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Green Value Engineering and Green Kaizen Technologies and Their Role in Reducing Costs: A Theoretical Study

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ABSTRACT

Due to business environmental developments, advanced models of innovations and various economic activities have been adopted that serve the community and environment in the same time, providing the basis is for sustainable development , regarding to the sustainability and its procedures push firms to find the modern manufacturing techniques such as green value engineering and green kaizen to contribute to reducing the costs of green products. The research aimed to explain the role of green value engineering and green kaizen techniques in costs reducing. Otherwise, clarifying the knowledge foundations of the two technologies and areas of application to support the competitiveness of economic entities.

The research adopts a theoretical analysis to discuss the literature related to the research variables for highlighting the spaces of cost reduction from the approaches of the green value engineering and green kaizen techniques. Accurate pricing of products and thus enhance the level of profits. The research also concluded the need to adopt the green value engineering approach and green kaizen to help economic entities achieve the productive efficiency while preserving the environment and thus achieving a sustainable competitive advantage.

Keywords: *Green value engineering; green kaizen; costs reducing; green products.*

INTRODUCTION

The concepts of green value engineering and green kaizen at the present time are considered important and necessary to ensure the fair distribution of resources on products or services, as well as to identify and classify the functions performed by products in order to achieve them at a lower cost or higher quality or both through innovative alternatives without compromising the basic requirements.

In order for the economic units to be able to ensure survival and competition in the global market, they must constantly improve all of their business activities, starting from product design and quality improvement by adhering to productivity instructions and cost management all the way to customer service and the only way to continuous improvement is the continuous measurement of activities that add value to the product or for the service provided by these units in order to achieve a competitive advantage.

Since the economic units are in constant need of continuous improvement in their operations, activities, and products to meet the customer's needs and requests, which are constantly changing, as a result of technological developments and the expansion of global markets (market globalization), so the use of various economic units of green value engineering and green kaizen techniques was aimed at reducing costs and eliminating waste Loss of time and resources and improving the quality of goods and services provided to the customer to achieve his satisfaction by reducing the response time to customer requests, innovation and achieving competitive advantage.

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RESEARCH METHODOLOGY

Research Problem

Customer requirements are an important factor in the process of manufacturing products or providing services that economic units face in the competitive market, as the inability to provide product designs or services that meet customers' needs at competitive prices to achieve a competitive advantage for economic units is considered a problem facing most economic units, which requires Taking advantage of modern technologies that help design and implement procedures for manufacturing green products at the lowest possible cost and to preserve the basic functions of the products without compromising the required quality and adapt them to suit the desire of customers.

The research problem can be described according to the following questions:

1. What is the role of (GVE) in cost reduction?
2. What is the role of (GK) in cost reduction?

Importance of Research

The importance of research lies in highlighting the concepts of green value engineering and green kaizen technologies in reducing costs through a work methodology that adopts the optimal use of resources and improving the quality of products, taking into account environmental requirements. The importance of research can be described in the following:

1. Demonstrating the importance of using modern technologies such as green value engineering and green kaizen in reducing product costs while maintaining the basic functions and required quality in order to achieve the desires of customers.
2. Orientation to reduce environmental impacts through the optimal use of resources has become one of the most important priorities to maintain the competitive position of economic units.

Research Objectives

The research's objectives to achieve the following:

1. Statement of the knowledge foundations of the green value engineering and green kaizen technologies.
2. Highlighting the role of green value engineering and green kaizen technologies in reducing costs.
3. Identify the most important areas for reducing the costs of green products, taking into account environmental requirements.

Research Hypothesis

"The use of green value engineering and green kaizen technologies contributes to reducing costs incurred by economic units".

Research Methodology

The theoretical analytical technique was used in the research to analyses the research variables through the relevant literature for the period (2007-2022) and to find the expected areas for cost reduction.

PREVIOUS STUDIES

The study (Brasco, 2011) dealt with a model based on simple concepts for managing environmental aspects capable of promoting better integration of environmental processes with business needs by following the green kaizen methodology, so the model that was developed has an ultimate goal of reducing environmental impacts resulting from the production process . While (Lee et al, 2015) argued about the need to choose construction costs and huge reduction in carbon emissions and confirm them by using green value engineering techniques, the study found that using green value engineering contributed to reducing construction costs of the railway project in Taiwan.

In addition, (Janani et al, 2018) emphasized the importance of value engineering in reducing unnecessary costs associated with the product. The study concluded that value engineering plans to achieve quantifiable value

developments by reducing prices and obtaining a better customer privilege, This can be applied in components Architectural, structural and physical of buildings. While (Monica, 2019) provided guidance on how to include management and operators in environmental improvements in a pharmaceutical manufacturing business by using a green performance map. The process include identifying potential improvements and cost-cutting measures. The study also indicated the relevance of using cost as a driver of environmental change.

