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The evolution of Kaizen in the industry: systematic literature review

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Abstract:

The paper discusses the concept of Kaizen, a Japanese philosophy of continuous improvement, and highlights its historical significance and widespread adoption in various industries worldwide. This paper is based on literature review of 98 research articles published related kaizen's evolution, industry application, and limitations during 2000-2022. The study employed a comprehensive search strategy across multiple databases like Scopus, Google Scholar, and others to gather relevant systematic reviews on kaizen. It references established guidelines like PRISMA and it mentions the planned thematic analysis using NVivo software, highlighting its applicability in identifying patterns and themes across diverse data sources. The review showed that Kaizen adoption is a useful tool for organizations looking to achieve continuous performance improvement and sustainability over time.

Key words:

Kaizen systematic literature review, continuous improvement, industry, lean manufacturing.

1. Introduction

Kaizen is a Japanese philosophy that focuses on continuous improvement. It emphasizes the importance of incremental changes to a process or system, which over time can lead to significant gains in quality and efficiency (Grosu et al., 2019). The concept originated in Japan after World War II when the country was rebuilding its economy (Titu et al., 2010). The word "kaizen" comes from the Japanese words "kai" (change) and "zen" (good), and it was initially introduced by Masaaki Imai, the founder of the Kaizen Institute in Japan (Imai, 1986).

The significance of kaizen in industry has been widely recognized, and it has been implemented in many industries around the world as a key tool for organizations seeking to optimize their processes and operations (Tufail et al., 2021). Kaizen has evolved over time, and understanding its evolution can provide valuable insights into the current state of kaizen as a tool for continuous improvement. Therefore, a systematic review of kaizen's evolution is necessary to understand the different forms of kaizen, how they have been implemented in various industries, and the benefits and limitations of its application (Aamer et al., 2022). The research questions for a systematic review of kaizen's evolution may include the following (Wilson, 2009):

- How has the concept of kaizen evolved over time?
- What are the key drivers of kaizen's evolution in the industry?
- What are the different types of kaizen, and how have they been implemented in different contexts?
- What are the benefits and limitations of kaizen, and how have they been experienced by organizations that have implemented it?

Answering these research questions can provide valuable insights into the history, evolution, and current state of kaizen as a tool for continuous improvement. This information can be used to inform future research and practice in this area, and it can also help organizations make informed

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decisions about whether to adopt kaizen and how to implement it effectively (Suárez-Barraza and Ramis-Pujol, 2010).

The scope of a systematic review of kaizen's evolution may include a wide range of sources such as journal articles, conference papers, books, and reports. The review can focus on a specific time period, industry sector, or geographical location, depending on the research questions and the availability of relevant literature. Inclusion criteria may include factors such as language, publication date, and study design, while exclusion criteria may include irrelevant topics or sources that do not meet the quality criteria for inclusion. By defining the scope and criteria for inclusion and exclusion, the review can ensure that it is comprehensive, rigorous, and unbiased in its approach (Aranha et al., 2018).

In conclusion, a systematic review of kaizen's evolution is essential to understand the various forms of kaizen, how they have been implemented in various industries, and the benefits and limitations of its application. Answering the research questions can provide valuable insights into the history, evolution, and current state of kaizen as a tool for continuous improvement. This information can be used to inform future research and practice in this area, and it can also help organizations make informed decisions about whether to adopt kaizen and how to implement it effectively.

2. Methods

2.1. Describe the search strategy used to identify relevant studies

A protocol was developed to lay out the methodology and inclusion standards in advance of the study. We searched extensively in several databases, including Scopus, Google Scholar, Web of Science, and ScienceDirect, for systematic reviews. Without placing any limitations on language or time period, our search includes the phrases "review" in the titles, abstracts, and/or keywords of the chosen publications. To guarantee that we didn't overlook any systematic reviews that didn't use the phrase directly in their titles, abstracts, or keywords, we purposefully avoided using the term "systematic" as a search keyword. Since that there isn't a thorough checklist like PRISMA for performing systematic reviews in the social sciences. (Moher et al., 2009) Planned to conduct a systematic review had to rely on existing narrative guidelines, such as (Petticrew and Roberts, 2006) and (Pickering and Byrne, 2014) document the steps they took.

