before implementation as few of the manufacturing companies of N14, O15, P16, Q17 and R18 reported in the initial assessment, government-MoI strictly diagnosed, monitored and controlled the implementation by conducting monthly regular sectorial meeting with senior executives of government institutes such MIDI's former development institutes, then MoI provided directions.

The third succession is 'check', and it covers performance evaluation and verification actions. After successful completion of the aforesaid practices, most of the companies have evaluated implementation process and performance using checklists even though the improvement was not imperative, and varies from company to company. Based on extensive review of reports, the study compiled and presented substantial improvements attained by companies such as A1, B2, C3, D4, E5, F6, G7, H8, I9, J10, K11, L12, M13, N14, O15, P16, Q17, R18, S19, T20, U21, V22 as summarised and described in Appendix 2. The improvements were quantitative (monetary and non-monetary) and qualitative results for instance, companies G7, K11, L12, N14, O15, R18, S19, T20, U21, V22 achieved a total of 158,777,469.7 ETB. This was due to selling of unlike materials, worth of 132,716,817.7 ETB, sorted by QCCs in companies G7, K11, N14, O15, R18, S19, V22; and cost saved by application of improvement ideas and modifications, worth of 26060652 ETB in companies G7, K11, L12, T20.

Moreover, average improvement of sales volume-33.02, net-profit-26.33; 5S improvement-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; labour 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 satisfaction-67.92 and absenteeism-26.6%. For further clarification, achieved results are discussed in Section 4.4 below.

Besides, companies were employed bar graphs, pie charts and tables to describe the results and compare with targets. In different way, few of the companies (H8, J10 and A'27) was conduct SWOT analysis and identified their strong points need to sustained and weak points to be improved in this phase. Company manager's of H8 and A'27 were also participated in developing performance evaluation criteria's and they evaluated the daily management actions and performance of CFTs. Based on the evaluation, feedback was delivered to CFTs and members. The interesting issue done by companies is presentation of progress report by each CFTs to respected management, KEC and JICA-Ethiopia experts.

Over and above the achieved quantitative results, companies were also gained qualitative results such as augmented safety awareness; relatively established industry, corporate culture and teamwork including teams evaluation, held minutes, reporting, QCC/CFTs ranking; teams built problem solving ability; improved team member's creativity, generating new and improvement ideas, developed innovative products; improved employees working morale; well organised workplace; established rewarding system and rewarded best performers; 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. However, the entire qualitative improvements were not maintained.

The fourth and final succession is 'act', and it includes standardisation, sustaining, completion, re-planning, and scale-up actions. In this regard, few companies such as D4, E5, G7, M13, A'27 able to standardised Kaizen practices, procedures, manuals and achieved results using checksheet and control charts. Besides, companies made aware of new standards including procedures and KPIs which considered as working rules. The fundamental activity performed in the companies were final report presentation by managers and CFTs. While, as described above, best performers (as individual and team) were rewarded as per quality of the presentation and audit result.

The best practices of CFTs were scaled-up to other departments after reviewed policies and organised CFTs. In addition, other companies were also visit Kaizen awarded companies, and benchmark improvement and best practices. Moreover, best performing companies identified and implemented sustaining strategies for Kaizen actions such as considered Kaizen in organization structure, assigned process owner Kaizen experts and built their knowledge and skill, provided awareness to employees, conducted induction and refreshment training program from time to time, considered Kaizen implementation in employee's performance evaluation, held weekly regular patrolling, audit and evaluation of Kaizen actions, held monthly progress sharing, recognised and encouraged teams and individuals. Moreover, few companies (D4, E5, G7, H8, I9, J10, L12, M13 and A'27) also clearly stated social and technical factors contributed for successful execution of Kaizen and attaining improvements such as management commitment, closely working with institutes, receiving training and consultation service and follow ups from KEC and JICA-Ethiopia project team, facilitating training to all staff, ensuring and allotting appropriate resources, relationship with supplier and customer, genuine participation and involvement of employees, developing policies and strategies, controlling the process using statistical process control tools, developing and implementing Kaizen procedures following problem solving approach, reward and recognition for better performer team and individuals, structured information sharing, emphasis on technology and innovation, considering Kaizen in organisation structure. Nevertheless, most of the case companies except the aforementioned faced immense challenge to accomplish these stated factors and sustainable strategies commonly stated by few companies such as D4, E5, G7, and M13 and A'27. Finally, the framework for implementing integrated Kaizen philosophy (CI) is developed as depicted in Figure 5.

