

THE POSSIBILITY OF USING KAIZEN METHOD (CONTINUOUS IMPROVEMENT) TO IMPROVE QUALITY AND REDUCE COSTS: AN APPLICATION RESEARCH ON KUFA CEMENT FACTORY

Suhail AL Tamimi¹, Fayhaa A. Mahmood², Majid Ahmed AL Anssari³

¹Department of Accounting, College of Administration and Economics, University of Basra, Basrah, Iraq.
Email: suh2001971@yahoo.com

²Department of Accounting, College of Administration and Economics, University of Basra, Basrah, Iraq.
Email: fstmmzi6@gmail.com

³Accounting Department, Shatt Al-Arab University College, Basrah, Iraq. Email: majidalanssari59@gmail.com

ABSTRACT: Along with an increase in the competitiveness of market-operating businesses, the global cement industry is experiencing a rise in competition. Therefore, businesses operating in this industry must concentrate on enhancing the quality and reducing costs. Thus, this study's application of the kaizen method in the context of Kufa will enhance employee performance and product quality, thereby contributing to Kufa's market competitiveness. This method also plays a crucial role in determining product demand. This study used 2015 data for content analysis to evaluate the function of the Kufa cement industry in cost reduction and quality improvement. The findings indicate that the kaizen method enhances product quality and decreases costs. Therefore, organizations should prioritize employee training so that employees can concentrate on continuous improvement. Academicians will find these findings useful for future publications and designing training sessions for cement industry decision-makers to enhance quality.

Keywords: Kaizen method, Cost reduction, quality improvement, 5s, Cement Industry

1. Introduction

The current business environment is highly volatile and dynamic. Several quality standards have been established for the competition and consumers. These requirements must be fulfilled to remain competitive in the market. Therefore, customers are more potent today than ever (Pascucci, Savelli, & Gistri, 2023). Due to digitalization, they have easy access to various services and products from which to choose the best option. To satisfy consumers, organizations need to prioritize quality and maintain it consistently. Thus, the organizations' decision-makers must focus on the quality of the products and the processes used to maintain quality (Gera et al., 2017).

On the other hand, businesses must prioritize improving quality over time. This enhancement should occur regularly. A company can use various tools for the continuous development of its products and services (Prashar & Antony, 2018). The Kaizen concept is one of the methods discussed in the literature regarding continuous improvement. This concept was first introduced approximately thirty years ago. This strategy applies to all organizations, including multinational corporations and small businesses. This strategy is being employed by various organizations, including the Cement industry and geographically diverse organizations. The central tenet of this strategy is that reliable operations (Roy, Kumar, & Satpathy, 2021) and impede quick operations must be eliminated.

In recent years, technological advancements and automation have directly impacted the intensification of market competition, necessitating that industrial

facilities offer low-cost, high-quality products to acquire the most significant number of consumers (Sichinsambwe et al., 2023). According to Saleem (2015), using a method of continuous improvement (kaizen) in the cement factory reduces product costs, improves employee performance, and enhances the production of high-quality goods, enhancing the company's market competitiveness.

Kaizen has its origins in Japanese quality circles following World War II. These circles or groups of Toyota employees focused on preventing defects. Kaizen is the key to organizational success (Carnerud, Jaca, & Bäckström, 2018). The kaizen style's origins can be traced back to the Japanese, where developments of this philosophy emerged as a result of the Japanese's belief that they were always superior to others in the global markets (Otsuka & Ben-Mazwi, 2022), which seeks to create opportunities and methods to carry out their daily work, thereby improving how it is preferable to work day after day. Kaizen relies on a culture that encourages the submission of individual proposals by employees to enhance their operations. The most successful organizations provide an environment that encourages employees to submit their proposals. Alvarado-Ramírez et al. (2018) note that the United States has utilized the Kaizen technique extensively over time, whose primary objective is to reduce costs and provide additional time to increase revenues.

The positive impact of the Kaizen method on the continuous enhancement of performance and quality is immediate. It also plays a crucial role in

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achieving positive management and employee actions and transformations. Continuous enhancement is essential for all organizations, including multinational corporations and startups. Using this method in their operations, firms and other small organizations can function effectively (Soltani & Amanat, 2019). According to Arya and Choudhary (2015), large organizations can gain a competitive advantage by employing this method. Organizations that are successful in their operations continually enhance their current status and consistently focus on enhancing their performance. They prioritize continuous improvement because they recognize its significance in the business context. Even when things are going well for their organizations, successful decision-makers in all types of organizations constantly seek to enhance their operations. These organizations constantly strive to enhance their performance, prioritizing development. Such organizations constantly seek to improve profitability by performing intelligently and effectively (Flug et al., 2022). The most successful organizations perpetually pursue innovation and development to provide superior customer service.

Important to agile and lean practices is the notion of continuous improvement. Kumar, Dhingra, and Singh (2018b) have covered seven lean development principles. Regarding agile practices, feedback channels among the respondent are the primary focus. They rely on the Kaizen method of continuous improvement to accomplish their objectives by minimizing costs through its implementation.