Based on the foregoing, it is clear that the most important thing that distinguishes the current research from previous studies is that it deals with the techniques of green value engineering and green kaizen to achieve cost reduction leading to the production processes of green products for economic units.

Green Value Engineering and its Role in Reducing Costs

Historical Background of Value Engineering

Value engineering (VE) began during World War II, when General Electric (GEC) faced a significant material shortage problem. In order to meet the needs of war equipment, (GEC) had to substitute scarce resources with alternative materials that were less expensive, more valuable, and performed better, Larry Miles, an engineer at (GEC), developed various ideas and approaches for selecting alternative materials to add value to products in 1947. Miles enhanced the functionality of an existing strategy that had been proven; the new method was more productive and became a way to create and operate resources at the lowest feasible cost. Since its initial implementation in (1950), (VE) has become a standard for many government agencies and units of Economics since it is frequently employed in building projects and has become important and a part of the development of most civil infrastructure projects. (VE) has been used for over a half-century. (VE) aims to provide innovative ideas and solutions to improve the value of the project, and in (1996), McDowell demonstrated that (VE) techniques could be applied to all types of industries, particularly manufacturing, and then expanded to include all economic fields. (Masengesho et al,2021:3)

Concept of Value

The value was defined as the lowest possible cost to obtain the best possible job performance and the highest possible quality. The value can be classified into four main types: (Al-Samarrai, 2021: 194-193)

1. Cost value: It is the total monetary cost of anything, whether direct or indirect costs, maintenance.
2. Total value: It is the aesthetic qualities or features desired by the customer.
3. Use value: It means the total benefit of the product, whether it is a good or a service.
4. Replacement value: It expresses the purchasing power of the product.

Either in terms of measuring the value, it is measured through the following equation:

Value measure = (functional performance + quality) / total cost

And the product of combining job performance with quality is called job merit, so the value will be calculated as follows:

Value = Functional Benefit / Cost

Another way to calculate job maturity and value in general is as follows:

Value = (performance + capacity) / cost

In general, the value focuses on three basic elements:

1. Functional performance: is the work performed by the product or unit.
2. Quality: It is the user's needs of the product.
3. Cost: It is the life cycle cost of the product.

The following figure shows the extent to which the elements of value are interrelated and overlapped:

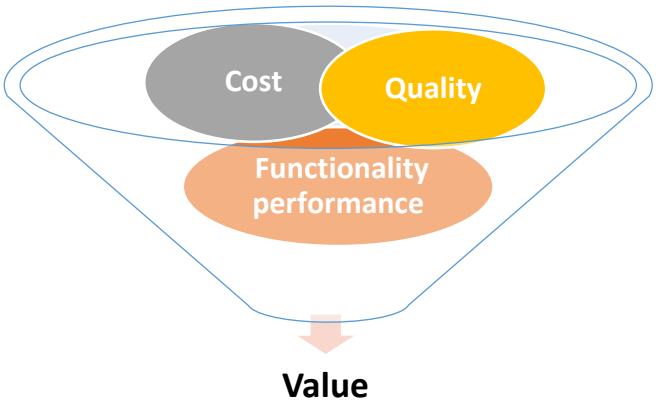


Figure (1) Elements of value: (Al-Samarrai, 2021: 194)

Green value engineering (GVE)

As a result of developments in the business environment and to achieve the desires of customers, concept of value engineering (VE) has evolved to employ the dimension of sustainability through the concept of green value engineering (GVE), as it is defined as "the systematic application of recognized technologies that define the function of a product or service, and assign a monetary value to that function and provide reliability the required job at the lowest total cost" (Rosnani:2020:2). It is also defined as the organized discipline that uses a combination of common sense and methodological skills to resolve and remove activities that do not add value in the project to reduce costs, In another direction, (GVE) is defined as an organized and systematic research procedure that focuses on system functionality and an effective way to save costs on a large scale at different stages of the project and aims to improve function performance, reduce environmental impact and achieve the goal of sustainable construction (Cheng: 2012:2).

According to the foregoing, (GVE) is an integrated programmed that uses a methodical and precise plan of action to address any issues pertaining to spending, performance, and quality by carefully selecting optimal functions for low-cost, high-performance products while eliminating functions that add nothing and have an environmental impact on the product or project, which contributes to cost reduction.

