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The Role of Green Kaizen in Productivity Enhancement

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ABSTRACT

The world is moving towards greening business in general and production systems in particular. At the same time, economic units seek to enhance their productivity and find any variables that can contribute to improving their elements. Economic units should not ignore the green dimension of cost management techniques because of its role in containing the green dimension of the production system and the product. However the few researches dealt with the subject of the green kaizen showed its role in reducing costs and improving the environment. Those researches did not address its contribution to raising the level of productivity. Productivity is an important indicator of economic units that expresses their level of success and progress, and they need new dimensions such as the green dimension to raise their levels. Here the research shows that Green Kaizen works to reduce the amount of waste, reduce costs, and improve the environmental aspects of the production system, which enhances the system's input of materials and energies and increases good output. The research aims to present the theoretical dimensions of the variables, link them in an analytical method, and explain the relationship between them. The research provides an opportunity for future research to apply green kaizen in many industrial or service fields and to use other tools to support continuous environmental improvements.

Keywords: *Kaizen; Green Kaizen; Productivity; Productivity Enhancement; Green Productivity*

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INTRODUCTION

Environmental awareness increases with the increase in the causes of pollution. The fingers point to the production systems as biggest cause, especially in the consumption of natural resources and energies, waste generation and negative environmental impacts. On the other hand, economic units today need to improve their productivity level by new methods that are compatible with the current situations and challenges, while taking on their responsibilities towards protecting natural resources, preserving the environment and reducing pollution sources.

Some of studies dealt with the method of determining costs according to the Green Kaizen as one of the green management accounting techniques, especially in the field of the pharmaceutical industry. Thorne relied on the Green Performance Map as a tool to reduce costs by reducing environmental impacts. By employing Green Kaizen and its tools in the pharmaceutical industry to reduce emissions and eliminate environmental waste in the production system. This has resulted in clear environmental improvements with significant financial savings(Thorne, 2019) . While Bellgran relied on the concept of Green Kaizen also

in the pharmaceutical industry, where it relied on cost as the main driver of environmental improvements. He explained that the activation of environmental strategies is very necessary in this industry and that it is important to find many standards and drivers for their implementation. It relied on cost as a primary criterion for choosing between alternatives for environmental improvements consistent with market needs and achieving profitability. He concluded that it was a successful method because it provided a new opportunity to link environmental responsibilities with economic goals (Bellgran et al., 2019) .

The use of green kaizen in the field of cost determination and reduction besides its use in the field of environmental improvement of production systems makes it necessary to employ it in the field of reducing the negative environmental impacts of these systems and improving their efficiency in the use of resources and transforming them into low-cost and green products. The multiple dimensions included in green kaizen can improve the level of productivity by improving the components of the productivity equation such as reducing environmental waste, reducing resources and costs waste, and increasing good outputs.

The research presents the theoretical dimensions of the concept of Green Kaizen and its dependence on the PDCA cycle Plan-Do-Check-Implement in making improvements and identifying alternatives as well as making use of the information provided by MFCA Material Flow Cost Accounting for in identifying areas for improvements. The research theoretically links the variables based on what was suggested by previous studies, although they are very few and do not cover various fields such as the production or service industry.

The current research was able to presents a theoretical basis that provides future studies with an opportunity to expand and apply them in the fields of industry and services. The research is divided into three sections. The first section presents the concept from which Green Kaizen arose, its development, areas and tools for its application, then the second section presents the concept of productivity and its importance for economic units. The third section deals with the analysis and interpretation of the variables and their relationship to each other to reach the extent of the contribution of Green Kaizen to improving the level of productivity by improving its components or elements.

GREEN KAIZEN

The term kaizen arised in the 1950's by Japanese companies to adopt continuous improvement of their operations. "kai" means changing and "zen" means good or better, which together represent gradual, orderly and continuous for the better change. It can be expressed by term 'improvement' (Kaur, 2014). Kaizen was first defined by Imai in his book "Kaizen - The Key to Japanese Competitive Success", which was published in 1986, as a concept of continuous continuous improvement that emphasizes the need to enhance the environment of production processes in the economic unit through the participation of individuals in its improvement (Chan & Tay, 2018)

Ried & Sanders believes that the concept of process improvement according to the Kaizen philosophy is applied in everything as reducing costs, improving quality and reducing waste in all components of the system (Ried & Sanders, 2010)

The method of estimating costs according to this method focuses on making improvements in the cost of the product at the manufacturing stage instead of improvements in the design and development stage, that is, it works to reduce costs during the production stage of a current product that was not taken into account within the design stage

(Modarress et al., 2005). The ultimate goal of green kaizen is to reduce the environmental impacts resulting from production processes. (Pampanelli et al., 2011). The product as the manufacturing stage usually consumes materials, energy, water and produces environmental impacts such as toxic chemicals, wastes generation, energy consumption, and carbon emissions. (Ried & Sanders, 2010)

