

Original Paper

Improving Economic Efficiency and Occupational Safety in Production Facilities Using the 5S-Kaizen Method

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Received: October 29, 2023 Accepted: January 23, 2024 Online Published: February 17, 2024

doi:10.22158/se.v9n1p44

URL: <http://dx.doi.org/10.22158/se.v9n1p44>

Abstract

This manuscript explores the integration of the 5S-Kaizen method as a strategic approach to improve economic efficiency and occupational safety in production facilities. Economic efficiency in manufacturing involves optimizing resources, enhancing productivity, and managing costs, while occupational safety is vital for employee well-being and sustainable business growth. In Vietnam, where companies face challenges related to high production costs and unsafe working environments, the 5S-Kaizen method is implemented to eliminate waste, reduce costs, and create safer workplaces. This method promotes process enhancements, system improvements, and workplace layout modifications, resulting in cost savings, improved labor efficiency, and reduced occupational accidents and illnesses. The manuscript details the 5S methodology, Kaizen principles, their advantages and disadvantages, and the benefits of combining them. It emphasizes the need for leadership support, employee involvement, and continuous improvement for successful implementation. Ultimately, the integration of 5S and Kaizen fosters a culture of continuous improvement and sustainability, positively impacting economic efficiency and occupational safety.

Keywords

5S-Kaizen method, economic efficiency, occupational safety, manufacturing facilities, waste reduction

1. Introduction

In a manufacturing facility, optimizing economic efficiency involves efficiently utilizing resources to meet economic objectives. This encompasses various aspects such as enhancing production, increasing labor productivity, efficient financial management, and optimizing business processes. Workplace safety is a critical factor in ensuring the well-being of the workforce. When employees operate in a safe environment, they can be more focused and productive. Prioritizing the welfare of individuals is a

fundamental component of the process of improving an organization's economic efficiency and sustainability. Workplace safety is an integral part of a company's sustainable development in today's competitive landscape. A product that combines good quality, cost-effectiveness, timely delivery, and safe working conditions for employees is more likely to lead to business success.

In Vietnam, companies often face challenges in remaining competitive due to high production costs, subpar product quality, unsafe working environments, and the associated risks of occupational accidents and illnesses, resulting in products that do not meet market demands. One of the root causes of these challenges is inadequate management, which leads to wastage of human resources, equipment, materials, and inefficient work processes. Consequently, finding solutions to address these issues is imperative. The implementation of the 5S-Kaizen method offers a strategic approach to eliminate waste, reduce costs, and concurrently create a safer working environment, preventing occupational accidents and illnesses, and supporting continuous business growth. The 5S-Kaizen method facilitates improvements in the production environment, cost savings, and labor efficiency through process enhancements, system improvements, and modifications to workplace layouts, thereby creating a safer environment and minimizing accidents and occupational illnesses. This, in turn, reduces waste, minimizes disposal, saves time, enhances product quality, and ultimately results in reduced per-unit production costs, safer workers, and better health conditions. Adopting the 5S-Kaizen method empowers businesses to enhance production management, mitigate environmental issues, improve productivity, and prioritize safety and health for workers by eliminating production inefficiencies, streamlining activities, and continuously enhancing working conditions in terms of condition, quality, and safety.

2. What Is 5S?

In today's fast-paced business environment, the pursuit of customer satisfaction through product quality and service excellence is paramount. Concurrently, the need to continually boost production output remains crucial. Globally, 5S is recognized as a powerful methodology for companies to enhance cleanliness, promote environmental sustainability, and establish a safe and organized workplace. In business contexts, the 5S methodology is often integrated with other improvement tools, such as Kaizen continuous improvement techniques and visual management practices. The adoption of 5S is also regarded as the initial step in implementing broader systems and methodologies, including Total Quality Management (TQM), Total Productive Maintenance (TPM), and Lean Manufacturing. Therefore, 5S stands as a highly effective tool for companies aiming to eliminate waste, elevate product quality, and enhance productivity. The benefits of implementing 5S are substantiated by numerous global research studies.

The practice of 5S has evolved into a supporting activity and, in some instances, serves as the foundational cornerstone for implementing other lean methodologies such as TPM, TQM, JIT, TPS, and ISO standards (Teeravarapug et al., 2011; Chen & Tan, 2013; Kushwaha, 2015).