The search was limited to articles published in English language from January 2000 to December 2022. The inclusion criteria for this review were articles that focused on the evolution of kaizen, her evolution in the industry, and the limitation of kaizen. The exclusion criteria included articles that were not peer-reviewed, conference abstracts, editorials, letters, and articles not written in English.

After conducting the search, all potentially relevant articles were screened for eligibility. The screening process involved two stages: first, titles and abstracts were reviewed to exclude irrelevant articles, and second, full texts of the remaining articles were assessed against the inclusion and exclusion criteria. Any disagreements about the eligibility of an article were resolved through discussion between the reviewers (Mulrow, 1994).

The search strategy used in this review is consistent with best practices for conducting systematic reviews and ensures that all relevant literature related to the research question is identified. It also ensures that the review is comprehensive and unbiased, and that the conclusions drawn are based on the best available evidence (Sambunjak et al., 2010).

In summary, a thorough and comprehensive search strategy was employed to identify all relevant studies about the evolution of kaizen, her evolution in the industry, and the limitation of kaizen. The search was conducted using multiple electronic databases and manual search of reference lists from relevant articles and books (Tricco et al., 2011)

2.2. The inclusion and exclusion criteria used to select studies

Inclusion and exclusion criteria are an important aspect of any systematic review, as they help to ensure that the studies selected for inclusion are relevant and of high quality. In the case of a systematic review on the evolution of kaizen, her evolution in the industry and the limitation of kaizen, the inclusion and exclusion criteria should be designed to identify studies that are most relevant to the research questions.

The criteria for inclusion should be created to guarantee that research are pertinent to the subject of kaizen and its advancement in the industry. Studies that concentrate on the use of kaizen in certain sectors, like manufacturing or healthcare, may be especially pertinent. The study design, such as randomized controlled trials, observational studies, or case studies, as well as the date of publication may also be used as inclusion criteria. Older studies might not accurately reflect current procedures.

Several authors have proposed criteria for selecting studies in systematic reviews. For example, the Cochrane Handbook for Systematic Reviews of Interventions recommends using a set of pre-defined criteria to select studies for inclusion, such as study design, population, intervention, and outcome measures (Cumpston et al., 2019). Similarly, the PRISMA statement recommends using clear and transparent criteria for selecting studies, and documenting the reasons for excluding studies as flowchart (Figure 1) (Moher et al., 2009).

Overall, the inclusion and exclusion criteria used to select studies for a systematic review on the evolution of kaizen, her evolution in the industry and the limitation of kaizen should be carefully defined and consistently applied to ensure that the resulting review is comprehensive, relevant, and based on high-quality evidence.

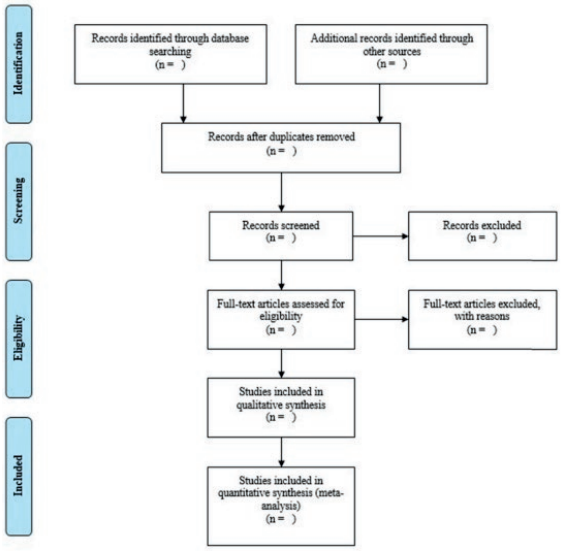

Figure 1. The PRISMA flow diagram.