There have been many successful experiences of applying the Kaizen philosophy in several areas, the most important of which is the field of environmental protection and its application in economic units in order to improve the environment, which represents an upward collective effort. (Brasco et al., 2011). Therefore, establishing a culture of continuous environmental improvement called green kaizen is a necessary way for the production industries to take full responsibility for the impact of their production systems of processes and products on the environment and the climate. By working to identify, visualize and prioritize environmental aspects (Bellgran et al., 2019)

PDCA

The steps of Kaizen cycle originally developed by the statistician Deming, called Plan-Do-Check-Act (PDCA) cycle,

which refers to the concept of quality and total quality management, so he modified it and applied it to Kaizen to improve quality periodically in four endless stages (Patel & Desai, 2020) :

- **Plan:** Studying and analyzing the current situation and forecasting requirements and changes to make improvements. It begins with defining the problem, setting goals, and preparing an action plan, taking into consideration stakeholders from all parties.
- **Do:** Develop metrics and pilot implementation in controlled conditions, planning operations, collecting data, and analyzing facts to develop solutions and implement changes on a small scale for the trial.
- **Check:** eliminate the effects to see if the desired result has been achieved, where the solutions are tested and measured to check whether the improvements meet the objectives set in the planning stage or not.
- **Act:** Putting the tried-and-true steps into practice if the improvements are successful, the cycle resumes so the team can start planning on a larger scale, but if the changes are not realized, the cycle starts over.

The main purpose of this course is to eliminate anything undesirable in the production stages and achieve harmony and consistency and then move to a new improvement cycle. This means that the system should never be based on the current situation (Patel & Desai, 2020) .

The application of these steps in reducing the environmental impacts generated by the production system will improve the system and enhance the green aspect, which will contribute to improving the product and its orientation to be environmentally friendly. Many steps of Continuous environmental improvement according to this method do not require costs or they may require small amounts. They include small, gradual, and continuous improvement steps. Continuous environmental improvement of the production system contributes to improving the efficiency of resource use, especially natural resources. It also contributes to paying attention to the quality of raw materials from the environmental aspect.. Continuous environmental improvement also reduces waste, which increases good output.

MFCA

It is a method of environmental management accounting that aims to assess and reduce both environmental impact and product costs (Youngin & Chattinnawat, 2019)

MFCA creates a direct link between the material information about resource flows and the monetary information provided by management accounting in order to link technical and environmental considerations and translate the physical indicators used in production or waste disposal into monetary indicators and vice versa (Wagner, 2015)

It is also characterized by the fact that the information it provides represents a way to discover and identify problems, as the transparency of material flows and associated costs increases significantly by identifying areas of material and energy consumption and absorption of costs, and this makes it more effective in controlling and measuring costs and improving productivity. (Wohlgemuth & Lütje, 2018)

These costs are distributed to the positive and negative cost of the product based on the attribution of activities to the generation of the product and waste. This technique is used to analyze production costs into positive cost and negative cost. The positive product cost expresses the

cost of the amount of materials that have been converted into final products according to the activity of the economic unit. While the negative product cost is the cost generated from the total waste materials (waste) i.e. those materials that are not converted into products, the positive and negative cost can be divided into 4 parts: material cost (MC), system cost (SC), and energy cost (EC), waste cost (WC) (Chaiwan et al., 2015)

PRODUCTIVITY

According to the general definition of productivity, which represents the relationship between the outputs of the production system and the inputs necessary to create these outflows, this relationship can be mathematically expressed as follows (Georgios et al., 2014):

P: Productivity.

Input: all production elements.

Output: all Primary products and secondary outputs.

Total (P) = input/output

The total productivity of production factors can be measured in units of money, value of the goods or services sold represent the output which divided by all costs of input i.e materials used, labor and capital investments. While partial

productivity is measured depending on each factor of production separately, partial productivity is an answer to a question about the amount of output that can be achieved from a certain level of input (Chase, Richard B. et al., 2006)

GREEN KAIZEN & PRODUCTIVITY

An inevitable secondary to the economic system, because the ethic of economic growth focuses on productivity. It is no longer possible to evaluate the performance of the institution on the basis of the economic coefficient alone, but rather it must be integrated with the environmental performance as well. The inclusion of the environmental impact component in the productivity scale is due to that most important reasons. Although companies view environmental protection as an obstacle to achieving short-term profitability. (Nachimutha et al., 2006).

