SELECTING KEY PERFORMANCE INDICATORS (KPIS) IN ENVIRONMENTAL SUSTAINABLE STRATEGIES FOR BUSINESSES

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Abstract: *A growing number of businesses seek to become more environmentally-friendly and to employ effective and efficient strategies that include objectives such as decreasing their carbon footprint, reducing their waste and increasing their energy efficiency. In order to make their efforts measurable and to evaluate the implementation of the strategy, environmental key performance indicators (KPIs) are increasing in popularity for the companies' strategy. However, the number of KPIs used in business strategies is rapidly increasing. Therefore, more and more companies and researchers are presented with the dilemma of selecting the most relevant, useful and important environmental KPIs. In this paper, we analyse the literature concerning environmental KPIs, discuss different criteria used in the selection of such KPIs, and make proposals regarding this criteria.*

Keywords*: environmental key performance indicators, environmental strategy, sustainable strategy, sustainability environmental key performance indicators, KPI.*
JEL Classification: *Q01, M19.*

1. The importance of using KPIs in sustainable business strategies

The interest in sustainable business strategies has been steadily growing in the last decades; within this trend, another important one is included: the interest in environmentally friendly strategies. This has happened in the context of climate change, growing pollution, and increasing consumer concern and pressure on companies to radically change their business processes. Therefore, simple environmental campaigns or tactics on the behalf od businesses are not enough; in order to bring substantial change in business processes, there is an urgent need to include environmental indicators in the business' strategies.

2. Popular KPIs and KPI categories used in sustainable business strategies

Hristov and Chirico (2019) have researched sustainable KPIs and put them into three main categories: related to environmental goals, to social goals and to economic goals. Five most popular environmental KPIs were identified, for which we also mention the related strategic goal and the used measurement.

The most common environmental KPI identified by Hristov and Chirico (2019) is the renewable resource rate, related to the strategic goal of improving the use of renewable resources, and measured with the quantity of renewable sources. The second most used environmental KPI is the efficiency resource use rate, related to the goal of reducing not necessary resources consumption, and measured either with energy used per 1000 production units, or consumption of different resources per 1000 production units. The third most used environmental KPI is total emissions of greenhouse gasses by weight, measured with CO2/1000 production units. Moreover, other common environmental KPIs are waste reduction rate (measured as the percentage of waste generated per 1000 production units) and the rate of reusable or recycled material (the percentage of reusable or recycled material).

3. The criteria and process for the selection of environmental KPIs

Kibira et al. (2017) and Kibira and Feng (2017) have discussed the selection of sustainable KPIs in the context of manufacturing and have identified a series of six criteria that stakeholders can use in order to select environmental KPIs: (1) cost effectiveness (the

relation between the cost and the benefit of implementing the indicator); (2) quantifiability (how much of the indicator can be precisely expressed numerically); (3) calculability (how correct and complete is the calculation necessary for computing the KPI's value); (4) management support (how willing is the management to implement and support the KPI); (5) comparability (to what degree is the historic data available); (6) understanding (to what degree is the KPI comprehensible by the team). Using these criteria, business stakeholders can include or exclude environmental KPIs, but also rank the ones included in the business strategy by their importance.

Alwaer et al. (2010) consider that, in order to implement an efficient selection for environmental KPIs, it is necessary to include four categories in which indicators should be separated: mandatory indicators, desired indicators, inspired indicators and non-active indicators.

Angelakoglou et al. (2019) have a slightly different approach: they consider that enviromentally-friendly strategies should be measured using six different types of KPIs: technical performance, environmental performance, social performance, social performance, ICT performance and legal performance.

4. Performance strategies

Development and implementation of strategies

Strategies are complex decision-making processes that take place at the level of the organization and are oriented towards achieving the fundamental objectives that the organization has proposed. To this end, strategies must meet two essential conditions:

• using resources, capabilities and skills efficiently and creatively

• achieving sustainable competitive advantages in the external competitive environment.

The elaboration of some strategies is always done in conditions of uncertainty generated both by the incompleteness of the data and by the dynamics of the external forces. Therefore, a successful strategy contains sufficient reserves of flexibility and adaptation over time to changes in the external environment, especially in the competitive one. When developing a strategy, one must also anticipate how to implement it, knowing that good ideas often end badly.