4.4 Analysis of the effectiveness of integrated Kaizen Philosophy practice

In response to *RQ1*, and connection with the effect of integrated Kaizen practices within the selected Ethiopian manufacturing industries, respondents were asked to answer the question, "What are the key competitiveness indicators attained, and influenced your organisation to practice Kaizen in view the performance of your organization in this calendar year?" analogous to the above cases, this question was also based on five level of agreement such as strongly agree = 5, agree = 4, moderate = 3, disagree = 2, strongly disagree = 1. The study present agreed responses of percentage values for evaluating the

level of agreement in achieving competitiveness results, and the key result in terms of percentage is presented in Figure 6.

Figure 6 demonstrates operational performance results such as customer (62%), maintenance results (58%), quality results (53%) and resource results (51%) were supported by minimum of 51% of the respondents. While, supplier, and people results were also supported by 49% and 47% respectively. This signified that listed operational results were achieved by companies. However, the other competitiveness indicators (innovation and business) were less supported by respondents. For instance, organisational innovation by (11%), product innovation (8%), market innovation (5%), process innovation (3%). Moreover, marketing results were better supported by respondents than innovation results despite the fact that the results were low relative to the aforementioned few operational results. For example, sales amount and share (by 36%) and financial results associated with profit and revenue by (27%).

Therefore, for supporting the results, the researchers assessed and presented the effect of integrated Kaizen implementation from company's final report and presentation, KEC's and ILO case and best practices book as stated in Appendix 2. This helps more for company managers, practitioners, academicians, and government to understand the effects seen easily and creates motivations for further execution of integrated Kaizen. In response to *RQ3*, the study identified some improved competitiveness indicators associated with operational and business results, and for sector wise comparison purpose, the analytical way of graphical representation associated with attained monetary values, free space, operational, innovational and business performance including financial and marketing results are described in Figures 7, 8 and 9.

Figure 7 illustrates ten manufacturing companies, three from metal and seven from chemical, attained and saved costs with total amount of USD 3175549.38, even though . 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, 2654336.35 USD (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 some studies including Desta (2014; Tiwari, 2017; Hailu et al., 2015, 2017a; Otsuka et al., 2018; Lina and Ullah, 2019; Berhe, 2022) as the authors stated that costs could be saved and monetary value gained by execution of simple 5S tool. For example, Otsuka et al. (2018) proved Ethiopian organisations (manufacturing companies and 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 attaining more than 70 million ETB by doing the same activity.

Moreover, 16.42% (521,213.04 USD) 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) and Taddese (2017) as the authors described application of CI 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 8.

Figure 8 illustrates that the aforesaid manufacturing companies, in total, gained 44,431.92 M² 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 9.

Figure 9 illustrates manufacturing companies attain operational and business results. As per four companies report and observation, the highest achieved performance improvement is 5S with middling 99.55%. This is due to workplace organisation 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 33.02%, and finance (net profit) with 26.33%. This is supported by other studies such as Cua et al. (2001), Prajogo and Sohal (2003), EFQM (2011), Taddese (2017), Tesfaye and Kitaw (2017), Masudin and Kamara (2018), Hailu et al. (2020) as the studies demonstrated organisation performance results such as quality, delivery time, cost, flexibility and innovativeness (Cua et al., 2001); productivity, finance, customer results (Masudin and Kamara, 2018; Hailu et al., 2020); marketing and production volume results (Masudin and Kamara, 2018); people and society results (Hailu et al., 2020) could be achieved through application of CI methodologies.

4.5 Drivers (social and technical factors) for successful execution of integrated Kaizen methodologies

In response to *RQ1*, and association with drivers of integrated Kaizen philosophy, respondents were also asked regarding the kinds of social and technical factors in which organisations experienced in the period of Kaizen execution, "What are the drivers of Kaizen/CI in terms of social & technical factors in view the experience of your organization?" The respondents were asked to evaluate the driver's in terms of whether they are: not a driver = 1, low driver = 2, moderate driver = 3, driver = 4 and high driver = 5. The percentage of the category of drivers is depicted in Figure 10.