2.3. Extraction the data from the included studies

Data extraction is a critical step in conducting a systematic review, as it involves extracting relevant information from the included studies to answer the research questions. In the case of a systematic review on the evolution of kaizen, its evolution in the industry, and the limitations of kaizen, the process of data extraction would involve identifying and extracting relevant data from the included studies, such as the author, year of publication, research design, sample size, methodology, findings, and limitations (Liberati et al., 2009).

The data extraction process can be conducted by one or more reviewers, depending on the size and complexity of the review. The reviewers would first screen the studies based on the inclusion and exclusion criteria and then extract the relevant data from the included studies. It is important to note that the process of data extraction can be time-consuming and labor-intensive, especially for larger reviews, and it requires a high level of attention to detail and accuracy (Khan et al., 2003). The data analysis process can involve the use of qualitative, quantitative, or mixed-methods approaches, depending on the research questions and the nature of the data (Bramer et al., 2016).

In conclusion, data extraction is an important step in performing a systematic evaluation of the development of kaizen, the development of the practice in the industry, and the limitations of kaizen.

2.4. Methods used to analyze the data

To analyze the data extracted about the evolution of kaizen, its evolution in the industry, and its limitations, we will use a thematic analysis approach with the assistance of NVivo software. Thematic analysis is a widely used qualitative research method that involves identifying patterns or themes within data that relate to the research question (Braun and Clarke, 2006). NVivo is a software program specifically designed for qualitative research analysis that allows for data organization, coding, and theme identification (Lakerman, 2008).

Thematic analysis has been used in previous research on kaizen in various contexts, such as healthcare (Mazzocato et al., 2016), education (Suárez-Barraza and Rodríguez-González, 2015), and manufacturing (Sahmi et al., 2023). The use of NVivo software for

thematic analysis has also been demonstrated in multiple studies, including research on leadership (Lipscombe et al., 2023), and healthcare (Nathan et al., 2018).

Using thematic analysis and NVivo software will allow us to identify common themes and patterns within the data extracted from the included studies, providing insight into the evolution of kaizen, its application in various industries, and its limitations.

3. Results

The current study reviewed 98 review papers. After conducting a search on the topic of kaizen, I found a total of 3103 publications. To narrow down my search, I added the keyword "review" to my search query, resulting in 416 publications. However, I wanted to further refine my search and include only publications related to the industry, so I added the keywords "industry" to my search, and found 98 relevant publications. To ensure that I selected the most appropriate studies for my analysis, I applied a set of inclusion and exclusion criteria. These criteria allowed me to filter out irrelevant studies and select only those that met my research objectives as showed in Figure 2.

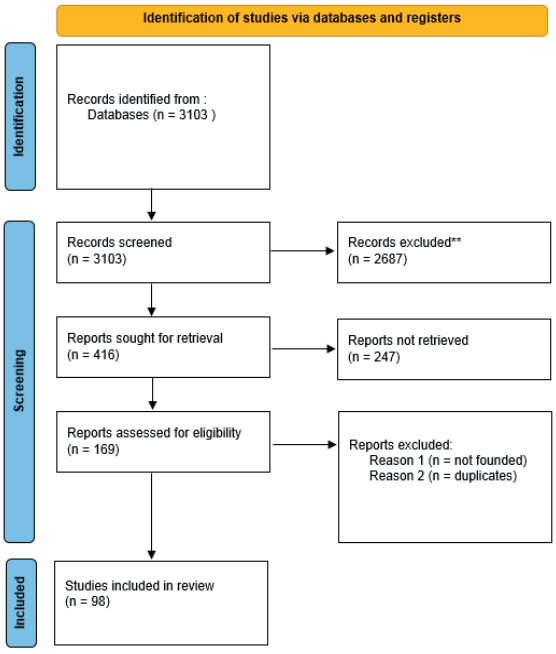

Figure 2. PRISMA flow diagram for systematic reviews which included searches of databases.