The 5S methodology is a systematic approach to improving performance and quality in the workplace environment. Originating in Japan in the early 1980s, 5S gained worldwide acceptance and adoption in countries like Singapore, China, Poland, and more from 1986 onwards. In 1993, 5S was introduced to Vietnam as Japan expanded its investments in the country. The primary objective of the 5S methodology is to eliminate unnecessary items, creating a larger, cleaner, and safer workspace while rationalizing work processes. This leads to time and effort savings for employees, enhanced work efficiency, reduced errors, and continuous improvements in both work and product quality. Additionally, 5S cultivates employee awareness, responsibility, and ethics, fosters mutual understanding among team members, and strengthens teamwork. Ultimately, it instills a habit of practicing 5S as an integral part of daily work routines.

5S has evolved into an effective management methodology widely applied on a global scale. The term “5S” originates from five Japanese words, all commencing with the letter “S”: Seiri, Seiton, Seiso, Seiketsu, and Shitsuke. These letters represent the following five Japanese words:

Seiri (Sort): Eliminate unnecessary items from the workplace by categorizing and retaining only essential items, tools, and documents.

Seiton (Set in Order): Organize the remaining items logically, ensuring that everything is easily accessible and in a usable position.

Seiso (Shine): Maintain cleanliness and conduct regular cleaning activities to ensure a safe and efficient work environment.

Seiketsu (Standardize): Establish procedures and work standards, and train employees to adhere to these standards to ensure consistency and effectiveness in work.

Shitsuke (Sustain): Foster adherence to and maintenance of established standards, continuously monitoring and improving the 5S system to uphold and enhance quality and performance.

The ultimate objective of 5S is to create a clean, organized, and efficient working environment. It not only improves performance and quality but also fosters a positive and innovative work culture within the organization. 5S is applicable across various domains, spanning manufacturing, services, and office management.

5S addresses psychological factors, enhances working conditions and team dynamics, improves the work environment, and reduces waste. 5S is a simple, easy-to-understand, and cost-effective improvement methodology that effectively mobilizes human resources, enhances productivity, quality, efficiency, and waste reduction.

To achieve the effectiveness of the 5S program, several key considerations must be kept in mind:

Adequate preparation is essential to ensure a thorough and successful implementation of 5S.

Financial investment is required, and businesses should allocate the necessary budget for the ongoing implementation and maintenance of 5S.

5S cannot be carried out by a single individual or a small group within the organization; it demands coordination, cooperation, synchronization, and continuous involvement.

Clear and transparent evaluation and measurement of the level of 5S implementation are critical to the program's success.

Regular vigilance is necessary, with managers promptly addressing violations while also providing appropriate encouragement, motivation, and rewards.

Leading by example is crucial, especially for senior leadership, in the successful implementation of 5S. Leadership support and understanding are prerequisites for implementing 5S effectively, necessitating leaders to form working groups and provide guidance.

The implementation of 5S should commence with training and education, ensuring that everyone comprehends the significance of 5S activities and possesses practical implementation skills. When awareness and tools are available, individuals are more likely to voluntarily participate and take initiative in 5S activities.

Creating an enabling environment that encourages participation from everyone is the key to success in implementing 5S.

The 5S program should be repeated continuously with higher standards to ensure the maintenance and enhancement of management activities.

Steps to Implement 5S:

Step 1: Preparation

Ensure that the leadership team comprehends the principles and benefits of 5S.

Research and gather experiences related to 5S activities.

Make a commitment to implementing the 5S program.

Establish a dedicated steering committee responsible for 5S implementation.

Assign individuals within the organization responsible for 5S activities.

Provide training to those responsible and instructional members.

Step 2: Official Leadership Announcement

Officially announce the initiation of the 5S program.

Present the program's objectives to all members of the organization.

Announce the formation of the steering committee, the deployment strategy, and specific responsibilities assigned to each area.

Create promotional materials such as banners, posters, newsletters, etc.

Conduct training on the fundamental principles of 5S for all employees.

Step 3: All Employees Perform Total Cleanup

Organize a "total cleanup day" immediately following the leadership announcement.

Divide the area and assign teams with designated responsibilities.

Ensure all necessary tools and equipment are readily available.

Execute the total cleanup day, emphasizing its significance as the commencement of the 5S implementation.

Issue cleanup instructions throughout the unit, encouraging lively, enthusiastic, and motivating

participation from all staff, including top leadership.

Capture photographs of everyone working on the first day for subsequent lessons.

Step 4: Implementation of Screening

Define criteria within each department to determine which items/documents/records should be removed.

After the initial screening, categorize items as follows:

Retain items/documents used regularly for convenience and accessibility.