Figure 10 demonstraes that, respondents indicated that the entire drivers (social and technical factors) were supported by a minimum 52%, and which means all are experienced by the Ethiopian manufacturing industries. So, the top seven drivers in order of ranking are leadership (85%), process management (82%), strategic partnership (78%), policy and strategy (76%), people management (75%), resource management (73%), and utilisation of problem solving approach (70%). This is supported by previous studies such as Antony et al. (2018); Näslund (2013) they stated, within any organisation, leadership plays an important role in strategy and, in particular, within CI deployment and adoption.

For supporting the results, and in order to respond the *RQ3*, the study assessed the detailed practices of the top seven ranked drivers based on the report received from few of the selected case companies such as D4, E5, G7, H8, I9, J10, L12, M13 and A'27. These companies were made an effort to practice the identified two social factors (leadership and people management) and five technical factors (process management, strategic partnership, policy and strategy, resource management, and utilisation of problem solving approach), and the detailed activities executed in every category of the drivers is presented as follows.

- In relation to leadership (social factor):* 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.
- With respect to people management (social factor):* 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 organising in QCCs and CFTs; Employees were encouraged to update their knowledge and skills; teamwork was a common practice within the company's CFTs, employees were received appropriate feedback, managers were recognised 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, labour union attitudes were good towards Kaizen philosophy implementation program).

- *On the subject of processes, products and services (technical factor):* Companies were established proper procedures and performed different jobs accordingly; companies were systematically recorded and measured achievements and 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 emphasised; The (R&D) department was continuously working on the development and 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.
- *With regard to policy and strategy (technical factor):* 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).
- *In connection with strategic partnership (technical factor):* 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 MoI (MIDI: KEC, TGIRDC, LLPIRDC, FBIRDC, MTEIRDC, CCIIRDC), JICA and ILO 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.
- *Relating to resource management (technical factor):* Required resources and updated information are provided to all employees to perform their jobs; companies were efficient on management and usage of facilities; they utilised free spaces of buildings for extra work; companies were established training and development centre; 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 organised 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).

- *Pertaining to utilisation of problem solving approach (technical factor):* 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 categorised within planning cycle. Besides, implementation of countermeasures under do cycle, and comprehending or confirm results under check cycle and standardise 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 (Jiro Kawakita 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. However, these experienced factors were challenges for other selected manufacturing companies as described in Section 4.7 below.

To sum-up the above literature, manufacturing companies were experienced social and technical factors during the implementation of Kaizen philosophy in order to attained some 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), Khanna et al. (2017a, 2017b), Todorovic et al. (2019), Lina and Ullah (2019), Kumar (2019), Hailu et al. (2017a, 2018b, 2020) and Berhe (2022) are also consistent with the aforesaid findings.

4.6 Roles of triple helix actors for successful execution of integrated Kaizen framework

In response to *RQ1*, and connection with roles of triple helix actors (companies, institution and government), respondents were asked concerning commitment and initiatives from companies, training and follow-ups from institutions, and strong monitoring and guidance from government during the execution of integrated Kaizen philosophy project, "Do you feel that the role of triple helix actors is significant for integrated Kaizen/CI execution in your organization?" based on this, the respondents were asked to evaluate the roles of triple helix with an option to answer 'yes' or 'no'. Whilst, the entire respondents answered 'yes' (100%) with 'no' (0%) to the preceding question, and this revealed that the roles of triple helix actors as described above commitment and initiatives from companies, training and follow-ups from institutions, and strong monitoring and guidance from government were noteworthy for successful execution of integrated Kaizen project as described in Section 4.3.2. This is supported by

Berhe et al. (2023) and Tilahun et al. (2020) as the authors strongly argue that, identified roles of triple helix and even overall PDCA cycle for check and balance are key strategies for successful execution of CI methodologies in order to enhance competitiveness of manufacturing industries, metal and steel industries in particular.