The initial statistics of the data comprise the findings from the descriptive analysis, which includes a graphical representation of the publication trend of the articles Figure 3. This graph displays the number of papers plotted against the years within the selected timeframe.

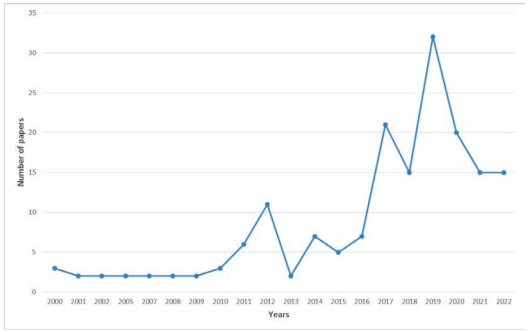

Figure 3. Publications over time.

The table shows the number of publications per year on the evolution of Kaizen in the industry, from 2000 to 2022. In the year 2000, there were three publications on this topic. The number of publications dropped to two in 2001, and remained at two for several years until 2010, where it increased to three.

From 2011 onwards, there was a significant increase in the number of publications on the topic of Kaizen in the industry. The number of publications in 2011 increased to six, and it continued to increase in the following years. The highest number of publications in this period was in 2019, with 32 publications, followed by 21 publications in 2017. However, there seems to be a slight decrease in the number of publications in the most recent years, with 15 publications in 2021 and 2022, compared to the 20 publications in 2020 and 32 publications in 2019.

Overall, the table indicates that there has been an increasing interest in the topic of Kaizen in the industry over the years, with a peak in publications in 2019. It is possible that the slight decrease in recent years is due to other emerging topics or the COVID-19 pandemic's impact on research and publications.

In conclusion, the data shows a significant increase in publications related to Kaizen in the industry over the past decade, indicating a growing interest in the philosophy of continuous improvement. The trend has stabilized in recent years, but the number

of publications remains high, suggesting that Kaizen will continue to be an important topic in the industry in the years to come.

Figure 4. Most recurring words.

The word cloud illustrated in the image above was obtained after the analysis of collected references abstracts. The data shows that the most common word used in these publications is "Kaizen," which appears 114 times. The second most common word is "lean," which appears 104 times, followed by "manufacturing" at 85 times and "improvement" at 84 times. Other common words include "management" at 79 times, "study" at 73 times, and "paper" at 70 times. The implementation of Kaizen is also a commonly discussed topic, as "implementation" appears 59 times. Quality, review, literature, research, and industry are other common themes in the publications related to Kaizen. These recurring words suggest that the focus of the publications is on the implementation and application of Kaizen in various industries and the management of continuous improvement processes to improve efficiency and productivity

4. Discussion

4.1. Interpret the results of the review in the context of the research questions mentioned in the introduction

In reviewing all studies, it is evident that Kaizen has evolved over time from a narrow focus on manufacturing efficiency to a more holistic approach that incorporates sustainability and digitalization. The studies reveal that early on, Kaizen was primarily associated with the Toyota Production System and involved techniques such as Just-in-Time and Total Quality Control. After evaluating every study, it is clear that Kaizen has changed over time, moving from a factory efficiency-only focus to a more comprehensive strategy that includes sustainability and digitization. According to the studies, Kaizen was first primarily connected to the Toyota Production System and involved concepts like Just-in-Time and Total Quality Control. But throughout time, Kaizen has been used in many different situations and industries, including healthcare (Gilotta et al., 2019), construction (Erdogan et al., 2017), and SMEs (Magnier-Watanabe, 2011). Although the needs for continuous improvement (Singh and Singh, 2015), cost reduction (Chen et al., 2012), quality improvement (Cherrafi et al., 2019), and customer satisfaction (Anosike et al., 2021) have persisted over time, the driving forces behind Kaizen's progress have also changed.

