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PRINCIPLES OF KAIZEN AND THEIR APPLICATIONS: GLOBAL AND UKRAINIAN EXPERIENCES

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Abstract. *In the article the authors have analyzed the core ideas and principles of Kaizen, a Japanese management philosophy, centered on continuous improvement, which has also gained increasing relevance among Ukrainian companies seeking to improve operational efficiency, employee engagement, and organizational sustainability. This article examines the application of Kaizen principles in Ukraine, highlighting selected company cases and the institutional environment supporting their implementation. These ideas of continuous improvements smoothly permeated the facets of management and everyday life as well. Empirical case studies, including applications in continual self-supervised learning, validate the practical efficacy of Kaizen, highlighting tangible benefits such as enhanced adaptability, error minimization, and organizational resilience.*

However, the authors point out certain challenges, particularly in fostering cultural change and overcoming resistance to iterative processes. The analysis demonstrates that Kaizen is an increasingly significant management approach within the Ukrainian business environment.

Key words: *Kaizen, incremental innovation, management approach, sustainable framework for improving competitiveness, organizational resilience.*

Introduction.

Whenever we think about innovations, the state-of-the-art technologies, breakthroughs in automotive and electronics production facilities, it always conjures up Japan, the motherland of such a global practice as *kaizen* (continuous improvement). The first mentioning of the philosophy «kaizen» was in the profound work of Masaaki Imai, the influential Japanese management thinker and consultant, «Kaizen: The Key to Japan's Competitive Success» published in 1986. Since then, this idea has penetrated nearly all manufacturing and reengineering companies as well as management practices.

Kaizen originated in post-war Japan and is commonly defined as a philosophy of



continuous, incremental improvement involving all employees, from top management to frontline workers [1]. Unlike radical organizational change models, Kaizen emphasizes small, systematic improvements that are embedded in daily routines and organizational culture. Scholars note that Kaizen contributes not only to productivity growth but also to long-term organizational learning and employee empowerment [4; 9].

Literature review. Masaaki Imai (1930–2023) was a Japanese organizational theorist and management consultant, best known as the founder of the Kaizen Institute and the person who introduced the world to the kaizen philosophy — the practice of *continuous improvement*. He is often called the “father of Continuous Improvement (CI)” for his impact on how companies think about quality and productivity [1].

In his first prominent work he introduced the Japanese philosophy of continuous improvement to Western business audiences and helped shape the early understanding of what later became known as Lean management. Based on case studies from companies like Toyota, it linked incremental improvement practices to competitive performance.

Having gained the global recognition for his undeniably revolutionizing achievements in the sphere of quality improvements, the author went on to publish new extended editions, such as «Gemba Kaizen: A Commonsense, Low-Cost Approach to Management» (1997, expanded edition 2012) and «Strategic KAIZEN™: Using Flow, Synchronization, and Leveling Assessment» (2021). Covering 21 real-world practices and tools for continuous improvement that organizations can apply directly to operations with minimal cost, the researcher focused on practical kaizen at the “gemba” — the real place where work happens (i.e., the shop floor) [2]. It emphasizes strategic application of kaizen principles — not just operational tweaks but *systemic improvement* across processes. Introduces concepts like Flow, Synchronization, and Leveling (FSL™) to deepen organizations' operational performance [2].

Founded in 1985, Kaizen Institute, a global firm, has always assisted well-established as well as emerging companies in implementing CI principles worldwide. His books have been translated into many languages, widely used in business schools



and management consultancy. Having demonstrated practical benefits gained from the introduction of kaizen principles in the day-to-day operations, Imai's work influenced companies beyond Japan, shaping *Lean and CI practices* in manufacturing and services around the world [1].

The ideas of kaizen have also been analyzed by other researchers (Chi Ian Tang, Lorena Qendro, Dimitris Spathis, Fahim Kawsar, Cecilia Mascolo, Akhil Mathur), specifying and introducing a training architecture with Kaizen, that is able to balance the trade-off between knowledge retention and learning from new data with an end-to-end model, paving the way for practical deployment of continual learning systems [8].

The goal of the article is to provide insights into Japanese business culture and demonstrate how Ukrainian businesses can benefit from studying and integrating its principles and practices.

Discussion. Kaizen is a philosophy centered on the pursuit of continuous, incremental improvement, particularly within organizational and operational contexts. Its foundational principle is the systematic reduction of errors, defects, and variability, thereby enhancing the quality, safety, satisfaction, trust, and efficiency of processes [3].

After the Second World War, the American Training Within Industry program contributed to the emergence of Japanese approaches to process improvement. The term «Kaizen» gained popularity after the publication of Masaaki Imai's book «Kaizen: The Key to Japan's Competitive Success» in 1986.