4.7 Barriers faced in application of integrated Kaizen within Ethiopian manufacturing industries

In response to *RQ1*, and connection with barriers impede the implementation of integrated Kaizen, respondents were asked to rate obstacles faced in their organisation during the execution of integrated Kaizen, “Which of the following barriers do you feel contributes to a failure for integrated Kaizen/CI execution in your organization?” The respondents were asked to evaluate the barrier in terms of whether it was: the most serious issue = 4, a major issue = 3, a minor issue = 2 and not an issue = 1. The list of barriers are symbolised and presented as follows: A-lack of top management commitment and leadership, B-organisation’s culture does not support CI initiatives, C-internal resistance, D-managers don’t have adequate knowledge of integrated Kaizen practice, E-poor project selection, F-broad quality objectives without measurable targets, G-lack of tangible results, H-CI initiatives are not consistent with the strategic initiatives being persuaded by the organisation, I-poor training and coaching, J-change management, K-perception of the leadership that implementation of CI initiatives is a money wasting activity, L-lack of resources due to unstable political environment, weak economic situation and uncertainty in governmental policies, M-organisation pursuit multiple CI initiatives thus lack of clarity of program goals, N-competing projects, O-lack of communication with employees, P-organisational structure didn’t allow in developing CI culture (like frankness, openness), Q-low employee retention, R-organisational emphasis on short-term profits rather than long-term gains, S-changing business focus, T-unmanaged expectations. The percentage of list of barriers is depicted in Figure 11.

Figure 11 illustrates the entire barriers were serious issues with rate of above 60%. The most ten identified serious issues were organisation’s culture does not support CI initiatives (B-82%), lack of resources due to unstable political environment, weak economic situation and uncertainty in government policies (L-81%), lack of communication with employees (O-80%), managers don’t have adequate knowledge of integrated Kaizen (D-77%), broad quality objectives without measurable targets (F-73%), poor training and coaching (I-73%), lack of tangible results (G-72%), poor project selection (E-71%), lack of top management commitment and leadership (A-71%), and internal resistance (C-70%). This result is supported by some previous studies conducted by Ahuja and Khamba (2008), Khamkham (2017) and Hailu et al. (2018a).

Hence, for supporting the results, and in order to respond the *RQ3*, the study assessed the obstacles faced by the majority of manufacturing companies during the execution of integrated Kaizen. From the investigation of company’s report, discussion and observation, it was observed that companies such as A1, B2, C3, F6, K11, N14, O15, P16, Q17, R18, S19, T20, U21, V22, W23, X24, Y25, Z26, B’28, C’29, D’30, E’31, F’32 were faced various obstacles, and as a result they faced challenges in execution of Kaizen practices, sustaining and maintaining substantial improvements. These reasons were both internal and external issues, and the internal issues (within the companies) were associated with human and technical causes, while external issues were also linked to government policies and country situation. However, challenges are varying from sub-

sector to sub-sector, and companies to companies, and researchers, academicians, consultants/practitioners must not be confused with this finding, since some of the barriers identified were the drivers (social and technical factors) for other companies such as D4, E5, G7, H8, I9, J10, L12, M13 and A'27. So, the details of internal and external challenges faced by the aforesaid companies are presented as follows.

The internal challenges, from company side, are categorised under seven groups such as the first is human or people related issues such as workers discouraging wage, skill gap associated with workers specific task, workers capability deviation, workers do not received soft skill (interactive/communication and problem solving) and hard skill (specific work or technical skills) related training, and this resulted in employees low basic and technical skills, employees resisted for cultural change during Kaizen execution, employees were not engaged/participated in execution of Kaizen, there was high employees turnover and absentism, and as a result there was low employees retention, lack of employees process ownership and thinking, employees had not received any incentives, working conditions were not comfortable for employees, employees had no sense of urgency associated with their work and time consciousness, employees had low motivation to work overtime. The second is leadership and top management support issues for instance poor composition of managers, not followed participative management style, poor guidance and follow-ups of workers, mindset problems of managers associated with (sense of purpose, urgency and responsibility, lack of consistency in learning, poor time management, lack of global mindset), perceived Kaizen/CI as a Kaizen office initiative, not established reward and recognition system, lack of management support and commitment associated with facilitating training and education, and allocating resources, poor organisation capabilities, poor project selection, (difficult to measure themes), poor management communication associated with Kaizen (practices progress, success and failure stories), lack of leadership vision and skills, poor encouragement and participation in CI initiatives, not provided delegation and authority to employees, and not promoted workers to management positions, poor nomination of experts and members of CFTs. The third is utilisation of problem solving approach for example unable to finish problem solving projects, not scaling-up best practices learned from successful projects, poor utilisation of known unique techniques including some CI tools and techniques such as (5S, customer survey, pare to analysis, supplier audits, benchmarking, fishbone diagram, quality cost systems, SPC, FMEA, DMAIC, VSM, flow charts, suggestion box, overall equipment effectiveness/OEE, quality function deployment/QFD, team building methods, quality circles), unable to hold progress sharing, inconsistent teams meeting, poor description and identification of problems, poor utilisation of SWOT analysis. The fourth is resource management such as lack of resources (skilled worker, raw material, accessories, spare parts, financial, technical supports), unable to update quality information to employees, no training centre, poor human resource development system, no allotted optimum budget, no equipped Kaizen office and experts, poor facility management (toilets, bath rooms). The fifth is process management such as poor practice of innovation activities, used obsolete technology, poor process and employees' evaluation system, weak information and data analysis, unable to apply application software's for analysis, unable to record and measure gains and losses, unable to employed CI methodologies such as statistical process control tools, weak collaboration of supporting processes, not implementing integrated management system. The sixth is policy and strategy for instance policies and strategies are not developed and deployed, lack of strategic alignment of CI methodologies with corporate