This research aims to investigate and implement the Kaizen method in the Kufa Cement factory as one of the instruments for continuous improvement and its relationship to cost reduction. Kufa Cement was selected as the manufacture of cement factory in Najaf province to test the hypothesis that the research for several reasons, including the longer Kufa Cement factory of essential and large factories in Iraq in terms of production capacity, the space and the number of employees and the cement factory is the first factory in the Middle East that produces cement in a wet manner; The fact that it is the only lab in Iraq and the Middle East that produces or analyzes wet cement; The fact that it is the

2. Literature Review

Continuous improvement refers to the enterprise-wide endeavor to enhance an organization's operations. Organizational decision-makers can also utilize

this method to enhance and develop their teams. Studies by Eaidgah et al. (2016) state that continuous improvement lacks a theoretical foundation. Therefore, general terms of total quality management are employed to implement TQM in various industries. On the other hand, few researchers have defined continuous improvement in culture as the regular improvement of various proportions that can be implemented in diverse organizations. In addition, researchers have defined continuous improvement as a regular and systematic effort to implement and seek new procedures to achieve continuous and active process improvement. Researchers also asserted that continuous improvement is an organization's active capability. Consequently, they defined it as "a learned and stable pattern of collective activity through which the organization systematically generates and modifies operating routines in the pursuit of enhanced effectiveness" (Carnerud et al., 2018)

Continuous improvement requires a progressive organizational culture shift to sustain long-term improvement efforts (Lee, Shiue, & Chen, 2016). Management is responsible for encouraging the adoption process and culture change. This requires administrative conduct: 1. Develop a strategic vision and tactical structure with the assistance of support personnel, 2. The development of organizational patterns that foster trust and cooperation; 3. The maintenance of the objective, especially during difficult times; 4. Decisions that are consistent with the stated philosophy of decision-making; 5. The creation of an incentive system that promotes cooperation. 6. adopted a balanced long-term and short-term perspective, 7. Establish a continuous training program; 8. Recognize accomplishments in a manner that strengthens collective and individual efforts (Maarof & Mahmud, 2016). In particular, the role of senior management is crucial to success. Regardless of the desires and efforts of employees, these efforts of continuous development cannot be encouraged without leadership in their accomplishment (Yurkofsky et al., 2020).

Properties of continuous improvement

Continuous improvement is a formation or combination of integrated management thought, work systems, and decision-making instruments. Alvarado-Ramírez et al. (2018) state that the philosophy of continuous improvement is based on the need to satisfy the requirements and desires of these customers. It focuses on improving operations and the lack of attention to results through a review of these

processes and the development and enhancement, enabling the best results. Continuous improvement encompasses every aspect of an organization's operations. Continuous improvement is the responsibility of employees and management as a whole and is, therefore, the responsibility of every individual in the organization; it is not the responsibility of a specific individual or group at the management level. Implementing improvement, if it is to acknowledge the existence of problems at work, is the most effective method for achieving the desired improvement in this organization (Buer, Fragapane, & Strandhagen, 2018). Continuity, in which you must presume that the management of the organization and its employees will continue to pay attention to the optimization processes required by this organization (Lizarelli et al., 2023).

The concept of Kaizen

The Japanese term Kaizen consists of two sections: kai, which means change, and zen, which means improvement. In addition, it defines "chase and teal." Research for making continuous advancements in machinery, materials, labor, and production methods by encouraging suggestions and ideas from the economic unit or factory's working groups (Macpherson et al., 2015). Khan et al. (2019) define continuous improvement as an event focusing on the organization's direction to some events in which managers and employees have the ability and knowledge of its performance and which result in cost reductions. In addition, define continuous improvement as the gradual improvement through minor rather than large or radical improvements made through innovation or large investments in technology. Improvement activities are the objective and responsibility of all employees, from upper management to front-line employees and their manuals, in every activity and every day, every time, through modest but consistent efforts for each element (Lim, Sabil, & Othman, 2022).

Kaizen is a method for reducing costs through artificiality in the product life cycle using small and continuous manufacturing process improvements instead of large roots and developments generated by the renewal, innovation, and vast investments (Biadacz, 2022). The kaizen approach is a set of procedures centered on manufacturing processes and consisting of small, ongoing incremental steps for continuous improvement. Reducing costs and increasing quality is accomplished through concerted efforts at all levels of management (Paraschivescu & Coțirleț, 2015).

According to the literature reviewed by Rahmanian and Rahmatinejad (2014), key elements of Kaizen methods include the **Review of operations**:-The fundamental unit of analysis for the kaizen method is to evaluate specific processes and operations, such as product processing audits, deletions, and product design process reviews. **People are the source of success**:-The kaizen successful programs rely on the knowledge of people and their looks to the regulations and procedures involved in the ability to identify improvements. In addition, high-level skills and participation of workers and institutions, as well as support for implementing the improvements, are crucial to achieving success. **Permanent need for change**: -Kaizen's success is contingent on the need for change and refusal to accept the status quo. Everyone should avoid self-satisfaction because there is always a need for improvement. Implementing changes is the foundation of this method, and the successful change program must prioritize operations (Jakubiec & Brodnicka, 2016; Rahmanian & Rahmatinejad, 2014).

Japan's entrance, the US entrance for continuous improvement

There are two entrances for continuous improvement: the Japanese entrance is known as the Kaizen method, and the American entrance is known as creativity (Iwao, 2017). **1. Japanese entry**:-The Japanese kaizen method views the optimization process as a series of small, sequential, consecutive, and continuous actions that must be taken gradually (Sugimoto, 2018). The kaizen method, which originates in Japan, seeks to raise performance continuously and without interruption or interruption. The Japanese believe continuous improvement must be accomplished in small, incremental steps; therefore, the kaizen requires that an economic entity continuously strive to provide the best performance across learning, problem-solving, and introducing procedural improvement (georgise & Mindaye, 2020).

USA Entrance: The American entrance for continuous improvement focused on developing new and innovative things to supplant the old ones creatively. These should be produced all at once or in one fell swoop to achieve the utmost level of quality through the use of complex and highly advanced technological methods and the availability of substantial funds (Strazdas & Cernevičute, 2016).