Green Value Engineering Objectives

Green value engineering seeks to achieve a set of goals, most notably the following: (Kumar, 2015: 32-34)

1. Improving quality while maintaining steady resources by increasing product functionality (i.e., providing the customer with more performance) decreasing resources while maintaining function, or increasing function while decreasing resources.
2. It can be used mainly to increase productivity and find the best balance between the cost, functionality, quality, dependability, and performance of a good or service. It can also be used to complete tasks as soon as possible without increasing costs or compromising the caliber of the work.
3. They can lessen the risks associated with implementing any project by avoiding actions that could harm the environment when combined with their collective expertise and experience.
4. Define the function of the product or service come up with creative alternatives and provide the functions that are required to meet the project's initial objectives of reliability and the lowest possible cost of the product life cycle without compromising the project's safety quality operations maintenance and environmental requirements.
5. Using available technology information and expertise to identify expenses and activities that do not correspond with the aims and needs of the client.

Advantages of Green Value Engineering

There are several advantages to (GVE) my agencies (Elysé:2021:118), (Pooja:2018:1084):

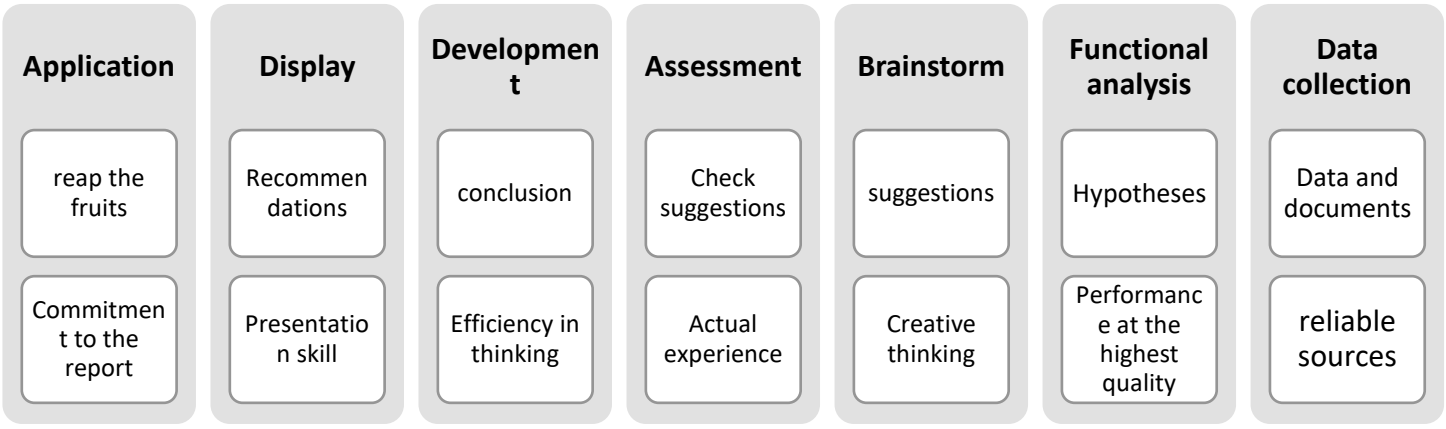
1. Helps determine the best design option.

2. Helps reduce and save on the total life cycle cost of a product or project.
3. To identify product or project problems and create real solutions and answers.
4. Improving the quality of present and future products or projects.
5. To enhance the customer's reliability and achieve savings during the life of the product or project until its completion.
6. Achieves savings in time and resources.
7. It contributes to improving the attitudes of employees towards work.
8. Achieve better management of operational procedures, which enhances quality levels.

Stages of Green Value Engineering

It depends on practical practices more than theory because it is based on variables (quality - efficiency - cost). It naturally varies from one unit to another, so it requires an integrated work team from all the specialties in the unit, in order to research problems and alternatives, and the figure below shows Logical sequence steps for applying value engineering steps.

Figure (2) stages of green value engineering: (Al-Samarrai: 2019)



It is important to complete each step in order to move to the next step. First, the information gathering stage is the most influential point, as collecting information before starting the study gives the team an awareness of the problems, which contributes to creating a greater chance of success. Secondly, the job analysis stage is characterized by value engineering in this stage from the rest. Problem-solving methods. In this step, the project functions are identified and the relationship between those functions is recognized. Thirdly, the functional innovation stage, as this stage includes collecting information about the unit. There are two main methods that are most appropriate for the field (VE), the analytical method and the innovative method. Fourth, the evaluation and selection stage. From this stage is to reduce the number of those ideas and then choose the most suitable according to the previously established objectives, and finally the stage of research and development. These ideas are the conclusion of the study, and due to the long period that this stage takes, a solid plan must be drawn up commensurate with the amount of ideas.