strategy, absence of defined model with procedure for CI execution, wrong selection of CI methodologies, lack of understanding of customers using voice of customer (VOC), not considering future needs of customers, unable to established Kaizen infrastructure or champion, not used research outputs for policies development. The seventh and final is partnership or relationship management such as unable to develop long term relationships with suppliers, poor customer management, suppliers were not involved in quality initiatives, not received quality raw materials, no periodic evaluation of supplier's performance, poor linkage with institutions.

Furthermore, the external challenges, from government policies and country situation, are associated to political issues like instability and conflict, labour laws for example (minimum wage, over time, leaves and income tax), poor logistics performance such as high logistics' related cost and transit time (lead time) due to the existence of multi check points, poor condition of road transportation from companies to the port, and this results in longer transportation time and higher cost, poor customs clearance due to absence of customs officers, poor power supply caused for frequent power outage for long periods of time, and this resulted in work stoppages, revenue losses, damage equipment and materials which substantially increases cost, and other business related problems such as general shortage of materials, supplies, and spare parts, insufficient banking services and a shortage of foreign currency.

To sum up the above discussion, it is confirmed that selected Ethiopian manufacturing industries faced various challenges associated with internal challenges such as human and technical issues, and external environment. The degree of challenges varies from subsector to subsector, and companies to companies. In addition, these identified barriers, internal obstacles in particular were the drivers which were not given consideration, and they were also drivers experienced by few companies as described above in either social or technical factors. This is supported by previous studies such as Berhe (2022) as he discovered the main reasons for failure of sustaining Kaizen practices in chemical companies were unpracticed Kaizen practices relating to social and technical issues. Other study (McDermott et al., 2022) also discovered five top human and technical issues as top critical failure factors (CFFs) to execution of CI such as poor communication about CI from senior management, lack of training and education, resistance to culture change, lack of resources (financial, technical, human etc.), and lack of awareness of the need for CI methodology (LSS) and its benefits. While, Bete Georgise and Mindaye (2020) also publicised few challenges linked to executives commitment, participation of frontline workers in teamwork's, allocation of resources, clear procedure and system, resistance to accept change tools, maintain standards and improvements, programmed reward and acknowledgements confronting the feasibility of Kaizen practices, still, these challenges were categorised as either human/social and technical issues. Moreover, Abebe and Singh (2019) confirmed that top management's low commitment and interest, poor coordination among employees and top management, insufficient budget for Kaizen projects are found to be the most serious challenges to successful Kaizen implementation, and at the end these challenges could be classified as either human or technical issues. Thus, the summary of the list of barriers is given in Figure 12.