These drivers are reflected in the implementation of different types of Kaizen, such as Lean Six Sigma (Kumar and Antony, 2008), 5S (Mizuno et al., 2012), and Toyota Production System (Srinivasan and Shah, 2018). The studies suggest that organizations have implemented these different types of Kaizen in a number of ways depending on their specific needs and goals. For instance, some studies propose a framework for integrating Kaizen and Industry 4.0 technologies (Vivan et al., 2016), while others propose a model for implementing Kaizen projects in the construction industry based on the Toyota Production System (Erdogan et al., 2017). Across these studies, organizations have reported a range of benefits and limitations of implementing Kaizen.

According to the studies, Kaizen can have a big impact on safety (Hambach et al., 2017), occupational health (Dametew et al., 2020), and employee learning (Hasan et al., 2021), as well as increased productivity (Belt, 2019), efficiency (Veres et al., 2018), and cost savings (Zocca et al., 2019). The studies do, however, indicate that putting Kaizen into practice can be difficult, particularly when there is resistance to change (Ma et al., 2017) and trouble comprehending Kaizen concepts (Boer et al., 2017). The studies also show that while digitization has created new Kaizen opportunities, it has also created new challenges, such as the time-consuming nature of monitoring Kaizen systems (Tripathi et al., 2022) and the difficulty of establishing and standardizing an enterprise-wide system (Wan Ibrahim et al., 2017). Overall, these studies provide valuable insights

into the evolution of Kaizen, the key drivers of its evolution, its different types, and the benefits and limitations of implementing Kaizen. Collectively, these findings suggest that Kaizen remains a powerful tool for improving organizational performance. This is particularly true when it is tailored to the specifics of each industry and organization and when implementation challenges are carefully considered and appropriately addressed.

4.2. Discuss the strengths and limitations of the included studies

The studies under evaluation offer insightful explanations of the Kaizen idea. However, the studies' various strengths and weaknesses should be taken into account. The variety of industries and circumstances in which Kaizen has been used is one of the study' strengths. For instance, the research on healthcare (Gilotta et al., 2019), construction (Erdogan et al., 2017), and SMEs (Magnier-Watanabe, 2011) provide a variety of viewpoints on the application and efficacy of Kaizen. The studies (Kumar and Antony, 2008), (Mizuno et al., 2012), and (Srinivasan and Shah, 2018) also look at several forms of Kaizen, giving information about the relative merits and drawbacks of various methods of Kaizen. Despite these advantages, some of the studies have limitations that warrant consideration. One limitation of some of the studies is the small sample sizes used, which can limit the generalizability of the findings (Siang and Yih, 2012), (Goyal and Law, 2019). Another limitation is potential bias related to the selection of case studies rather than more objective measures of Kaizen's effectiveness (Garza-Reyes et al., 2022), (Mogab and Cole, 2000). Furthermore, some of the studies may not be relevant across different industries or contexts due to the specific focus of the research (Edgington, 1999). Another limitation of the studies is the lack of clarity with regard to the conceptualization of Kaizen. Some of the studies define Kaizen in different ways, making it difficult to draw clear conclusions about how Kaizen has evolved over time (Santos et al., 2018), (Hoefsmit et al., 2022). Furthermore, given the limitations of the studies, it's possible that some other facets of the Kaizen concept remain unexplored. Despite these drawbacks, the studies examined offer important insights on the development, motivations, and application of Kaizen in various contexts, as well as its advantages and disadvantages. For businesses wishing to apply Kaizen, these insights can be helpful since they give a foundation for knowing what approaches work best and what difficulties to expect (Vivan et al., 2016), (Tripathi et al., 2022). Therefore, it is important to continue to build on the studies available and address their limitations to further improve understanding of Kaizen and its potential applications. Overall, while the studies reviewed have areas of strength and weakness, as a whole, they contribute a valuable perspective on the concept of Kaizen and provide a basis for conducting further research in the future.