The Role of Green Value Engineering in Public Strategies for Competition

There are three types of strategies that economic units can apply, which are the following: (Al-Samarrai, 2021: 201)

1. Cost leadership strategy: The most important risk of this strategy is that the unit will encounter problems when it tries to reduce the different shapes and features of the product in an effort to reduce costs To avoid these risks, the unit must follow sound and studied methods such as (VE) as the methodology will help the unit To reduce costs without compromising the quality of the product, but rather work to improve it and add value to the product, which will increase customers' demand for it.

2. Differentiation strategy: The unit's pursuit of differentiation may lead to products that exceed the costs of the customer's purchasing power, which will lead to the customer's distancing from these products because of the comparison that the customer will make between the products. Here (VE) plays an important role in working on the introduction of new methods of work performance and in Its production, distribution and marketing, which will lead to the production of premium products.
3. Focus strategy: The concentration strategy includes the two previous strategies in its application, so it is the most beneficial from the use of (VE) as its aim is to find distinguished alternatives at reduced prices**.**

Areas of Cost Reduction Through Green Value Engineering

Green value engineering adopts an approach to achieve the necessary functions at the lowest cost for the life cycle of the product or project This can be accomplished through the use of new materials and design innovation, the simplification of the construction process, the innovation of construction methods, the reduction of construction costs and time, the improvement of construction quality and safety, and the reduction of environmental consequences. Costs are measured during the job analysis stage by computing the cost of value-added activities after subtracting the cost of non-value-added activities.

The researchers believe that (GVE) can be used in the design phase due to its comprehensive impact, as the design phase primarily affects all stages of the product life cycle as (GVE) is implemented by gathering the essential product data, defining the components and functions of each item, as well as its costs and environmental consequences, and attempting to offer design alternatives that lead to job creation while decreasing emissions and waste. (Ridha & Soror, 78: 2021) This can be explained as follows:

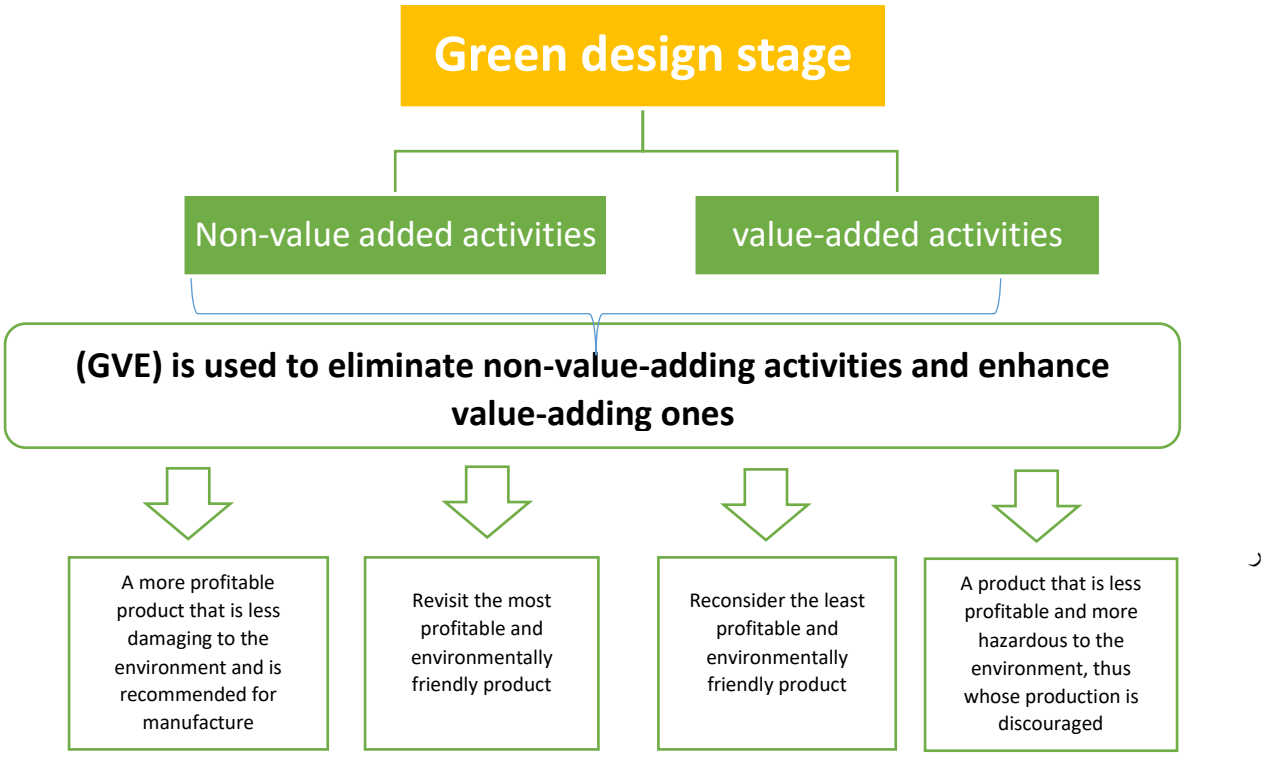


Figure (3) Reducing product costs at the design stage: (Ridha and Soror,2021:79)