4.8 Proposed solutions to mitigate problems (way forward)

The above discussion confirmed that selected manufacturing companies made effort in execution of integrated Kaizen practices, and as a result few companies have attained quantitative (monetary and non-monetary) and qualitative results. However, considerable number of companies was forced to cease the implementation, and even the success companies were not also able to sustain practices and maintain substantial improvements. In addition, the contribution of these effects on each company development is not imperative and remains minimal as companies need to secure sustainable competitiveness which results in contributing more for the industrialisation. To ensure sustainable competitiveness that result in economic and social development for the country in the current competitive world, establishing and successfully executing world-class management systems to the Ethiopian manufacturing companies is critically important. Even if the companies are executing Kaizen with the support of MIDI's centres including KEC, JICA-Ethiopia, and ILO but some of the unique techniques, drivers related to social and technical factors including the government policy and external challenges are scarcely incorporated in the plan of action. Based on the empirical exploratory study, examination of company's documents including reports, strategic plan, and policy and strategy, this document lacks integrated Kaizen practices synchronisation and structured implementation system to bring companies excellence in Ethiopia. Therefore in this part, the proposed solutions and the actions with respect to social and technical factors are presented that should be taken to achieve promising Kaizen practice convey in Ethiopia that lead to the development of industrialisation with the emphasis of manufacturing companies.

In connection with social factor of people: manufacturing companies need to improve employees salary, employees must receive basic, interactive and problem solving skill training, companies must organised teams and involved in Kaizen practice, companies need to establish and practice motivational and incentive systems. In connection with utilisation of problem solving approach barrier: teams need to first receive theoretical and practical training and then use the integration of QC story (formation of teams, theme selection, reason out for selection of the theme, current situation analysis, target setting, activity planning, cause analysis, countermeasure proposal and implementation, checking results, comparing results with target, standardised and control, future plan), and seven QC tools (for instance, check sheet, flow chart, pare to diagram, cause and effect, scatter diagram, histogram, and control chart) to solve problems, best practices should be primarily documented and expand to other departments, the top management must take the initiative and hold monthly progress sharing, teams must hold meetings consistently, managers and experts must evaluate the current situation of the companies using SWOT analysis tool.

In relation to leadership barrier: top management should follow participative management style and composition of managers must be based on the company's strategy, managers should monitor and control the implementation process regularly, managers must have positive attitude and upgrade their knowledge and skill consistently, and they must have a sense of purpose, urgency and responsibility, managers should manage their time and need to have global mindset, reward and recognition system must established and practiced based on the performance of teams or individuals or both, top management must take the initiative and facilitate consistent training and education, managers should involve in the practice and encourage teams by upgrading best

performers to management positions and give authority to employees to perform their task, managers should have structured communication system to discuss with employees.

In association with resource barrier: managers ought to provide quality and updated information to employees, companies must organise training centre and Kaizen office and hired skilled experts, human resource development must be based on planning, management and improvement of existing skill and knowledge gaps of employees; appropriate time, personnel and optimum budget (money) must be allocated for the implementation, and facilities (toilets, bath rooms) must be clean and neat. In connection with process barrier: companies must practice innovation activities and use up to date technology machineries, managers must evaluate the implementation process and performance of employees, managers must employ employee application software's (for instance, Arena, TORA, SPSS, STATA) for analysing information and data, teams must use formats to record and measure gains and losses during and after the implementation, managers ought to utilise statistical process control tools, supporting processes (for example, R&D, product design centre, supply and procurement, human resource department, sales and marketing, information and communication technology must cooperate with each other, companies must implement maintenance, quality and production management as an integrated management method.

In link to policy and strategy barrier: managers as a team must develop and deploy policies and strategies with respect to their mission and vision; managers need to prepare structured implementation framework with the trend of PDCA cycle; the company policies and strategies must consider future needs of customers related to innovative products; companies must focus on thematic areas (for instance, operational, innovation and business improvements), conduct a research and used findings for the development of policies. In relation to partnership barrier: companies must develop long term relationship with suppliers; companies must regularly evaluate and give on time feedback in connection with the performance of supplier's in order to get quality raw materials, and based on the evaluation result companies need to select reliable suppliers; companies must train and build suppliers in relation to quality management; companies must design and produce based on customer needs, and customers should also involve in product development; companies must take a survey to evaluate the degree of customers satisfaction; companies ought to make bond with institutions (Academic, TCR, TVET, MIDI-TGIRDC, LLPIRDC, MTEIRDC, CCIRDC, FBIRDC, KEC, and NGO's), and companies must receive trainings, consultations, research works and outputs.