When improving financial productivity is targeted, the best approach is to focus on reducing the cost per unit of the product (Kamble & Wankhade, 2018). The cost of the product unit includes most of the inputs used in production, especially the raw materials. Focusing on the environmental impacts generated by the components of the product may not reduce the cost, but it represents an advantage in imposing a higher price than similar products in the market. The environmental

quality of the product will make it the focus of customers' attention and will attract a larger number of them. On the other hand, continuous environmental improvement in production Technique via increasing positive production factors and treating, removing or reducing negative production factors is a successful way to increase productivity (Tuttle & Heap, 2008)

Green kaizen cost concepts help eliminate waste in operations, as much as possible, thus improving processing time, cost and quality (Al-Barghuthi et al., 2020). Focusing on improving processes will directly eliminate time that does not add value, such as stops, breakdowns, handling between stages and others, which increases the efficiency of energy use, and improving processes leads to improving the quality of the product especially via searching for raw materials with lower environmental impacts. Which obviously increases the efficiency of the use of materials. In addition that waste recycling activities enhance the process of cost optimization, as it represents a source of income that reduces the burden of costs generated from it. Continuous environmental improvement in production processes, especially those that target product components and raw materials, leads to reducing environmental impacts during the product life cycle, as it is the

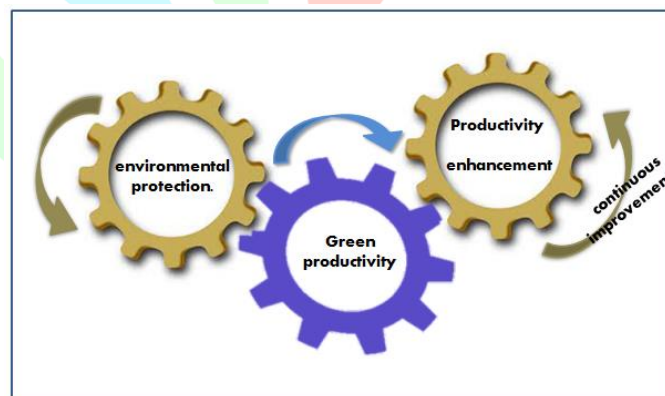
most important factor in achieving environmental and economic sustainability. resulting from environmental aspects and impacts, especially those related to compliance with legislation, as well as improving its competitiveness, which opens new opportunities for it in the market (Xie et al., 2019).

The cost of waste does not only include the costs of disposing of waste, but also includes the value of the materials that entered its formation in addition to the costs of storing and transporting it, and this also includes energy and its flows, where energy is considered as materials within the concept, all costs related to energy from the cost of labor and others are included in its flows (Wagner, 2015). MFCA is based on the principle of material balance, which means that the amount of input materials can be consistent with the sum of products and material losses (waste), i.e. the sum of the main, secondary and incidental final outputs, it focuses on the relationship between inputs and outputs in production processes, where the loss is defined as The difference between input and output based on weight (Kokubu & Kitada, 2015). Green kaizen also contributes to improving quality when it relies on the information provided by material flow cost accounting, as MFCA technology helps to identify

waste generation areas and indicate the associated costs, where check points can be reduced and replaced by focusing improvement on these areas. (Youngin & Chattinnawat, 2019). The material and monetary informations provided by the MFCA represent a successful tool for identifying environmental problems in Green Kaizen. Green Kaizen relies on MFCA to determine the areas of waste generation and energy consumption and works to treat them and propose solutions. This method leads to reducing the negative cost that represents any materials that have not been converted into products since this enhances the input aspect. This will also reduce the costs of inputs vs increasing the quantities of outputs.

The more a company invests in quality and environmental aspects, the more likely it is to achieve green performance excellence. The concept of corporate green performance focuses on introducing or improving new products or processes in a way that not only meets customers' expectations in terms of quality, but also leads to improved environmental performance (Abbas, 2020). Quality management practices in the form of ISO 9001 standards lead to reductions in waste generation and emissions so TQM certification can facilitate the implementation of environmental management, leading to improved environmental performance (Wu et al., 2020)

Figure (1)



Source: N. Mohan Das Gandhi V. Selladurai P. Santhi, (2006), "**Green productivity indexing**", International Journal of Productivity and Performance Management, Vol. 55,p596.

Fig1. Show how the Green kaizen is considered a successful economic method, as it achieves improvements in productivity and supports environmental protection at the same time, as the improvements it includes reduce pollution and reduce environmental waste in each improvement cycle of the production system

DISCUSSION AND CONCLUSION

Productivity can be increased by adopting Green Kaizen. Green Kaizen practices have been used to reduce costs and improve the environmental aspects of the production systems. Its contribution to waste reduction has also been clarified.

Continuous environmental improvements called Green Kaizen improve the method of converting inputs into outputs. It can enhance the value of the outputs that represent the finished products by being environmentally friendly and of high quality, which gives them the advantage of a higher price and the ability to compete with similar products in the market. It also contributes significantly to improving the efficiency of resource use from raw materials and energies, reducing waste, reducing environmental waste, reducing the level of pollution and negative environmental impacts of inputs and processes.

This theoretical research can be the basis for many applied studies in the future and the experience of Green Kaizen practices in various fields. Green Kaizen is currently applied in the pharmaceutical industry, but it can be developed for adoption in other industries or also in the field of services.

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