The products were also divided into the following: Khattab & Al Hassan,2015:209)

- Profitable and ecologically responsible products: These are green products that meet client needs, economic unit aims, and environmental regulations. As a result, these items must be kept and made.
- The most profitable and environmentally damaging products are: These items meet the economic unit's profit goal, but they do not meet the wants and desires of the green client and do not meet environmental standards. In this instance, the economic unit must rethink and invent methods for producing the raw materials needed in the design. To ensure that these products meet environmental standards.
- Products are less profitable and environmentally friendly: While these products are environmentally friendly, meet customer needs, and meet environmental standards, they do not meet the goal of profiting the economic unit, motivating them to look for a way to reduce the cost of this type of product without sacrificing their green products.
- Products that are less profitable and more detrimental to the environment: products that do not meet the desires of all parties (the economic unit - the client - the community) and that the economic unit should not create, instead seeking ideas for green and ecologically friendly products.

GREEN KAIZEN (GK) AND ITS ROLE IN REDUCING COSTS

The Historical Origins of Green Kaizen Technology

Kaizen is a concept of continuous improvement that emphasizes the need to improve the environment of production processes in the economic unit through individual participation in its improvement. It was first defined by Imai in his (1986) book "Kaizen: The Key to Competitive Success.". (Chan & Tay, 2018:62)

Kaizen means "change to make things better" or "evolution" in Japanese, and the concept of kaizen was associated with improving industrial and job efficiency in the second half of the twentieth century, as most Japanese leaders focused on mastering the opportunities of improving production in industrial units. (Hine & Brubaker, 2007: 190)

Green kaizen (GK) was introduced in October (2017) and ran as a pilot programmed until June (2018) Yet, the instruments and approaches created are rarely used, even though there are obvious benefits to combining resource efficiency with environmental enhancements. To support (GK) in the manufacturing industry in other industry sectors, with the aim of continuous and permanent improvement This methodology is based on following simple steps for continuous improvement in aspects of the economic unit at the lowest possible costs and time It also aims to reduce waste and raise productivity, in addition to raising the creative capabilities of workers. It goes beyond the theory (kaizen) the business world to enter personal life due to the process of achieving it, and (kaizen) is based on the role of people in improvement supporting ideas and creativity from within the economic unit and reducing spending on experts and consultants, hence the importance of (kaizen) in creating a suitable environment for creativity and improvement (Bellgran et al, 2019: 1222).

Green Kaizen (GK)

The Green Kaizen (GK) approach is important for improving the operations of economic units It is defined as a new tool designed to reduce the environmental impact of industrial production Waste is one of the categories of environmental aspects that the tool promotes and manages This is done first by reducing the amount of waste generated and secondly by increasing the amount of waste generated. recycle or reuse, as well as the definition of a tool that focuses on improving the flows supporting the economic unit (water, energy, materials, effluents, and chemicals) with the ultimate goal of improving the overall performance of the economic unit by reducing costs and significant environmental impacts, thus putting An approved and green plan. (Nicholas, 2019:11)

The Importance of Green Kaizen

The importance of green kaizen can be summarized as follows: (Kenza, 22:2020)

1. Continuous improvement is more than a philosophy, tool, or process; it is a way of life that prioritises the customer over market share. As a result, it is one of the fundamental cornerstones of market success and permanence.

2. Continuous development is a race without a finish line since it highlights areas for progress throughout the organisation.
3. Continuous improvement emphasises the why and how methodology above the "who" technique.
4. It is founded on the premise of doing the right thing from the start, which is based on the idea that prevention is better than treatment.
5. Forcing management and employees to prioritise learning as a main goal that must be reached as one of the techniques that institutions might use to compete.
6. Continuous improvement has become a critical element in the current economic changes.
7. Contribute to increasing the competitiveness of enterprises by meeting the needs of customers with quality and appropriate prices.
8. Monitoring and managing operations by implementing a series of procedures such as lowering the proportion of damage and employing control maps.
9. Anticipating customer needs to make improvements better.