In the last part, the government should support the companies by improving its policies. In association with labour laws: government should put stimulating salary, minimising income tax and leaves; in relation to logistics performance: government ought to minimise check points and improve roads taking to Djibouti from the companies; in link to custom clearance custom officers must stay on their office and work based on the rules and regulations; in relation to business related issues banking services must be improved and the government should provide foreign currency and solve the existing conflicts and political instability by negotiating; and companies need to have alternate generators to prevent frequent power outage for long periods of time, to prevent work stoppages and revenue losses, and damage of equipment and materials.

5 Conclusions

As per the discussion carried out in the aforementioned sections, the empirical exploratory examination 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 primarily conducted a survey, and received 308 valid questionnaires from 32 manufacturing companies. The survey finding demonstrated that Ethiopia manufacturing companies were made an effort in executing few unique techniques of integrated CI methodologies, drivers (social and technical factors) and as a result attaining substantial improvements, though companies faced various obstacles during the implementation. So, for supporting of these key findings, the study utilised SWOT analysis and developed general perspective regarding to the status of integrated Kaizen practice application on selected manufacturing companies.

This empirical investigative study gives adequate understanding on practice of integrated Kaizen using structured framework, practice of drivers such as social and technical factors, execution of triple helix actors, 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 integrated Kaizen on manufacturing companies bring on achieving quantitative (monetary and non-monetary) and qualitative results. However, the implementation and attained results was not imperative, and varies from sub-sector to sub-sector, and company to company.

Based on the above discussion, companies were executed integrated Kaizen using structured implementation framework with the trend of PDCA cycle. In this case, the lessons learned taken as novelties in an integrated Kaizen execution with the context of Ethiopian manufacturing industries are: process owners-expert's team building; considering Kaizen in organisation structure; clearly defined policies and strategies using cross-SWOT analysis matrix; following level based implementation strategy first basic-5S, and then advanced methodologies such as integrated unique techniques of LM, TQM, SCM, IM and LSS methodologies; conducting monthly consistent progress sharing; support of institutions; commitment of company managers in facilitating resources to employees; strong monitoring and controlling system from MoI and MIDI; performance based reward system among others. Moreover, companies have also practiced social and technical factors of Kaizen for successful implementation of the Kaizen project. Moreover, institutions were also involved in providing trainings and follow-ups. As a result, the implementation enables manufacturing companies to organise and standardise their working places and achieved quantitative and qualitative results.

In response to *RQ1*, the study discovered unique techniques of integrated Kaizen methodologies such as in station quality, planned maintenance, 5whys, JIT delivery by suppliers, autonomous maintenance, JIT schedule, customer focus, machine-person separation, pokayoke/standardised procedures, JIT layout, cross-functional product design from LM and TQM methodologies supported above 50% (see Figure 4). Whilst, leading drivers identified as social factors are people management and leadership, and technical factors such as problem solving methodology, process management including product and service, policy and strategy, partnership and resource management as all are supported by 70% and above (see Figure 10). Besides, it also identified roles of triple helix actors such as commitment and initiatives from companies, training and follow-ups

from institutions, and strong monitoring and controlling from government as discussed in exploration of integrated Kaizen practice in manufacturing companies (see Section 4.6), and also recognised some barriers faced by selected manufacturing companies such as organisation's culture does not support CI initiatives, lack of resources due to unstable political environment, weak economic situation and uncertainty in government policies, lack of communication with employees, and others as described above (see in Figure 11).

In response to *RQ2*, the study discovered structured implementation framework for execution of integrated Kaizen (see Figure 5). In Ethiopia, different approaches were used for Kaizen implementation. Some manufacturing companies were implementing Kaizen philosophy in a level based strategy such as first basic Kaizen, and next advanced Kaizen, and others were followed problem based implementation strategy. But, in both cases, manufacturing companies applied Kaizen followed four main phases with the trend of PDCA cycle such as in 'plan' preparedness; conceptualisation and planning were considered; implementation of both basic and advanced Kaizen practices to solve problems were also under 'do'; stabilisation or performance evaluation and verification under 'check', and standardisation, sustaining and complete CI transformation with re-planning under 'act'.