Kaizen is not a one-time improvement, but a way of life. The idea is to continuously improve. Instead of drastic changes, kaizen suggests acting gradually. If implemented regularly, they have a powerful effect over time. Kaizen works for the future, not speed. Ideas for improving certain aspects can come not only from «chiefs», but also from every employee who sees work processes from the inside every day. This helps to look at the situation from different angles.

The Japanese business culture is based on deep traditional values that form a unique style of doing business.



Wa (harmony) is the desire to maintain peace and balance in the team. Harmony is considered to be one of the highest priorities, and all conflicts are resolved gently so as not to disturb the internal peace of the team. Giri (duty) is a sense of moral and social obligation to the company, colleagues, and even society as a whole [6, p. 137]. Employees believe it is important to fulfill their obligations and maintain the reputation of the organization. Shūdan ishiki (group consciousness) - the interests of the team are higher than individual ones [6, p. 138]. Personal success is linked to the success of the team or company, so a collective approach prevails in many decisions.

There are three pillars of corporate communication. This is not just terminology, but a whole system of internal communication, which is considered the basis of interaction in Japanese organizations. Ho-Ren-So is an abbreviation of three Japanese words: Houkoku – reporting; Renraku – informing; Soudan – consultation. Ringi or Ringi-sho is a system of decision-making through collective approval. It is deeply rooted in Japanese culture, which values harmony (wa) and coherence [6].

How does it work? The solution is proposed in the form of a ringi-sho document. This document is passed from one person to another (usually through a hierarchy) for approval. Everyone puts their stamp (hanko) or signature in case of approval or a comment if something needs to be improved. Only when everyone agrees does the decision take effect.

This philosophy, if applied in business, motivates all employees to propose, experiment and test new ideas. If an idea doesn't work, you can always go back to the previous options, thus avoiding high costs, which is a huge plus.

When you consider kaizen, it is impossible not to look at the example of Toyota. Toyota has become a symbol of the Kaizen philosophy around the world. In the 1950s, it began implementing a system of continuous improvement, which was later called the Toyota Production System (TPS). The key to its success is the involvement of all employees in the daily search for solutions that make production much more efficient [1].

One of the most well-known tools that embodies this philosophy is the andon board: a special system that allows every employee to stop the production line if they



notice a mistake. This shows us that every team member has an impact on the quality of the final product. Toyota receives thousands of suggestions for improvement from employees every year, and most of them are implemented. This helps to set up production as efficiently and comfortably as possible for the team. It is not just a set of tools, but an organizational culture that supports innovation, responsibility, and respect for people. Kaizen at Toyota is about trust, teamwork, long-term thinking, and self-discipline.

The historical development of Kaizen is deeply rooted in Japanese industrial and organizational culture, with its principles emerging prominently in the latter half of the twentieth century. While the term «Kaizen» itself is not explicitly referenced in the context provided, the evolution of related methodologies such as Kansei engineering in Japan during the 1970s offers insight into the broader movement toward continuous improvement and user-centered design [10]. Kansei engineering, which originated in Japan in the 1970s, exemplifies the integration of user experience, emotion, and knowledge into systematic product and process improvement [10]. This approach reflects the foundational Kaizen philosophy of harmonizing knowledge, emotion, and passion to achieve incremental and ongoing enhancements in both products and organizational processes [10]. Thus, Kansei is defined as «the state of mind where knowledge, emotion, and passion are harmonized» [10, p.10]

The development of Kansei engineering illustrates the methodological sophistication that paralleled the rise of Kaizen principles in Japanese industry. Early Kansei engineering methods focused on decomposing complex user experiences (Kansei) into actionable design elements, using structured approaches such as tree decomposition and semantic differential scales [10]. This systematic mapping of user needs and emotions to physical product attributes mirrors the Kaizen emphasis on breaking down processes into manageable components for targeted improvement. Over time, Kansei engineering evolved to incorporate expert systems and hybrid mapping techniques, enabling both forward and backward translation between user experience and design elements [10].

These advancements not only improved the accuracy and efficiency of the



improvement process but also addressed challenges such as uncertainty in user requirements and the need for validation through user feedback. The integration of advanced technologies, such as deep learning for extracting user Kansei from online reviews, further exemplifies the ongoing refinement and expansion of continuous improvement methodologies in line with Kaizen principles [10].