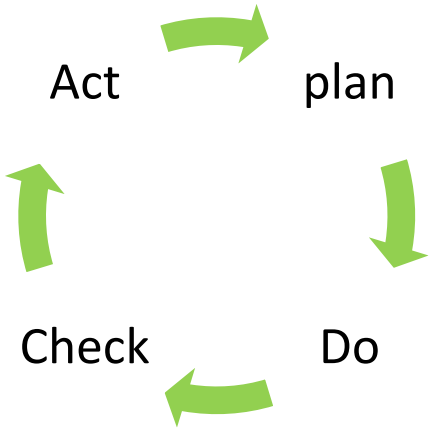
Green Kaizen Steps

Statistical analyst Deming developed the steps of the Kaizen cycle known as the "Plan-Do-Check-Act" (PDCA) cycle, which is linked to the idea of quality and total quality management, He then modified this cycle and applied it to Kaizen Company in order to continuously improve quality in four infinite stages:

1. Plan: the study and analysis of the current state, as well as the forecasting of needs and modifications to yield enhancements, starting with issue identification, goal-setting, and the development of an action plan that considers all relevant parties.
2. Do: design metrics and conduct controlled experiments, organise operations, gather data, analyses facts to produce answers, and apply small-scale alterations to the experiment.
3. Check: Remove effects to see if the desired outcome was obtained. Solutions are tested and measured to ensure the goals that were established during the planning phase are achieved.
4. Act: Putting established methods into practice If the improvements work, the cycle is restarted so that the team can begin larger-scale planning, if the changes do not work, the cycle is restarted. (Bhoi et al, 2014: 817)

The above can be explained through the following diagram:

Figure (4) Steps of Kaizen cycle: Prepared by the researchers



This cycle's main goal is to get rid of everything unpleasant that occurred during the production process create harmony and uniformity and move on to the next cycle of improvement. Consequently since implementing these modifications will lessen the system's impact on the environment the system should never be dependent on its current

configuration, The production system improves the system and encourages the green component which helps the product become more environmentally friendly and better.

In a related context, (Bellgran et al, 2019:1223) believes that the goal of creating a positive green circle of improvement that creates practical environmental improvements that lead to cost savings and sharing best practices is to expand the scope of successful cost savings and build gradually and integrate the GK tool for the purpose of benefiting from savings Green costs as a motivator at the shop floor level when identifying specific improvement solutions to prioritize as well as use the Lean Toolbox to further standardize and support a learning culture to conduct continuous environmental Additionally, it has been proven that having management support and involvement can accelerate the pace of change when it comes to the task of improving Production environment. This is because business cases must be prepared for the proposed green changes, which means that the costs must outweigh the benefits in terms of money.

The proposed plan and the following diagram illustrate the above :

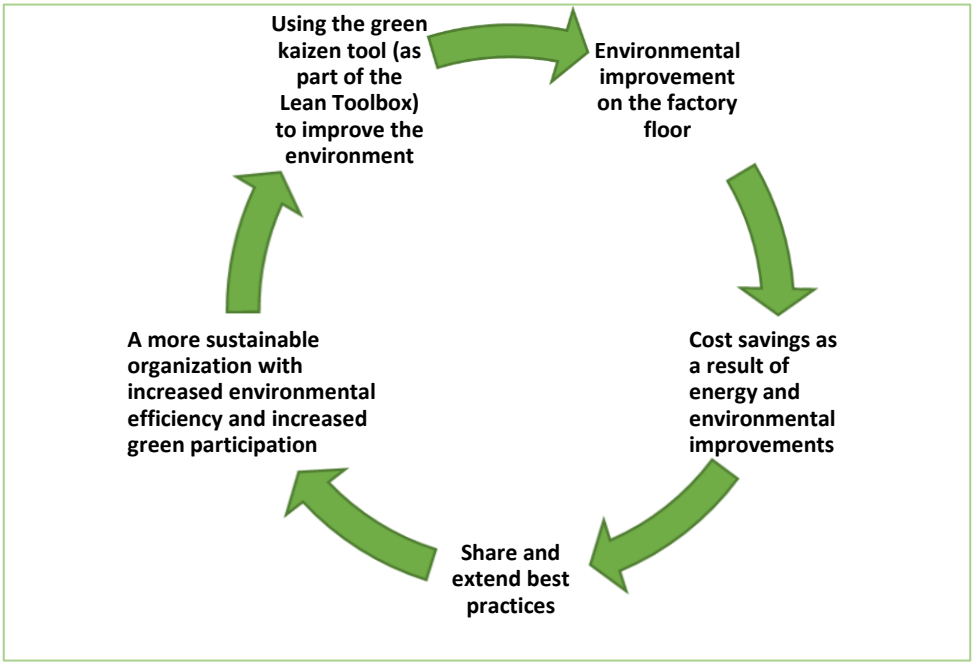


Figure (5) Positive improvement circle: (Bellgran et al,2019:1224)

The researchers found that improving processes would immediately reduce time wasted on non-value-adding activities like stops, malfunctions, transitions between stages, and so forth. This would raise energy consumption efficiency, and better processes would result in higher-quality products. particularly by searching for raw materials that have negative effects Less environmentally friendly, which definitely boosts material efficiency. Furthermore, trash recycling operations contribute to cost optimization by providing a source of money that decreases the burden of costs associated with them.