In response to *RQ3*, the implementation of integrated Kaizen practices such as few unique techniques, drivers (social and technical factors), roles of triple helix actors through structured execution framework consequences in attaining monetary and non-monetary results such as saving and gaining a total of 158,777,469.7 ETB and 41,852.5 M² free space. Moreover, the mediocre achieved improvements of net profits, sales volume, productivity, delivery time, production volume, labour 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. However, this analytical study finding also confirmed that even though companies were achieving considerable results, they could not sustain the Kaizen activities 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 barriers as described above (see Section 4.6 and Figure 12). 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. For this reason, all companies are highly recommended that they should able to practice integrated Kaizen philosophy based on developed structured implementation framework. So, execution of unique techniques, drivers (social and technical factors), roles of triple helix actors, and sustaining these actions by eliminating barriers is expected from manufacturing companies to secure and enhance sustainable competitiveness as described in way-forward section of the study.

6 Implications of the research

6.1 Theoretical implications

This research contributes to the existing Kaizen philosophy literature by providing information about its definition and principles, and implementation phases including unique techniques, social and technical factors (drivers), roles of triple helix actors, and

internal and external barriers which have significant impact in enhancing sustaining competitiveness applying in manufacturing companies. Thus, the study identified structured implementation framework for execution of integrated Kaizen (see Figure 5), unique techniques (see Section 4.3); key competitiveness indicators (see Section 4.4); seven drivers with two social and five technical factors of Kaizen (see Section 4.5); internal and external barriers (see Section 4.7). Moreover, the study also provided way forward (see sub-Section 4.6) for the case companies to eradicate the challenges.

6.2 Practical implications

In relation to practical implications, this study discovered a framework for Kaizen implementation in manufacturing industries to enhance competitiveness, operational, innovation and business performance results in particular. The framework encompassed various Kaizen actions with the trend of PDCA cycle, and it is based on four main successions as described by Berhe et al. (2023). These are plan (preparedness; conceptualisation; and planning); do (implementation of both basic and advanced Kaizen practices to solve the identified problems with monitoring); check (stabilisation or performance evaluation and verification) and Act (standardisation, sustaining and complete project with 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 techniques such as autonomous maintenance, planned/preventive maintenance, layout improvement, establishing quality in station and others as stated in Figure 4.

Besides, the framework is successful and able to secure sustainable competitiveness when the companies fully execute identified drivers of social factors (people management and leadership), technical factors such as (process management, policy and strategy, problem solving approach, resource management and partnership), and roles of triple helix actor's such as (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 authorise 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 organisation structure, process owners-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.

6.3 Managerial implications

In relation to managerial implications, the study developed a framework which could be used as an implementation guideline for the company managers in order to practice in the existing or other companies. Besides, the study contributes to a better understanding on Kaizen practice could impact in enhancing manufacturing industries sustainable competitiveness. But, for achieving the quantitative and qualitative results, company managers should give attention to the practice of identified unique techniques, drivers (social and technical factors), structured framework, roles of triple helix actors, and elimination of barriers. Moreover, the leadership should be committed and supportive, managers should be effective in management and development of people, managers should develop and deploy policies and 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 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 using integrated Kaizen implementation framework. Consequently, managers should focus on the identified integrated Kaizen practices such as unique techniques, drivers (social and technical factors), roles of triple helix actors, and in accordance with the circumference of discussed structured implementation framework to determine as a company's framework, which is also consistent with the modern view of Berhe (2022), Tilahun et al. (2020), Hailu et al. (2020, 2018b), Kumar (2019), Todorovic et al. (2019), Lina and Ullah (2019), Khanna et al. (2017a, 2017b), Amrutkar and Kamalja (2017), signifying that practices of integrated Kaizen can influence sustainable competitiveness in relation to operational, innovational, business (financial and marketing) results.

7 Limitations and directions for future research

Even though it is the first study, it has some limitations. The study only targeted on 32 companies, albeit there were hundreds of manufacturing companies implemented Kaizen till this study conducted. The quality of the report received from these companies was also poor and insufficient, and even some key competitiveness indicators were not well recorded. Therefore, researchers for future study can focus on the topic and target several companies with big data to generalise the key finding in order to contribute to academics, practitioners and government including MIDI for the purpose of implementation of integrated Kaizen on other manufacturing industries, service providers and educational institutions. In addition, researchers in the future could also apply the framework to verify whether integrated Kaizen philosophy (CI) practices could enhance sustainable competitiveness or not.

Appendices and supplementary materials are available on request by emailing the corresponding author.

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