The analyzed publications allow us to state that the historical trajectory of Kaizen is also characterized by its emphasis on creating organizational systems that support continuous improvement. In the context of Kansei engineering, the establishment of databases, expert systems, and feedback loops between designers and users reflects a broader commitment to institutionalizing improvement processes [10]. This systemic approach ensures that the insights gained from user experience and product evaluation are not only captured but also systematically translated into actionable changes. The iterative nature of these processes, involving both forward and backward mapping, aligns with the Kaizen philosophy of ongoing, incremental improvement driven by feedback and learning at all organizational levels [10]. As such, the historical development of Kaizen is marked by a progressive shift from ad hoc improvements to structured, organization-wide systems that embed continuous improvement into the fabric of daily operations [10].

This philosophy has been applied in different spheres and proved its efficacy. Especially it has become prominent in the domain of healthcare and medicine, where the application of Kaizen has demonstrated substantial benefits, notably in the enhancement of care monitoring processes and outcomes [3]. By fostering transparency, robustness, and efficiency, Kaizen contributes to the interpretability and reliability of complex systems, such as those involving explainable artificial intelligence (XAI) [3].

At the heart of the Kaizen philosophy lies the commitment to continuous, incremental improvement. This principle emphasizes that progress is achieved not through sporadic, large-scale changes, but rather through a sustained series of small, manageable enhancements [3]. In the context of healthcare and medicine, this approach has demonstrated substantial benefits, including improvements in quality, safety,



satisfaction, trust, and efficiency. The iterative nature of Kaizen ensures that processes, such as care monitoring and AI-driven decision support, are constantly refined to reduce errors, defects, and variability [3]. This systematic reduction of inefficiencies leads to greater transparency and robustness in a service delivery, ultimately enhancing outcomes and the reliability of processes [3].

A core tenet of Kaizen is the use of iterative cycles informed by real-world feedback. In the domain of explainable artificial intelligence (XAI) within healthcare, this means that models, algorithms, and interpretability techniques are continuously refined based on new data, research findings, and clinical insights [3]. The regular updating of AI systems is fundamental to maintaining their relevance and effectiveness in the face of evolving medical knowledge and changing healthcare demands. This adaptive process not only improves the accuracy and interpretability of AI models but also ensures that the systems remain trustworthy and aligned with clinical needs. By systematically incorporating feedback, healthcare organizations can foster a culture of continuous learning and improvement, which is essential for the sustained success of AI applications in medicine [3].

The philosophy «Kaizen» also implies certain tools. A central tool in the Kaizen approach, particularly within the context of explainable artificial intelligence (XAI) in healthcare, is the iterative refinement of models and algorithms [3]. This process involves systematically updating and improving AI systems based on real-world feedback, new clinical insights, and evolving medical knowledge. By continuously incorporating fresh data and research findings, healthcare organizations ensure that their AI-driven systems remain relevant, effective, and aligned with current clinical practices. This iterative cycle not only enhances the accuracy and robustness of AI models but also supports the adaptability of these systems to changing healthcare demands [3]. The regular integration of feedback from end-users — such as clinicians and patients — further refines interpretability techniques, making AI outputs more understandable and actionable in clinical settings. This ongoing process of model evolution is fundamental to maintaining the trustworthiness and utility of AI applications in healthcare, as it systematically addresses errors, defects, and sources of



variability that may arise over time [3].

Beyond technical tools, Kaizen also encompasses organizational techniques aimed at fostering a culture of continuous learning and improvement. This involves encouraging regular review and enhancement of AI systems, promoting open communication about system performance, and supporting ongoing education for both developers and end-users [3]. By embedding these practices into the organizational culture, companies can ensure that improvements are sustained over time and that all stakeholders remain engaged in the process of enhancing AI applications [3]. This cultural commitment to continuous improvement is critical for achieving the broader goals of Kaizen — namely, enhancing quality, safety, satisfaction, trust, and efficiency in healthcare delivery [3].

Another key set of techniques within the Kaizen framework involves the systematic reduction of errors, defects, and variability in AI-driven processes.

One of the vivid examples of successful Kaizen implications is within healthcare. A central strategy for implementing Kaizen in organizations, particularly within healthcare and AI-driven environments, is the establishment of iterative improvement cycles [3]. This approach involves the continuous refinement of processes, models, and interpretability techniques based on real-world feedback and evolving knowledge. In the context of explainable artificial intelligence (XAI) in healthcare, such cycles are critical for maintaining the relevance and effectiveness of AI systems. Regularly updating models to incorporate new data, research findings, and clinical insights ensures that AI applications remain aligned with the latest medical standards and patient needs [3]. This iterative process not only enhances the accuracy and robustness of AI-driven care monitoring but also systematically reduces errors, defects, and variability in outcomes. By institutionalizing these cycles, organizations can create a dynamic environment where continuous learning and adaptation are integral to daily operations, thereby supporting the core Kaizen philosophy of incremental, ongoing improvement [3].