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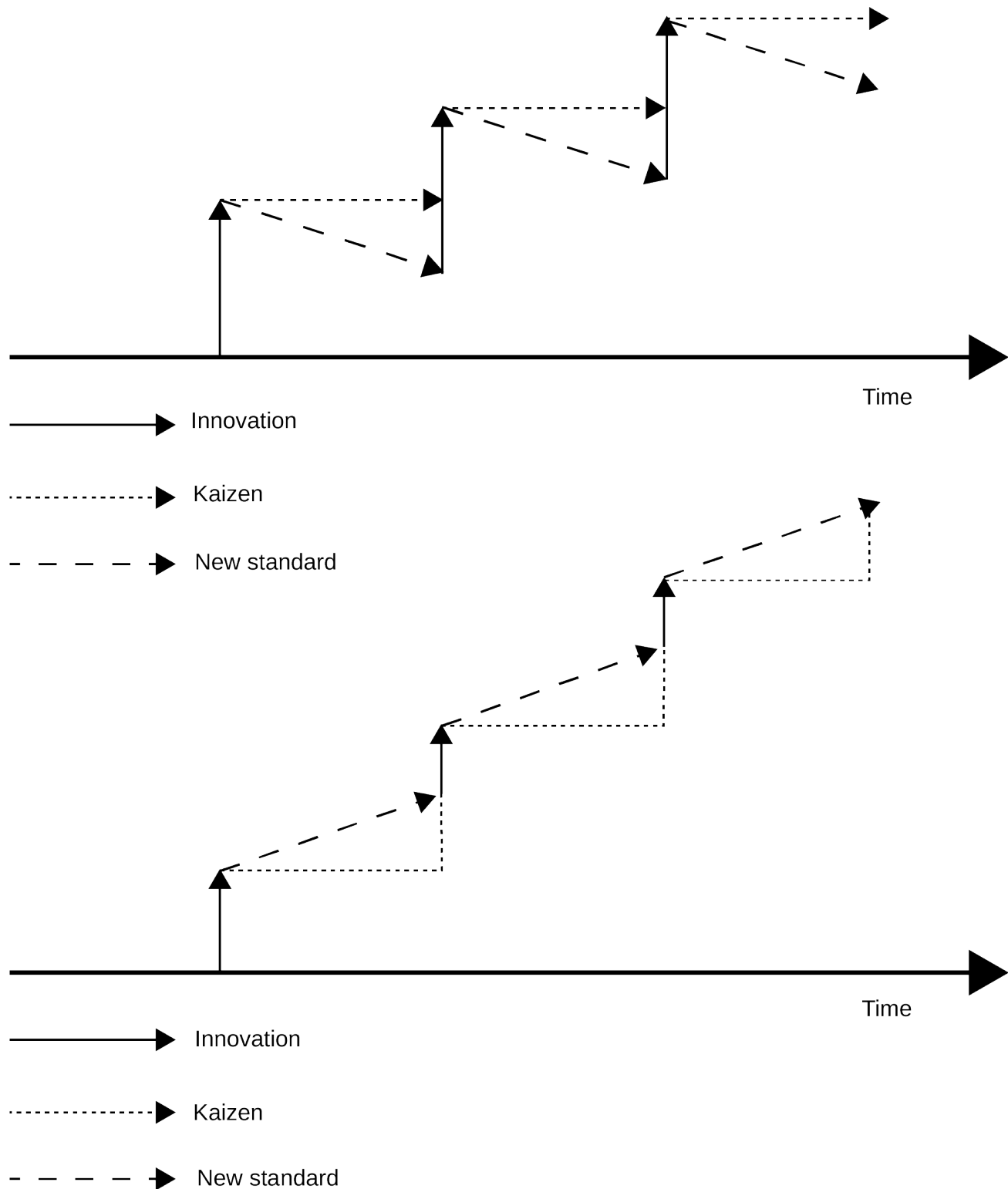


Figure 1: Implementation of innovation without (a) and with (b) Kaizen

The figure reveals that performance declines after a period of time while waiting for a new invention to boost it once more. The numbers reveal a negative performance variance because the improvement began

with radical performance and a significant increase in the interval between performance operations (Alosani & Al-Dhaafri, 2022).

The difference between Japanese entrance and USA entrance

S.	Advantages	Japanese entrance (Kaizen)	USA entrance(innovation)
1.	Affect	Long range but not suddenly	Small range, but suddenly.
2.	Steps	Small steps	Large steps
3.	Time structure	Consecutive & gradually	Intermittent & ungradually
4.	Overall	Every person(employee)	Choose little (distinct)
5.	Changes	Always gradually	Suddenly & volatile
6.	entrance	Collective efforts	Individual ideas, individual efforts
7.	Style	Maintains & improvement	Destroy & build again
8.	The range	As a traditional knowledge & technical case	Improvement in technology, new inventions, new theory.
9.	Operation requirement	Require a little investment	Require a lot of investment
10.	Voltage direction	Employees	Technology
11.	Evaluation criterion	Scientific voltage to get the best result	Result, profit
12.	performance	Better works in a slow-growth economic	Best suitable to a slow-growth economy.

Evaluate the system of kaizen

The activity of the Kaizen system concentrates on the development of small portions of products, which makes cost reduction a top priority, as sectors are divided into teams, and their development is examined every six months. The key to successfully applying kaizen is identifying cost and continuity reduction objectives. Instead of focusing on improvements to the design and development process, Kaizen emphasized minor manufacturing-stage improvements (Alosani & Al-Dhaafri, 2022).

On this basis, the kaizen system can be summed up as the improvement of all things, at all levels, at all times, eternally. Therefore, to initiate continuous development, the same organization should be questioned daily about how to enhance the staff (at all levels), working techniques, methods of work, work procedures, time, equipment, systems, tools, materials, production levels, and inventory (Kumar, Dhingra, & Singh, 2018a).

Elements of continuous improvement and tools

As a result of the fact that continuous development necessitates the commitment to make changes continuously and creatively, one must be committed to continuous change. Kaizen represents five (5 s) Japanese words beginning with the letter s (a shitsuke, seir, seiton, seiso, seikets) that denote daily improvement activities at all levels (the community, the home, standard, training, and discipline) (Albandag & Halis, 2018).