Store infrequently used items/documents in appropriate locations with proper labeling for easy retrieval.

Set aside and categorize unnecessary items for disposal.

Step 5: Implementation of Arrangement

Apply workplace layout principles to harmonize the arrangement of objects, machinery, equipment, and documents for easy access.

Prioritize and label objects, and if necessary, assign numbers for identification.

Ensure that the arrangement is comprehensible to all employees, not just managers.

Step 6: Implementation of Cleanliness

Maintain cleanliness through both the total cleanup day and daily cleaning routines.

Conduct regular checks to ensure workstations, machinery, and floors remain clean and free from dust and dirt.

Encourage 5 to 10 minutes of cleaning before and after work hours to cultivate a clean habit during work.

Emphasize maintaining cleanliness while working to prevent procrastination.

Step 7: Implementation of Care

Carry out the Seiri - Seiton - Seiso activities correctly to maintain cleanliness and tidiness.

To sustain and enhance 5S, implement effective measures such as:

Standardizing 5S implementation within the organization to maintain discipline.

Conducting 5S evaluation activities.

Fostering competition among departments/sections.

Step 8: Implementation of Readiness

Achieve Shitsuke - Readiness by autonomously implementing the above steps and instilling habits and culture throughout the organization.

Set an example and lead 5S implementation for managers of each department or section.

Encourage all employees to adhere to common regulations, act autonomously, and treat the workplace as a shared home.

Cultivate a sense of autonomy over time with effort from all members of the organization.

Step 9: Conduct Inspection and Scoring

Conduct simultaneous monthly inspections of the workplace by the 5S Committee.

Record identified issues and consolidate feedback.
Score and assess the strengths and weaknesses of each department.
Identify areas requiring improvement for the following month.
Take photographs before and after improvements for comparison.
Consider surprise inspections for greater honesty.
Conduct inspections during working hours for practicality and immediate feedback.
Compile scores and announce results regularly.
Recognize excellent units as role models and award them with trophies and honors.
Rotate the 5S trophy among the best units to foster competition.
Reward the best unit of the year and acknowledge individual contributions within that unit.
5S serves as the foundational basis for implementing quality assurance systems, recognizing that a healthy, clean, spacious, and convenient environment enhances labor productivity and facilitates the effective implementation of a quality management system. The 5S method originated in Japan and is celebrated for its global adoption.

Step 10: Recognition and Rewards

On a monthly basis, acknowledge and reward the most outstanding units by presenting certificates of recognition and trophies to the entire organization. The 5S trophy should rotate among the top-performing units to stimulate healthy competition among them.

At the end of the year, honor the most exceptional unit of the year with gifts and commend the contributions of each individual within that unit.

5S serves as the foundational cornerstone for implementing quality assurance systems, underpinned by the belief that operating within a healthy, clean, spacious, and convenient environment boosts morale, elevates labor productivity, and creates the conditions for the effective implementation of a quality management system. The 5S methodology originated in Japan, and the Japanese take pride in its widespread adoption worldwide.

3. Kaizen Method

Kaizen is a concept and management approach centered around continuous improvement. The term “Kaizen” originates from Japanese, combining “Kai” meaning “change” and “Zen” meaning “better.” Therefore, Kaizen signifies “change for the better” or “continuous improvement.” Kaizen is not merely a specific method; it is a management philosophy rooted in fundamental values of enhancement and ongoing development. Specifically, Kaizen focuses on promoting improvement and optimizing performance over the long term. Here are some key characteristics of Kaizen:

Flexibility and Employee Involvement: Kaizen emphasizes the creation of a flexible work environment where individuals can propose and implement small improvements without waiting for extensive projects or higher management intervention. The philosophy places a strong emphasis on cultivating commitment from everyone in the organization. Employees are encouraged to contribute

ideas and actively participate in the improvement process. This not only fosters a positive work culture where individuals feel valued and engaged in continuous improvement but also promotes consensus and collaboration.

Continuous Improvement: Kaizen recognizes that improvement is an ongoing process. Continuous development is the key to sustaining and enhancing performance over the long haul. Kaizen is not confined to a particular part of the organization; it can be applied at all levels and in various fields, from manufacturing to services and office management.

Training and Support: Within the Kaizen philosophy, training and support play a crucial role in creating self-awareness and autonomy. This enables the organization to self-regulate and self-evaluate processes and activities.