4.3. Identify any gaps in the current knowledge base and suggest areas for future research

Despite the valuable insights gained through the studies reviewed, there are still gaps in the current knowledge base surrounding the concept of Kaizen. One area that requires further study is the identification of effective methods for implementing Kaizen across different industries and contexts, particularly as it relates to specific challenges and opportunities unique to each sector (Edgington, 1999). For example, studies could explore how to overcome unique challenges in implementing Kaizen in industries such as construction, healthcare, and SMEs. Such studies may be conducted by directly comparing the success levels of Kaizen implementations across different industries or by developing specific case studies that examine how to best apply Kaizen strategies in each industry.

The effectiveness of various forms of Kaizen and the best ways to combine them is another subject that needs more research. The examined research mostly concentrated on various forms of Kaizen as distinct concepts but did not explicitly show how they might be combined to increase their efficacy. Future studies should examine the effectiveness of implementing different Kaizen types sequentially or simultaneously to create more effective and long-lasting outcomes in order to close this gap (Kumar and Antony, 2008). Additionally, research could focus on identifying the types of Kaizen that are most effective for specific industries, contexts, or types of organizations (Srinivasan and Shah, 2018). The studies also suggest that there is a need for more research into the challenges faced during the implementation of Kaizen, including the challenges presented by digitization (Wan Ibrahim et al., 2017). In this regard, further research is needed to determine how to optimize the use of digitization to aid in the overall effectiveness of Kaizen implementations

(Vivan et al., 2016). Moreover, research should explore resistance to change, which was identified as a major challenge in many of the studies, to better understand its nature and develop strategies to address it in Kaizen implementations (Ma et al., 2017).

In conclusion, all studies reviewed have contributed significantly to our understanding of Kaizen over time and across industries. However, there remain gaps in the knowledge base that must be addressed by future research. Suggested areas for future research include better understanding the specific challenges of implementing Kaizen in different industries and contexts, optimizing the use of different types of Kaizen, and developing strategies to overcome the challenges encountered during implementation. By continuing to research and improve the understanding of Kaizen, organizations can better implement Kaizen to achieve channel savings and enhance overall performance.

4.4. The evolution in the industry and the limitation of kaizen and Kaizen 4.0

Based on the review of all articles. Kaizen has evolved over time from a narrow focus on manufacturing efficiency to a comprehensive approach that includes sustainability and digitalization. The different types of Kaizen have been tailored to improve productivity, efficiency, cost reduction, safety, occupational health, and employee learning. However, the articles also revealed certain limitations surrounding the implementation of Kaizen. Although Kaizen can be an excellent tool for improving organizational performance, implementing it has been challenging for many organizations due to issues such as resistance to change (Ma et al., 2017) difficulty understanding Kaizen concepts (Boer et al., 2017), and the time-consuming nature of managing Kaizen systems (Tripathi et al., 2022). The evolution of Kaizen in the context of the fourth industrial revolution (Industry 4.0) represents a significant opportunity for organizations to improve their processes and ensure sustainability. To achieve sustainable performance, integrating Kaizen and Industry 4.0 technology has been suggested in several articles (Vivan et al., 2016). The difficulty of adopting and standardizing an enterprise-wide system is one of the additional difficulties that such integration has brought about, for example (Wan Ibrahim et al., 2017). To successfully apply Kaizen 4.0, organizations will need to overcome these obstacles as well as others (Vivan et al., 2016). The analyzed studies lead us to the conclusion that Kaizen is still a potent instrument for enhancing organizational performance. The evolution of Kaizen from a narrow focus on manufacturing efficiency to a more holistic approach, including sustainability and digitalization, proves to be beneficial. Organizations can implement different types of Kaizen to improve performance in various areas relevant to their specific industry or context. While there remain limitations in the implementation of Kaizen, they can be addressed by carefully considering and appropriately addressing implementation challenges. Furthermore, integrating Kaizen with Industry 4.0 technologies shows potential for achieving sustainable performance, yet it also presents new challenges that must be addressed. Overall, organizations can continue to benefit from implementing Kaizen as an ongoing tool for continuous improvement that ensures better outcomes and a more related-profitable bottom line.