Rizkya, Sari, Syahputri, and Fadhilah's (2021) 5S is a straightforward and effective method for organizing the processes of an organization. It also plays a crucial role in enhancing the organization's visual management and productivity. To ensure safe, repeatable, and efficient

business practices, organizations must implement the 5 S methodology. As stated previously, there are 5 phases of 5 S: Seiri (Classify, clear, and sort), Seiton (Organize, Simplify, and Straighten), Seiso (Check, Clean, Scrub, Shine, and Sweep), Seiketsu (Conformity, Stabilize, and Standardize), and Shtsuke (Standardize, Conformity, and Standardize) (Practice, customer, self-discipline and sustain).

Elements of the Kaizen Method

Five components comprise the Kaizen Method. The first is collaboration. Teamwork requires all employees within an organization to collaborate to achieve a singular objective, including continuously improving the organization's internal processes. Without the assistance of other employees, it is difficult for an individual to accomplish organizational objectives. Personal discipline demonstrates that self-disciplined employees are valuable and essential to the organization (Abuzied, 2022). They make significant amends in the organization's operations. Therefore, employees must develop self-discipline in all organizational processes, including financial resources, material expenditures, performance quality, and time management. The third component of this aspect is boosting employee morale (Gunawan et al., 2022).

Sometimes organizations are successful in instituting process changes and sometimes unsuccessful. Despite all of this, the morale of the organization's employees must remain elevated. In other words, all employees must exert significant effort toward enhancing confidence. Quality circle is an essential component of the Kaizen Method (Gunawan et al., 2022). This improvement is called arranging distinct quality-related circles that include employees at various organizational levels. It

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refers to the group of employees who meet periodically to deliberate and search for solutions to the organization's problems. The organization's employees can contribute their expertise, knowledge, and ideas in these circles. Due to this cooperation and collaboration, the quality circle measures the effectiveness of an organization's performance (Odeleye, 2021).

Consequently, they can also enhance efficacy. The final element of the Kaizen elements is enhancement suggestion. According to Gunawan et al. (2022), to enhance operational processes, all employees must be free to offer suggestions and ideas.

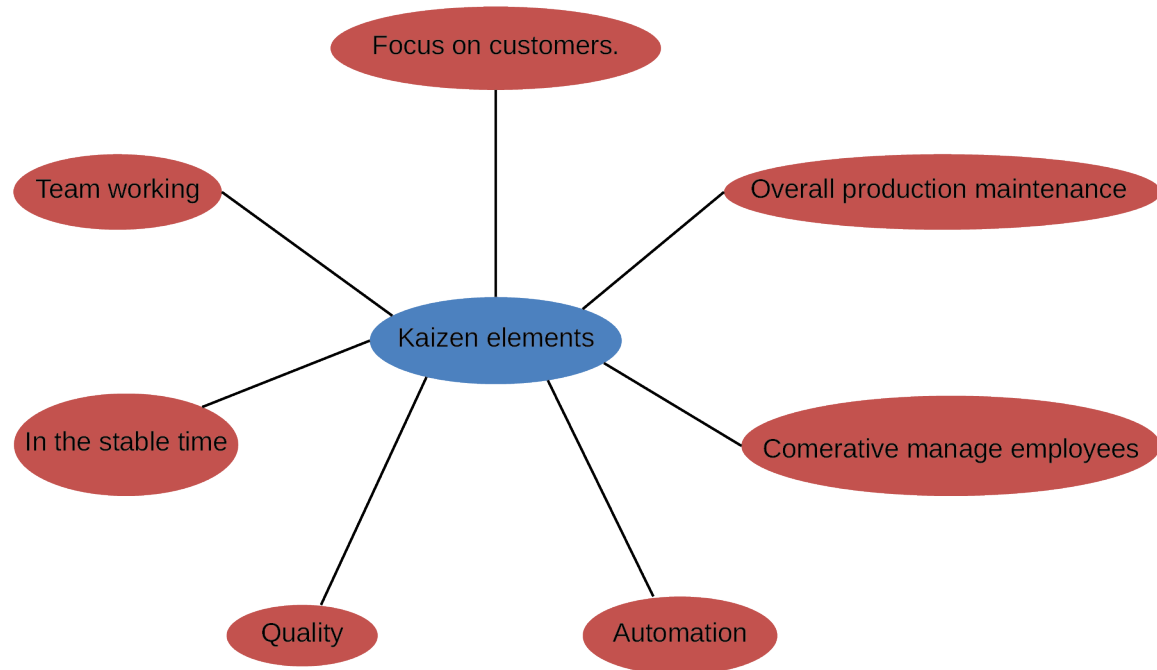


Figure 2: Kaizen Elements

The concept of quality and types of costs
Quality concept

With the growing emphasis on quality and the enormous advancements in the production of products and services, technology continues to be one of the most critical aspects of the business environment regarding quality. There are numerous definitions of quality and multiple entrances through which they are viewed, and many people are interested in them. According to Kaswengi and Lambey-Checchin (2020), quality varies between individuals.

Therefore, quality is the most important factor for surviving the current global environment of rapid change. It becomes crucial due to other factors such as rigorous competition, technological progress, and globalization (Zhang et al., 2022). To develop an organization-wide culture based on quality, the organization must implement a culture related to quality and cultivate a positive attitude among its employees. Various authors have provided varying definitions of

quality. Researchers have defined quality in terms of its technical application as "the ability of a product or service to satisfy the stated requirements" or "a product or service that is devoid of defects" (Brata, Husani, & Ali, 2017). In other terms, quality refers to the composite characteristics of the product by which services and goods must meet the needs and expectations of customers. Quality is the production of defect-free products.

In a social context, quality management is the quality management that occurs organically. This procedure is based on regular development in the operations and management of the organization (Antunes, Quirós, & Justino, 2017). It seeks to achieve excellence in product operations by promptly responding to consumer needs and expectations. Concentrating on quality assurance factors is essential to eliminate product defects and errors. These factors are critical in mitigating any problematic product or service delivery situation. Past

investigations by Brata et al. (2017) have described various quality management approaches to enhance the organization's competitiveness and efficacy.