Optimizing Performance and Quality: Kaizen focuses on optimizing performance and quality through the continuous improvement of processes and work methods. It’s not just a collection of tools but a comprehensive approach and management philosophy that many organizations use to foster a positive work environment and facilitate continuous improvement.

Small Incremental Improvements: A hallmark of Kaizen is the belief that “small incremental improvements lead to significant results.” Large outcomes are the cumulative result of small changes and ongoing improvements. Therefore, Kaizen requires the participation of everyone with the mindset that “everything can be improved.”

Initially, Kaizen was primarily applied in Japanese manufacturing companies like Toyota, Suzuki, Canon, Honda, and more. However, Kaizen has gradually gained widespread adoption in various industries and countries worldwide, including Vietnam. The improvement process in Kaizen often begins with small-scale ideas but yields impressive results over an extended period. This concept stands in contrast to the innovation approach commonly embraced by Western businesses, which often prioritize large changes and immediate breakthroughs.

Content	Kaizen	Innovation Programs
Scope of Change	Focused on incremental improvements.	Aim for significant, transformative changes.
Time	Emphasizes short-term, ongoing improvements.	Span long periods, intermittently.
Effective	Gradual change, less impression.	Strive for breakthrough change, strong impression.
People	Involves everyone in the organization.	Engage a select group of individuals.
Approach	Leverages collective efforts.	Concentrate on the efforts of a chosen few.

Process	Often involves team sessions, root cause analysis, and immediate measures.	include detailed analysis, project planning, implementation, and result evaluation stages.
Mindset and Culture	Cultivates employee responsibility, continuous learning, adaptability, and a preference for small, sustainable changes over time.	May require a risk-tolerant, entrepreneurial mindset, with an emphasis on fostering a culture of creativity, experimentation, and embracing uncertainty.

Applying Kaizen to a business yields both tangible and intangible benefits. Kaizen accumulates incremental improvements over time, resulting in significant and substantial outcomes. It effectively reduces waste and enhances productivity in production and business operations by reducing inventory, substandard quality products, waiting and transportation times, while also improving employee skills.

Kaizen fosters a culture of motivation within the organization, encouraging individuals to generate effective improvement ideas. It promotes a sense of teamwork and strengthens internal bonds, contributing to a corporate culture centered on thriftiness and efficiency in every aspect.

The process of implementing Kaizen in production doesn't necessitate abrupt, major changes. Instead, it focuses on accumulating small improvements to achieve substantial results. It involves a thorough examination of issues at their root causes to prevent recurring errors.

To successfully implement continuous improvement through Kaizen, businesses should adhere to fundamental principles ensuring success and sustainability during implementation. Here are some basic principles of Kaizen:

- + Improvement Mindset: All employees must cultivate a mindset of continuous improvement, fostering creativity and idea generation throughout the organization.
- + Everyone's Involvement: Kaizen is not the responsibility of a select few; it requires participation from everyone in the organization, from top management to frontline employees.
- + Implement Improvement now: Improvement ideas should be implemented promptly, without unnecessary delays, to optimize performance.
- + Root Cause Analysis: Kaizen delves deeper by analyzing and addressing the root causes of problems, preventing their recurrence.
- + Customer Satisfaction: Kaizen prioritizes customer satisfaction, with all improvement efforts aimed at delivering the best value and quality.
- + Enhance Performance and Quality: The primary goal of Kaizen is to optimize performance and quality, not just reduce waste, by enhancing the value of products and services.
- + Automation: Kaizen promotes automation to eliminate unnecessary steps and enhance efficiency in

the production process.

- + Standardization: Ensure that improvement measures are standardized to maintain consistency and effectiveness in the work process.
- + Continuous Training: Provide ongoing training to enhance employee skills and knowledge, enabling them to better understand and improve the work process.
- + Foster Consensus: Build consensus and collaboration within the organization, ensuring collective efforts toward continuous improvement.

By implementing these core principles, businesses can harness the power of Kaizen to optimize their production processes and provide the best value to customers.

To successfully apply Kaizen, businesses must comprehend its philosophy and adhere to its requirements. It's essential to start with specific areas where Kaizen can be most effective and gradually expand to other areas as its positive impact becomes evident.

Kaizen operates through gradual, small-scale improvements over an extended period. Japanese companies often focus on implementing Kaizen or employee participation programs because they are managerially controllable and less costly than making significant investments. Kaizen enhances work quality, recognizes managerial involvement, improves product and service quality, and reduces operating costs.