Another key strategy for successful Kaizen implementation is the cultivation of a culture that values continuous learning and open feedback. In organizations utilizing



XAI, this means encouraging all stakeholders — including employees, data scientists, and end-users — to actively participate in the improvement process. By systematically gathering and integrating feedback from these diverse groups, organizations can identify areas where AI systems may lack transparency, robustness, or user-friendliness [3]. This collaborative approach not only enhances the interpretability and trustworthiness of AI applications but also ensures that improvements are grounded in practical, real-world experiences [3]. Furthermore, fostering such a culture helps organizations address challenges by promoting the quantification and communication of model uncertainty. Ultimately, this strategy leads to more reliable and understandable AI tools that support high-quality service provision and informed management decision-making [3].

The adoption of Kaizen principles in continuous improvement processes, particularly within AI-driven systems, yields a multitude of significant benefits. Central to the Kaizen philosophy is the pursuit of continuous, incremental improvement, which directly enhances the quality, safety, and efficiency of service delivery. In the context of explainable artificial intelligence (XAI), Kaizen fosters systematic error reduction, minimizes defects, and decreases variability in customer-satisfaction monitoring processes. This leads to improved transparency and robustness in both the processes and outcomes of providing customer services, thereby increasing the interpretability and trustworthiness of AI applications for end-users [3].

Despite its substantial benefits, the implementation of Kaizen in continuous improvement processes is not without challenges. One notable difficulty arises from the need to regularly update AI models with new data, research, and clinical insights. This requirement can be resource-intensive and may necessitate robust data management infrastructures and interdisciplinary collaboration to ensure that updates are both timely and accurate. Additionally, the presence of data noise and other sources of uncertainty in automated disease diagnosis underscores the importance of quantifying and effectively communicating the limitations and uncertainties inherent in AI models. Failure to do so can compromise the reliability and perceived trustworthiness of AI-driven diagnoses, potentially undermining the benefits of



continuous improvement [3].

Another challenge lies in fostering and sustaining a culture of continuous learning and improvement within healthcare organizations. This cultural shift demands ongoing commitment from leadership, as well as engagement and training for all stakeholders involved in the development and deployment of AI systems. Resistance to change, limited resources, and competing organizational priorities can impede the successful adoption of Kaizen principles. Moreover, the iterative nature of Kaizen may lead to incremental changes that are difficult to measure or attribute directly to specific outcomes, complicating the assessment of progress and the justification of ongoing investments in continuous improvement initiatives [8].

The Kaizen architecture has been specifically developed to address the challenges inherent in continual self-supervised learning (CSSL), a domain where models must adapt to streams of both unlabelled and labelled data arriving over time. Traditional machine learning and self-supervised learning (SSL) models typically assume access to large, static datasets for training, which is not feasible in many real-world scenarios where data is distributed, privacy-sensitive, or only temporarily available [8]. Kaizen's approach is to integrate both unlabelled and labelled data within each training round, thereby enabling the model to learn continually and adaptively, rather than relying on periodic, centralized retraining. This is particularly relevant for applications such as vision tasks on mobile devices or surveillance systems, where new classes or concepts may emerge after initial deployment and where retraining on a central server is impractical due to latency, privacy, and resource constraints [8].

Kaizen's architecture is designed to balance the dual objectives of learning from new data and retaining previously acquired knowledge, a challenge often referred to as catastrophic forgetting in continual learning literature. The system employs a novel loss function and a distillation mechanism that together enable the feature extractor and classifier to be trained end-to-end, leveraging both types of data [8]. This design allows for greater flexibility in storage and computation, as well as enhanced accommodation of privacy concerns, since not all data needs to be centrally aggregated or persistently stored. In comparative evaluations, Kaizen demonstrated superior performance over



prior CSSL methods, achieving up to a 14.4% absolute improvement in accuracy and a 25.4% reduction in forgetting [8]. These results underscore Kaizen's effectiveness in maintaining high performance not only after the final task but throughout the entire continual learning process, which is critical for real-world deployments where models must remain robust and adaptive as new data arrives incrementally [8].

The practical implications of Kaizen's design and evaluation are significant for domains where data privacy, storage limitations, and the need for rapid adaptation are paramount. By enabling continual learning from both unlabelled and labelled data without the need for centralized retraining, Kaizen supports deployment in environments such as mobile devices, edge computing, and privacy-sensitive applications. The architecture's flexibility in handling different types of data and its robust performance across the continual learning timeline make it a compelling case study for the application of Kaizen principles in modern machine learning systems, demonstrating how continuous improvement methodologies can be effectively translated into the design of adaptive, real-world AI solutions [8].