Green Kaizen Principles

To specify the practices of (GK) activities, it is necessary to define the principles on which the (GK) is based, as well as a clear knowledge of the processes that will be used. As a result, the requirement for clarity of the basic concepts of kaizen leads to their easier application in institutions. There are few guiding principles on which support (GK) should concentrate. (Sundararajan & Terkar, 2022:6)

1. relying on cooperation, active engagement in continual improvement ideas.
2. Focusing on human resources within management (kaizen) and competitive advantage.
3. The kaizen ideology acknowledges that there is always potential for improvement and values group agreement.
4. (kaizen) Is concerned with the establishment of standards and the continuous improvement of those standards in order to promote greater standards.

From the foregoing, it can be said that the principles of (kaizen) depend on improving processes, work methods and procedures, improving results, defining work standards and developing them continuously, and supporting the behaviors required for improvement, and it also defines work practices that adopt (kaizen) activities, so management and workers should work together To direct the principles of (kaizen) and its pillars in defining practices through (kaizen) daily activities, taking into account the obstacles and challenges of work and it represents also the key to the competitiveness of institutions, with the participation of workers in developing proposals for improvement, as it is a methodology that relies on a group of techniques and tools for improvement.

The Role of Green Kaizen in Reducing Costs

The Kaizen aims to gradually and continuously improve the quality of productive and competitive products and services by all workers (collective effort), and the main purpose of the Kaizen philosophy is to reduce costs and increase production by 50-100% by eliminating losses, as there are two activities in the Kaizen philosophy: (Constantin et al, 2014:2)

1. Activities that add value
2. Activities that do not add value

As it results in an increase in the value of the activities that arise in the production process, as any activity aimed at increasing the activities that create value will improve working conditions, and this is the reason why lean manufacturing depends on increasing labor productivity (activities that add value) by identifying losses and eradicate it.

(Ried & Sanders) also believe that since the costing method concentrates on reducing the cost of the product during the manufacturing stage the Kaizen philosophy's concept of process enhancement is applied in everything such as lowering costs, improving quality, and lowering waste in all system components putting improvements in place during the design and development stages that lower manufacturing costs of an already-existing product that were not taken into account during the design phase. (Ried & Sanders, 2010)

As the economic units use the Kaizen methodology to considerably and quickly lower the costs of components with high costs, as the costing systems in the Kaizen share many fundamental features: (Mustafa, 2022: 1270)

1. The emphasis is on understanding and driving process costs rather than acquiring more precise product costs.
2. Cost reduction is the team's job, not the individuals.
3. Actual production costs are frequently estimated, communicated, and analyzed by frontline workers, and in most situations, the cost information is collected and processed by the team itself, rather than the accounting team.
4. The cost information teams utilise is tailored to production environments, ensuring that learning and improvement efforts are focused on the areas with the greatest potential for cost savings.
5. Standard costing is constantly modified to reflect historical cost reductions and projected cost reductions in the future. It preserves proven breakthroughs in process optimization while setting a new standard for future advancement.
6. Business teams are responsible for coming up with cost-cutting solutions, and they have the authority to make small-scale expenditures if they can demonstrate their capacity to cut expenses.

The following is a chart showing Kaizen's goals to reduce product costs.

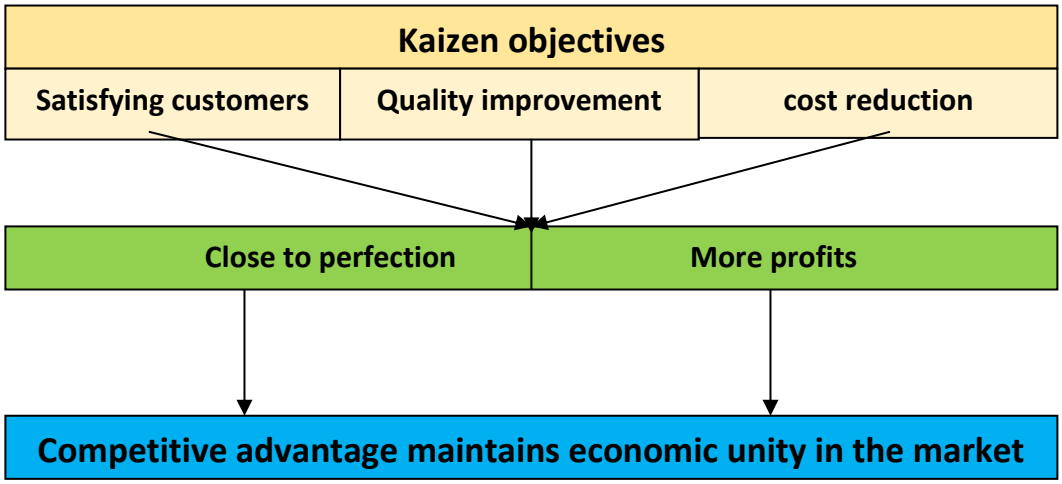


Figure (6) Kaizen goal of continuous improvement of products: Preparation of the two researchers