Concept of Cost

The concept of cost is essential for pricing products and competing with rivals. It also plays a crucial role in providing products or services at competitive prices and expanding the organization's market share. To accomplish progress and success, businesses primarily concentrate on reducing the price of their products. Improving one's market performance is essential for sustaining and increasing profits. It is possible to attain this objective by providing inexpensive services and goods. Cost reduction is, therefore, an essential factor (Antunes et al., 2017). It also plays a crucial function in enhancing the quality of products and services. The concept of cost reduction encompasses the fundamental reduction of marketing and production expenses. The product's cost reduction must be based on reality. It refers to attaining cost savings by eliminating unnecessary operations activities. It also refers to a product without errors and flaws (Kreem, Al-Yasar, & Abdulhussein, 2020).

Concept of quality costs

The concept of quality is of great concern to the organization's constituents, as it plays a crucial role in its continuous improvement. Moreover, quality is a new concept based on a business strategy emphasizing continuous improvement and innovation. It also refers to avoiding financial and human resource waste to satisfy customers. The notion of quality is essential because it is the tangible factor that influences the public's perception of an organization. The product's quality consists of its suitability and appearance, conformity and durability, dependability and superiority, and characteristics and performance.

Type of cost quality

1. Prevention cost is defined as the costs incurred to prevent the production of products that do not meet quality specifications. Quality system costs are defined as the costs of the planning, implementation, and maintenance of quality systems and include salaries and cost development and design of the product and process design and production of equipment and methods of quality control and design of information systems (Velkoska & Tomov, 2022). Quality system costs are the costs incurred by the company as a result of its efforts to implement quality systems (Daunoriene & Katiliute, 2016).

2. Appraisal cost: It is defined as the expenditures to maintain quality based on official product quality assessments (Daunoriene & Katiliute, 2016; Glogovac & Filipovic, 2018). At the same time, studies define it as those expenses incurred when discovering that individual product units are of poor quality. In addition, it refers to the costs associated with measuring, evaluating, or auditing purchased products, components, or materials to determine the degree of compliance with particular standards. Literature defines it as measuring, testing, and analyzing materials, products, and production processes to assure conformance with product quality specifications (Chatzipetrou & Moschidis, 2016)

3. Internal Failure cost: The American Society for Quality (ASQC) defines internal failure as the costs that result from the deviation of production control and the emergence of units that do not conform to planned specifications and quality measurements and necessitate the destruction or remanufacture of lines (Mitra, 2021). These are the costs associated with low-quality produce discovered before shipment to the consumer.

4. Eternal Failure Costs are defined as the facility's external failure costs incurred after selling low-quality products to consumers. Some costs are eliminated without a defective product, while others are incurred when products fail to meet quality standards during shipment to customers (Eraslan & Servet, 2021).

Quality objectives

To obtain a clear vision for all employees of the company or organization, the initial researchers attempted to concentrate on the desired outcomes and pay greater attention to quality. The presence of an environment that is conducive to innovation increases productivity and performance and increases effort, as well as encourages visions nature developmental and renovated to enhance and advance the work procedures (Eraslan & Servet, 2021); Greater job satisfaction among organizations or business members; Reduce the duration and number of steps involved in conducting business; Create and streamline work procedures; Improve the degree of cooperation and integration between the various parts of the organization (senior management-middle management-employees working within the organization) (Seelbach & Brannan, 2022).

Further quality maintenance objectives are Train employees within the organization to function as a team and to reject individualism and isolationism; Reject the message as futile and refined; Raise the level of confidence and scientific

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competence among employees and customers; Reduce the cost of providing the product or service; Achieve the satisfaction and expectations of the beneficiaries of the organization's products or services (customers-vendors-suppliers); Motivate and encourage all employees to participate in the development and improvement of the organization's overall quality programs to motivate and encourage them to engage in open debate regarding the indicators of success and failure; (Kieny et al., 2018).

According to studies, quality enhancement aims to achieve the following objectives: Continuously achieving quality; reducing the cost of service or production; minimizing time wasted on tasks (Seelbach & Brannan, 2022).

Benefits of cost quality

Quality is one of the tools and methods of quality management that can be used to enter the facility and develop the concept of total quality management costs, thereby enhancing quality, recognizing and complying with the increased cost and waste and activities that do not contribute value. As well as, the costs of quality are not a burden, as some belief, but are the result of a positive impact on the quality of production and sales volume, as well as the organization's profitability and competitive advantage, and could be limited to the most significant benefits of defining and measuring quality costs (Farinha, Lourenço, & Caroço, 2016).

Utilizing quality costs as a tool for measuring the effectiveness of the implementation of any quality control program is needed. Utilizing quality costs is a method for identifying future problems and improvement opportunities that permit the evaluation of administration (Sousa & Nunes, 2019). Quality costs are viewed as a tool that can be used in planning to reach the lower quality level, and through the use of available information on each category of quality costs, such as valuation costs and quality assurance costs, the lower quality level can be achieved (Rehacek, 2018).

Quality control is one of the costs of tools. They assist management in conducting internal comparisons of products, services, processes, and departments, where cost is the first step towards control and enhances quality and performance levels. The quality costs are a tool for preparing the essential quality control program for the following budget period (Herowati et al., 2021).

Other benefits of the system can quality control of the realization of the company or the consumer include a higher quality of the company's products and the ability to provide products at an appropriate time for the

consumer, as well as a reduction in cost and time (Brata et al., 2017) Moreover, implementing a system of quality control in industrial companies has additional benefits, including contributing to the improvement of the desired product quality production, contributing to reduce product manufacturing costs, contributing to the improvement of the company's market share, contributing to the success of the production and operations management, and contributing to the improvement ensure and increase (Modhiya & Desai, 2016).

Concept of reducing costs

According to Abdilmouti (2018), the Kaizen method is utilized in the case of the tread to reduce costs and focus on space reductions. This emphasis on reducing costs by kaizen is a further improvement to the current production or product design process. These improvements take the form of the development of improved configuration processes and improve the performance of the machines to reduce loss and increase employee training and encourage them to apply the additional daily changes that can improve performance cost of quality, and thus the emphasis on the concept of kaizen (Vardhan, Gupta, & Gangwar, 2015).