In contrast, Western managers often prioritize innovation, which involves breakthroughs in technology or new production techniques with immediate, groundbreaking impacts. While innovation is a sudden phenomenon, Kaizen is gradual and subtle, with results not immediately visible. Kaizen represents a continuous process, while innovation tends to be a more sporadic occurrence.

4. Advantages of Kaizen in Business

Kaizen emphasizes gradual improvements, offering a more gentle approach to change, reducing resistance and pushback often associated with significant changes. Kaizen promotes a meticulous examination of processes, resulting in error and waste reduction. By implementing Kaizen, companies experience fewer errors, leading to a reduced need for constant monitoring and checking. Employee morale is bolstered as Kaizen fosters a sense of value and purpose among employees. Kaizen extends the organization's customer focus, heightening employee awareness of customer requirements. Kaizen establishes systems that encourage both short-term and long-term improvements.

5. Disadvantages of Kaizen

Companies with closed cultures and communication patterns may need to undergo cultural changes to create an environment receptive to Kaizen. Short-term Kaizen implementations can generate initial excitement that fades over time, making long-term sustainability a challenge.

- **The Benefits of the 5S-Kaizen Method in Improving Economic Efficiency and Occupational Safety in Manufacturing Facilities.**

While the 5S method is a valuable organizational and management approach, it may encounter some limitations when not combined with the philosophy of Kaizen (continuous improvement):

- + **Stillness and Lack of Innovation:** 5S primarily focuses on creating a clean, organized, and safe working environment. Without continuous improvement methods like Kaizen, organizations can become stagnant and lack innovation.
- + **Not Focused on Performance and Quality:** While 5S helps enhance organization and cleanliness, it does not strongly emphasize improving performance and quality. Without Kaizen, organizations may miss opportunities to optimize production processes and enhance product quality.
- + **Risks of Non-Continuous Maintenance:** If the focus is solely on 5S without mechanisms for updating and continuous maintenance like Kaizen, organizations can easily fall into a state of complacency and forget to maintain standards and practices.
- + **Lack of Active Employee Participation:** 5S can become a top-down process without active employee involvement. Kaizen typically encourages the active participation and input of all individuals within the organization.
- + **Lack of Flexibility in Thinking:** 5S can overly focus on maintenance and preservation, which may reduce flexibility in the thinking and behavior of employees if not combined with Kaizen.
- + **Lack of Short-Term and Long-Term Reflection:** 5S often concentrates on addressing short-term issues. Without Kaizen, organizations may miss the opportunity to effectively address long-term issues.

However, implementing Kaizen without 5S can also lead to some challenges and difficulties:

Lack of Basic Organizational Structure: 5S provides a basic organizational structure through sorting, setting in order, and cleanliness. Without 5S, the work environment can become disorganized, messy, and lacking in structure, which can reduce efficiency and create chaos.

Difficulty in Quality and Performance Management: 5S often helps establish work standards and processes, aiding in quality and performance control. Without 5S, managing quality and performance can become challenging and inconsistent.

Neglect of Continuous Maintenance: 5S is not only about implementation but also about continuous maintenance and improvement. Without 5S, organizations may struggle to maintain the necessary standards and practices for a healthy work environment.

Reduced Employee Self-Discipline and Automation: 5S often encourages self-discipline and automation in maintaining processes. Without 5S, there may be a lack of self-discipline and automation, leading to the reappearance of issues.

Limited Active Employee Involvement: 5S often creates conditions for active employee participation in continuous improvement. Without 5S, it may be challenging to promote active participation and input from everyone in the organization.

To maximize the benefits of 5S, combining it with Kaizen is crucial to ensure continuous improvement and sustainability within the organization.

Combining 5S with Kaizen results in higher efficiency and creates conditions for employees to perform their jobs better. This combination enhances the working environment, fosters employee engagement, improves productivity, enhances product quality, and ultimately transforms the organizational culture to one of continuous improvement and sustainability.

The integration of 5S and Kaizen is not just about changing processes but also about changing the mindset and actions of every member in the business. It creates a positive, creative, and motivating work environment, contributing to the sustainable development of the organization.

Key factors for the successful implementation of 5S include leadership commitment and support, training and education, voluntary participation of everyone, and the continuous repetition of the 5S cycle with higher standards.

In conclusion, the relationship between economic efficiency and occupational safety is mutually reinforcing, and the 5S-Kaizen method plays a significant role in achieving both. A safe working environment not only protects the health and lives of workers but also brings economic benefits to the business. “5S Kaizen” is a management and process improvement method applied in many businesses to enhance management efficiency and productivity.

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