It is clear from the above figure the process of cost reduction, through continuous and harsh reduction of the costs of activities that do not add value, reducing waste, and improving the time of the industrial cycle, as all of them contribute to reducing the cost, as well as the improvement suggestions submitted by employees, which are taken seriously and implemented Appropriate ones wherever possible as the result indicates a more efficient, effective and lower cost process.

DISCUSSION

Through what was presented above and what previous studies have covered, we notice the major role played by green value engineering and green kaizen techniques in reducing costs and improving the quality of products and services, through the impact of the use of these two techniques on the environment and society. With regard to their effects on the environment, a decrease in the use of environmental pollutants can be observed. Green value engineering focuses on the economic units' use of environmentally friendly materials in the production and manufacturing process, because the engineering of production or manufacturing processes, as well as the engineering of the rest of the processes from the beginning of the idea of production or development until presenting the product to customers as well as after-sales services, product recycling, or the waste landfill process its a study Product design principles help economic units to determine the size and quality of materials required for production and manufacturing, and determine the size and quantity of pollutants and the possibility of reducing them, leading to providing products with the least amount of pollutants harmful to the environment with the least consumption of raw materials while maintaining product quality. The green value engineering methodology has been since its inception. In the 1940s, it focused on the scarcity of resources, and the extent of the capabilities or capabilities of economic units to produce and manufacture in light of the scarcity of these resources. On this basis, the green Kaizen methodology was used along with the green value engineering methodology, for the basic goal of preserving the environment and reducing... Production costs in light of resource scarcity, and global concern for the environment.

Society has had an effective role in adopting modern technologies by economic units that reduce pollutants that accompany the production and manufacturing process and reduce costs, Through the great interest given by social organizations to preserving the environment, and introducing the beneficiaries of the activities of economic units to the impact of their operations on the environment, and thus the damage they cause to society, present or future, as well as defining the costs involved in reducing pollution in various periods, and because man is the end user of products These units, the social organizations have a major role in guiding its decisions in order to use products that are less harmful to the environment, which contributed to forcing the economic units to produce products that meet the desires of customers, so these units had to use cost-effective techniques that contribute to reducing the impact of pollution and reducing costs.

CONCLUSIONS

1. The techniques of green value engineering and green kaizen enable economic units to better estimate production costs in order to reach the credibility of product pricing and thus the profitability of that unit, in addition to enabling the unit to allocate costs to products, operations, cost centers, or service centers in an appropriate manner to facilitate the implementation of Liability protection system.
2. The importance of adopting the technologies of green value engineering and green kaizen, and the reflection of this importance on the environmental aspect, which leads to the creation of a safe environment.
3. Adopting green value engineering and green kaizen technologies leads to creating a competitive advantage for the economic unit and achieving appropriate environmental cost management.
4. The technology of green value engineering requires the establishment of an integrated work team for the purpose of completing its steps. This team consists of engineers, designers, production supervisors, cost accountants and others.
5. Adopting the green value engineering approach leads to reducing the initial costs of the components of the product or project according to the initial design, which takes into account environmental aspects, and then the best design is chosen by the design team, thus achieving the optimal use of resources.
6. Green value engineering technology aims to deliver quantifiable improvements through cost reduction, better quality and improved design features for the customer.

RECOMMENDATIONS

1. Senior management's commitment to the environment and managing its costs, realizing its importance through adopting the of green value engineering and green kaizen, and their role in measuring and reducing costs.
2. Encouraging economic units to follow the techniques of green value engineering and green kaizen by holding courses in this regard by understanding how to direct the market, manage quality and innovation to help economic units achieve optimal green performance.
3. Comprehensive interest in analyzing activities and knowing their costs, and not neglecting any activity related to the competitive environment.
4. Using appropriate analysis tools and techniques for green value engineering and green kaizen techniques for economic units to ensure continuity.
5. The need to apply the techniques of green value engineering and green kaizen in order to help economic units reach the best operating conditions with the lowest costs and environmental damage and achieve competition.

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