The concept of cost reduction has been defined as the transition from the current cost level to a lower level, which necessitates a change in circumstances calculated based on costs so that the same product can be produced at a lower cost per economic unit (Ranieri et al., 2018). According to studies, the goal of cost reduction through the use of the Kaizen method is to eliminate activities that do not add value to the product from the consumer's perspective and to reduce damage, taking into account all the suggestions submitted by the workers to optimize the process (Proença, Gaspar, & Lima, 2022).

Cost reduction can be regarded as a desire to study and analyze cost per unit and pursue all avenues to reduce it to an absolute minimum while maintaining quality and within a predetermined production volume, which is a goal that each facility must achieve through the attainment of the required production efficiency and the specified standard, and to an entity that must find ways to initiate steps to reduce costs and would be responsible for illuminating an opportunity to reach processing distractions and then improving the situation, as it aims to reduce costs to the standard level that has been developed under specific conditions (Wei, Smith, & Sohn, 2017). Kaizen differs from Total Quality Management in Japan, which led to the establishment those facilities.

This distinguishes kaizen for complete quality management

(Hosono, 2020). Others note that using kaizen eliminates costs and losses in operations as much as possible, thereby improving process time, cost, and quality; this is the operation's technical aspect (Cwikla et al., 2018).

Waste can be categorized as a waste of excess production limit, Waste transport, Waste storage, Waste movement, and waste of reform/rejects. The Japanese achieve success through the quality of their products, which is why their dedication to achieving quality is less expensive, and one of their strategies is to place a greater emphasis on enhancing the capabilities and user training to have them contribute more to the prevention of poor quality (Goyal et al., 2019)

Reduce costs of quality by using kaizen

Reducing an entity's costs is the most fundamental objective to obtain a competitive advantage over other businesses in the same industry and market. At the competition factor, resource scarcity, high prices, and significant and numerous changes in the work environment, it was necessary to provide methods and modalities that accompanied this change and contributed to the cost-cutting objective (Dhingra, Kumar, & Singh, 2019).

Quality Improvement

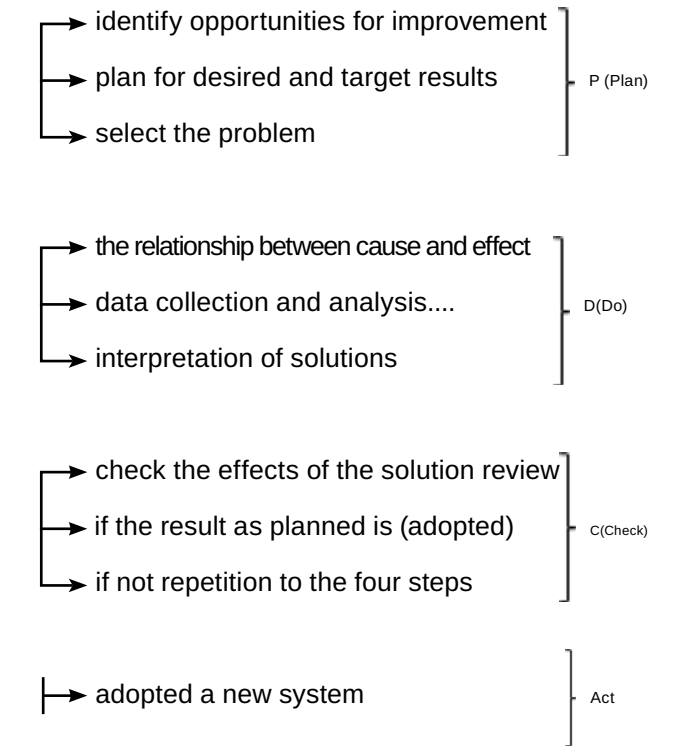
Quality improvement is a collection of measures a business takes to increase the efficacy and efficiency of activities and processes to provide additional quality benefits to the business and its customers (Adams, 2018).

Today is not only the objective of quality measurement and improvement; achieving this objective necessitates substantiation of more characteristics of the target quality and reducing distractions that hinder its improvement (Namjoshi et al., 2020). Therefore, companies cannot focus on keeping customers satisfied without quality improvement. When confirming the quality of a product, they cannot ignore the issue of how high or low the quality level is. And that the objective of continuous improvement is to achieve full proficiency through the continual enhancement of production processes, as well as the extraordinary efforts required to achieve this objective, because achieving a strategic objective is not as important as achieving a competitive advantage by reducing costs for continuous improvement (Savino & Mazza, 2016). It is essential to observe the following, which served as evidence of companies' commitment to quality improvement: Solid reputation, Cost reductions, Productivity enhancements, and meeting customer needs.

Thus satisfy Deming's cycle of continuous improvement processes, PDCA ideas confirm to contain the first phase

to identify, analyze, explore and problem and choose the team to improve, and in the second cause working to remove the implementation of the plan, either in the stage examination are monitoring progress and ensure that the results of the proposed solution, If the results are successful, the team is being documented for the modified process the multiplicity of standard operation and only by repetition all the steps (Jagusiak-Kocik, 2017).

The PDCA cycle in literature represents the plan, do, check and act. It is the process that provides support to both practices and principles of Kaizen and improvement on continuous basis, This cycle provides a comprehensive structure and framework in order to identify different opportunities and later evaluate them objectively. The organization that uses PDCA goes through improvement on the regular basis by creating culture to think critically and solving different problems. It is possible to test the ideas rigorously at a small scale by using PDCA. Figure 3 below represent the four step PDCA cycle. The first step (Plan, P) include identification of improvement, planning of target result and selection of problem. The second step (Do, D) include relationship among cause and effect, data collection and understanding the main cause of problem. The third step of (check, C) include checking of effect of solution and if the results are in favor adopt it, otherwise, drop it. In the end, Act include adoption of new system. According to PDCA figure



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Relationship between Kaizen methods, improve quality and Reduce costs.