In Ukraine the ideas of the Kaizen philosophy have also penetrated some enterprise. The diffusion of Kaizen in Ukraine is supported by professional associations, consulting organizations, and training initiatives focused on Lean and continuous improvement. Kaizen clubs, conferences, and workshops facilitate knowledge exchange among managers and practitioners. Such institutional support is widely recognized in the literature as a key factor for the sustainable adoption of Kaizen practices [9].

The elements of Kaizen and Lean management have been introduced in *Ukrzaliznytsia*, particularly in maintenance and repair operations. With support from international development organizations and Lean Institute Ukraine, employees participated in Kaizen training programs that combined classroom instruction with on-site improvement activities. Similar initiatives align with international evidence showing that Kaizen events can generate rapid improvements in operational performance when applied in infrastructure and public-sector organizations.

In the manufacturing sector, *Weidmann-MPF PJSC* has adopted Kaizen as part of



a broader lean manufacturing strategy. The company emphasizes employee involvement in quality improvement and process optimization, reflecting Kaizen's core principle of participatory problem solving. Research indicates that such approaches enhance production stability and quality consistency, particularly in industrial environments [5].

The Ukrainian representative office of *Toyota* operates in accordance with the Kaizen philosophy as an integral component of the Toyota Production System. This case illustrates the transfer of Japanese management practices to the Ukrainian context and confirms earlier findings that Kaizen principles are adaptable across national and cultural boundaries [4].

Ukrainian companies applying Kaizen commonly use Lean tools such as 5S workplace organization, the PDCA (Plan–Do–Check–Act) cycle, Kanban, and visual management systems. Kaizen events — short, focused improvement workshops—are frequently employed to address specific operational issues and deliver measurable results within a limited timeframe. Empirical studies confirm that these tools are effective in promoting process transparency and continuous improvement [2].

The implementation of Kaizen in Ukrainian companies contributes to the development of a culture of continuous improvement, increased operational efficiency, and enhanced employee engagement. Importantly, Kaizen allows organizations to achieve performance gains without substantial capital investment, which is particularly relevant for companies operating in transitional and resource-constrained economies [5].

The future of Kaizen methodology is increasingly intertwined with the adoption of advanced technologies, particularly in the realms of forecasting and anomaly detection. As large language models (LLMs) continue to evolve, their integration into continuous improvement processes is expected to drive significant innovation [7]. The convergence of technological advancements and research breakthroughs is anticipated to enhance the accuracy, adaptability, and insightfulness of Kaizen initiatives. By leveraging the predictive and analytical capabilities of LLMs, organizations can identify inefficiencies and improvement opportunities with greater precision, thereby



accelerating the cycle of continuous improvement [7]. This technological synergy is likely to facilitate more data-driven decision-making within Kaizen frameworks, enabling real-time monitoring and rapid response to emerging issues [7].

Another prominent trend shaping the future of Kaizen methodology is the increasing emphasis on interdisciplinary collaboration [7]. The integration of expertise from fields such as artificial intelligence, data science, and operations management is expected to foster novel approaches to continuous improvement. Such collaboration can lead to the development of hybrid methodologies that combine the strengths of traditional Kaizen principles with cutting-edge analytical tools [7]. This evolution is poised to expand the applicability of Kaizen beyond its conventional domains, making it relevant to a broader range of industries and organizational contexts. The ongoing dialogue between technological innovation and process improvement philosophies will likely result in more robust, adaptable, and scalable Kaizen practices, ensuring their continued relevance in an era of rapid change [7].

In **conclusion** we can state that the comprehensive analysis of Kaizen presented in this paper underscores its enduring significance as a methodology for continuous improvement across diverse organizational contexts. Tracing its historical development, Kaizen emerges as a concept rooted in incremental, iterative change, evolving through systematic integration into organizational processes. Its core principles — continuous improvement, iterative feedback, and transparent communication — form the philosophical backbone that drives both individual and collective advancement.

The deployment of key tools and techniques, such as iterative model refinement, error reduction, and uncertainty quantification, demonstrates Kaizen's adaptability to complex, dynamic environments. Implementation strategies emphasize the necessity of embedding improvement cycles and cultivating a culture of learning and feedback, which are critical for sustaining long-term progress.

Looking forward, the integration of advanced technologies and interdisciplinary collaboration signals a promising trajectory for Kaizen's methodological evolution. These innovations are poised to amplify its impact, enabling more sophisticated, data-



driven approaches to continuous improvement. In sum, Kaizen remains a foundational paradigm for organizations seeking sustained excellence through systematic, incremental change.

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