5. Conclusion

A number of important results on the development of Kaizen, its relevance and applicability within industries, as well as its limitations, are highlighted in the review of all studies. First, the analysis showed that Kaizen has changed from a particular emphasis on industrial efficiency to a comprehensive strategy that prioritizes sustainability and digitization. A more effective and long-lasting improvement can be achieved by combining other types of Kaizen, such as Lean Six Sigma, 5S, and the Toyota Production System, which have all been created to address particular organizational performance areas. Secondly, the study identified that the evolution of Kaizen must also relate with the fourth industrial revolution (Industry 4.0). Several studies have proposed integrating Kaizen with Industry 4.0 technologies to improve organizational performance and ensure sustainability (Wan Ibrahim et al., 2017). The study revealed that the integration of Kaizen and Industry 4.0 presents new challenges that organizations must overcome to maximize the effectiveness of these strategies (Vivan et al., 2016). Lastly, the review findings revealed some of the limitations associated with the implementation of Kaizen. For instance, resistance to change (Ma et al., 2017), difficulty in managing Kaizen systems, and difficulty understanding the Kaizen concepts (Boer et al., 2017) have been identified as significant challenges that organizations face when trying to implement Kaizen. According to

research, these restrictions could be overcome by making sure Kaizen programs are suited to particular organizational or industry environments and that staff members receive proper training (Tripathi et al., 2022). In order to maximize the initiatives, there are additional hurdles brought about by the integration of Kaizen with Industry 4.0 technology (Wan Ibrahim et al., 2017).

In conclusion, the thorough analysis of these studies has revealed a wealth of information on the development and utility of Kaizen, its connection to Industry 4.0, and its limitations. According to the studies that have been analyzed, Kaizen has changed from having a restricted focus on industrial efficiency to a more comprehensive strategy that integrates sustainability and digitalization. Greater sustainability and efficiency are possible with the integration of Kaizen and Industry 4.0, but businesses must overcome new obstacles to make these outcomes a reality. Despite these advantages, the reviewed studies have shown a number of constraints that need to be addressed. To do this, specific organizational or industrial contexts should implement specialized Kaizen tactics, undertake adequate employee training, and promote effective management techniques. Overall, the study shows that Kaizen adoption is a useful tool for organizations looking to achieve continuous performance improvement and sustainability over time.

The review all studies has identified several areas that require further investigation to improve the effectiveness of Kaizen in different industries and sectors, future research could:

Explore the optimal combination of multiple types of Kaizen to identify the most efficient and effective approaches for continuous improvement. This research could further explore the limits and challenges encountered while applying hybrid Kaizen types.

Investigate ways of achieving effective integration, enhancing the applicability of Industry 4.0 in Kaizen practices, while overcoming emerging challenges presented by technology advancements.

Focus on developing the Organizational Kaizen culture required to sustain performance improvement. More specifically, how can management foster a culture of continuous learning and improvement within its organization, encourage individual involvement, improve employee engagement, and facilitate the communication of the Kaizen philosophy across all levels of the organization.

Explore ways of incentivizing Kaizen adoption in different organizational and industrial contexts. Research should concentrate on how financial incentives, government policies, or motivation methods could be implemented to encourage the widespread adoption of Kaizen.

In conclusion, while the reviewed studies of Kaizen have contributed to an improved understanding of its application, limitations, and integration with Industry 4.0 technology, more research is needed to enhance its efficacy further. Future research can specifically focus on enhancing the effectiveness of Kaizen by investigating optimal utilization of Kaizen types, improving organizational Kaizen culture, incentivizing Kaizen adoption in industries and governmental levels, exploring the challenges and benefits of integrating Kaizen with Industry 4.0, and developing policies that support the sustained growth and mainstreaming of Kaizen practices.

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