Janjić, Bogičević, and Krstić (2019) conducted a study to evaluate the impact of the Kaizen philosophy on the manufacturing sector in terms of continuous improvement. This study determined that the Kaizen method is effective for measuring continuous business improvement. Similarly, the study conducted by Anh, Yen, and Matsui (2015) revealed a positive correlation between Vietnam's organizational culture and Kaizen Application. They also proposed enhancing the organization's performance using the Kaizen method. Similarly, Prayuda (2020) evaluated the role of the kaizen method for continuous improvement in the automobile industry and found that this method is essential for regular performance evaluation.

3. Methodology

This investigation was conducted in a cement factory with a lean production system, specifically the Kufa cement factory. The data for analysis were collected from 2015 studies and publications. The results were obtained based on the application of 5s, namely Seiri, Seiton, Seiso, Seiketsu, and

Shitsuke. The implementation of 5s based on statistical data may assist in analyzing the reduction of costs and enhancement of product quality of the products manufactured at the Kufa cement factory. This study aimed to examine the conventional significance of the Kaizen method in the context of the Kufa cement industry. As is evident from the empirical and theoretical literature review of past studies, the application of the Kaizen method is supported by the data and content analysis of past studies.

Application side

Kufa cement factory was constructed in 1977 with a production capacity of 6,000 tons per day by a Danish company (F L Smidth). The factory covers an area of 88,55,452 square feet and employs 1,237 people. Kufa cement factory was the first in the Middle East to produce cement by the wetness method, which makes it easier to mix the materials and pump them through pipes and pumps.

The dry method is more cost-effective, but it is challenging to control the mixing of materials and requires machinery and equipment for moor maintenance.

Factory production departments

Quarry department	Rubber conveyor department	Raw material mills department	Ovens department	Cement mills department	Packing department	Electrical station department
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1-Quarry department: This Department is responsible for extracting limestone from the quarry using specialized machinery, sending it to the crusher to reduce the large stones (30 centimeter–70 cm) to smaller sizes (5 cm–0.5 cm), and then transporting them to the rubber carrier using large factory-specific vehicles.

2-Rubber conveyor department: This division transports atone from the quarry to the factory via a rubber conveyor that is (22.5 km) long and contains (9) stations in each area (25 m2). Either production at this stage is stored in the warehouses of a giant within the factory, and the classification of limestone and the arrival of the carbonate proportion in it.

3-Raw material mills department: This Department is responsible for grinding and mixing the limestone with clay wire at a proportion of! /3 to obtain the raw materials required to be burned with great softening. Either production in this stage is stored in ponds (giant) to calibrate and modify the deviations and the required elements.

4-Ovens department: This Department is one of the essential parts of the factory, as it is where the first materials are burned to create clinker inside the ovens and the massive 1450-degree centrifuge. Clinker is stored in the warehouse close to the Department of cement mills, as it is the primary ingredient in cement installation.

5-Cement mills department: This Department is responsible for the grinding and blending clinker and gypsum in the production of high-strength cement and sending the resulting product to a large silo for storage.

6-Packing department: This Department improves the process of removing cement from storage silos and packaging it in either paper bags measuring one kilogram or cars for transport as cement material.

7-Electrical station department: This Department is furnished with a 25 MW electrical power plant by the factory, which consists of six units powered by the black oil.

Table (3) Area of production departments for the year 2015

S.	Production department	Area(m ²)	Notes
1	Stone quarry building	331	
2	Crusher building	1500	
3	Rubber conveyor building	150	The total length of the conveyor (22.5 km) contains(9) station in each area(25m ²)
4	Raw material mills building	3816	
5	Ovens control building	110	
6	Cement mills building		
7	Packing with scales	3550	
8	Warehouse building	7280	
Total		885452	

Table (4) Production capacity of the Department for the year 2015

S.	Production departments	Production capacity (ton/hour)	Notes
1	Crusher	450*2 crusher	
2	Rubber conveyor	1000	
3	Raw material mills	140*4 mills	
4	ovens	1500 ton/day * 4 oven	
5	Cement mills	110*4 mills	
6	Packing	300*2 path packing	

Table (5) employees 'number for each production department

S	Production department	Employees' number	Note
1	Electrical station	90	
2	Stone Quarry	183	
3	Rubber conveyor	80	
4	Raw material mills	121	
5	Ovens	182	
6	Cement mills	95	
7	Packing	88	
8	Production	85	
9	Quality control	49	
10	Electrical maintenance	51	
11	Mechanical maintenance	212	

Cost reduction by Kaizen budget

1-Quarry department: The size of the stone quarry building (331 m2), the size of the crusher (155 m2), the crusher's production capacity (450*2 crusher tons per hour), and the number of employees 188.

Following an interview with a production engineer, it was determined that there is damage in the quarry stage, which cannot be controlled during production; therefore, they cannot reduce costs at this stage.

2-Rubber conveyor department: Following an interview with the department manager, it was determined that there is no damage at this juncture so no cost reductions can be made.

3-Raw material mills building: After speaking with a production engineer, it was determined that there is no harm at this stage, so they cannot reduce costs.

4-Ovens Department: This Department's production capacity (1500 tons per dayx4 furnaces), area (110 square meters), and employee count (182) are detailed below.

Table (6) Production and hours working for the year 2015

Ovens	Production/resistant(ton)	Working hours(hour)
W.1	14924	3772
W.2	329628	6376
W.3	266369	5452
W.4	102946	2554

5-Cement mills building: This Department contains (4) mills, the production capacity (110*4 mills ton/ hour) and the area of this Department (2121 m²), and employees number (95) workers.

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Table (7) Cement mills production and working hours for 2015.

Cement mills	Production/resistant(ton)	Working hours(hour)	Dinar/hour
Z.1	291607	4122.91	1202269416
Z.2	93772	1446.45	135636509
Z.3	233563	3453.53	806616827

Following an interview with a technical engineer, it was determined that the fourth cement mill(Z.4) in 2015 was maintained by a failure due to the mill horizontal's need to be maintained for a long duration. Costs can be reduced at this stage if improvement procedures

are implemented to replace the horizontal mill with a vertical mill, which occupies less space and requires less maintenance (100 tons). The following table illustrates the increase in cement production using the Kaizen methodology:

Table (8) Cost production improvement for cement mills for the year 2015

Cement mills	Production/resistant(ton)	Working hours(hour)	Dinar/hour
Z.1	2628000	4122.91	1083500710
Z.2	2628000	1446.45	3801270600
Z.3	2628000	3453.53	9075876840

(300 ton*24 hour *365 day)

Table (9) shows the cement mills' cost using the Kaizen method for 2015.

Cement mills	Quantity before improvement (ton)	Quantity after improvement(ton)	Kaizen goal
Z.1	291607	2628000	2336393
Z.2	93772	2628000	2634228
Z.3	233563	2628000	2394437
Total	618942	7884000	726558

The quantity of cement mills increased in 2015, as shown in the preceding table. Before implementing the Kaizen method, the number of mills produced was 618942 tons; however, after implementing the Kaizen method, the number of mills increased to 7884,000 tons, and researchers estimated a 72,6558-ton increase in cement mill production if the Kaizen method was applied to these mills.

are as follows: (88).

There are currently two categories of damage in the packing phase.

1-Obvious damage (torn): Following an interview with the superintendent of the packing section, it was determined that there is a permitted rate of (0.003) per the requirements.

6-Packing stage: The capacity of the cement to fill the cement (100*6) machine filling ton/hour and the flux (300*2 path ton/hour), the packing area with balance (approximately 3550m2), and the number of personnel

Specifications for calculating the ratio of the shredder are as follows:

Ratio ripper=quantity of torn bags/quantity of provided bags=not to go away (0.003)

Table (10) shows damage to the baltat during 2015.

Year's seasons	Type of material	Damaged in baltat	The quantity of bags provide	Percentage of ripper
First season	Paper bags	331	1670987	0.19%
Second season	Paper bags	427	2318132	0.18%
Third season	Paper bags	1573	2991870	0.52%
Fourth season	Paper bags	608	2715532	0.22%

2-Damaged in packing: The damage that occurs within the factory, and after following up on this stage and meeting with the director of the packing

department in the factory, it was determined that there is an opportunity to reduce the cost of direct materials, which is the cost of used bags, due to

the following causes:

- a-Because of the manufacturing of the bags.
- b-The bags were filled too much.

- c-Mechanical problem due to the deviation of the bag.
- d-Electrical problem occurs.

Table (11) shows the quantity damaged in the factory for the year 2015

Year's seasons	Type of material	Input quantity	Quantity material damaged	Percentage of ripper
First season	Paper bags	1670987	5003	0.3%
Second season	Paper bags	2318132	7764	0.3%
Third season	Paper bags	2991870	10720	0.4%
Fourth season	Paper bags	2715532	8612	0.4%

Improvement can be made at this stage through the following.

- a-Use bags of suitable sizes.
- b-Purchase bags at competitive prices according to the required specifications.

c-Control the stability at the voltage of backing machines and prevent the rupture of bags because of deviation. Officials and technicians believe that estimates of improvement rates in this stage can be (0.1%).

Table (12) Kaizen budget for reduction of direct material cost in the packing stage for the year 2015

Year's seasons	Type of material	Input quantity	Quantity material damaged	Percentage of ripper
First season	Paper bags	1670987	1671	0.1%
Second season	Paper bags	2318132	2318	0.1%
Third season	Paper bags	2991870	2992	0.1%
Fourth season	Paper bags	2715532	2716	0.1%

Table (13 shows) the material quantity damaged before and after reduction using the Kaizen method for the year 2015.

Year's seasons	Type of material	Material quantity damage before improvement	Material Quantity damaged after improvement	Reduction quantity (Kaizen goal)
First season	Paper bags	5003	1671	3332
Second season	Paper bags	7764	2318	5446
Third season	Paper bags	10720	2992	7728
Fourth season	Paper bags	8612	2716	5896
Total quantity reduction		32099	9697	22402

The previous data demonstrate a gradual decline in the quantity of paper bags in 2015 (22402 bags). After comparing the quantity of bags with the highest quality before Kaizen (32099 bags) to the number of damaged materials after implementing the Kaizen method, the reduction in the quantity of damaged material is (9697 paper bags). Using the Kaizen methodology in the factory, the researcher reduced the number of paper sacks produced in 2015.

organizational success, as it encourages those involved in production operations to reduce costs and increase revenue. Moreover, the Kaizen method focuses on the manufacturing process in the form of phases and on continuous improvement. The primary objective of this continuity is to enhance quality and reduce costs while maintaining a customer-centric focus. Customers continually seek the finest services and products, so organizations must prioritize customer satisfaction.

4. Conclusions

This research was conducted to evaluate the function of the Kaizen method in the context of the Kufa Cement Factory in reducing costs and enhancing quality regularly. Based on the findings, it has been determined that the Kaizen method is essential for

Organizations must concentrate on regular and continuous small steps while considering the manufactured goods' economic viability. Continuity is essential for organizations to obtain a competitive advantage and endure in the market for an extended period. The results indicate that the Kufa Cement

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factory must emphasize quality and reduce the production of defective products. Therefore, organizations must prioritize employee training to enhance their performance.

5. Limitations and Implications

Similar to numerous other studies, the present study has a few limitations. This analysis was conducted about the Kufa cement facility. Future research can employ the Kaizen method to enhance quality in other industries, such as the automobile industry. Managers in various industries can use the Kaizen method to train employees to enhance their performance. In addition, academicians can use the study's findings in their future research.

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