The implementation of a strategy is done in time, and the results can be immediate or lasting. There are always time constants between implementation and results, which must be known and taken into account. Also, there are always a number of resistances that arise when implementing a strategy. Knowing these resistances is crucial to overcoming them, without consuming too much energy and time. For example, one of the strongest resistances to the implementation of a strategy that contains a large amount of novelty or that imposes important changes is the mentality. Ignoring the existence and role of mentality in any process of change will encounter real difficulties in implementing a strategy. This situation is characteristic especially for us, Romanians, who were not educated in the spirit of change and taking the risk of uncertainty. Therefore, real attention is required to identify and assess possible resistance to the implementation of a strategy.

The evaluation of a strategy is based on a metric and a reference system, known and accepted since the strategy development phase. The evaluation must take into account the implementation process and the time constants required to obtain the results. Evaluation is an absolutely necessary process and it is part of a distributed, throughout the implementation of the strategy, so that if necessary to intervene to correct and adapt it to the new conditions and requirements of the external competitive environment. Evaluation allows a strategy to be considered a success or a failure. It is important that even in case of a failure, its magnitude should be as small as possible, and the associated losses should not

jeopardize the existence of the organization. Thus, a high-impact, unsuccessful strategy can lead to the bankruptcy of the organization.

A very important aspect in developing a strategy is its opportunity. In other words, it must be analyzed with a lot of realism to what extent the considered strategy corresponds to the requirements of the beneficiaries and is not premature or morally outdated. The elaboration of strategies is based on the analysis of the external environment and, respectively, the analysis of the internal environment. Based on these analyzes, the favorable and unfavorable conditions for launching or continuing a strategy are established and it is decided on the opportunity or its adaptation.

SWOT analysis The name is given by the initials of the English words Strengths, Weaknesses, Opportunities and Threats. Given the popularity of the phrase SWOT in the literature and in management consulting we will keep it as such in the following.

Strengths are translated in this context by the strong or strong elements of the organization, respectively by those that give it strength or power compared to other organizations in the external competitive environment. The concrete way of manifesting these strong elements varies from one organization to another, but they generally refer to the fundamental competencies, which are based on the resources and capabilities of the organization.

Weaknesses are translated in this context by weak elements, respectively elements that generate disadvantages compared to other organizations in the external competitive environment. The analysis of the internal environment ultimately leads to the identification of the poles of strength and weakness for each organization, but in comparison with the other competing organizations. In other words, these evaluations on the SW axis have a relative significance and depend on the realism and courage of managers to know their weaknesses.

Opportunities means opportunities in the external environment for the possible strategies of the organization. These opportunities exist, but they must be identified and deciphered as appropriate as possible, taking into account the associated uncertainties. At the same time, it is important to evaluate a certain dynamic of these opportunities in order to make the most of them.

Threats means potential threats to the organization in the external competitive environment. These threats may result directly from competing organizations or as a result of the dynamics of the external environment. We also emphasize here the relative nature of the evaluation on the OT axis. What is an opportunity for one organization can be a threat to another organization, depending on their behavior and their relationship to the external competitive environment. For example, the advent of personal computers has been a threat to companies like IBM, but a great opportunity for new companies like Apple or Compaq.

To obtain a better overall picture, the axis of internal factors SW can be associated with the OX axis of a diagram, and the axis of external factors OT can be associated with the OY axis of the same diagram. Combining internal factors with external factors can generate four categories of strategies. These are generic strategies because they acquire content in the concrete conditions of each organization.

• SO strategies. These are max-max strategies, in the sense that they combine the most favorable elements to build a strategy. OS strategies use the strong or powerful elements of the organization to take advantage of existing opportunities in the external environment. These strategies are aggressive and aim to create a net competitive advantage over other competing organizations.

• WO strategies. These are min-max strategies, in the sense that they combine the elements of weakness existing in the organization with the existing opportunities in the external environment.

Basically, they try to use the opportunities to eliminate weaknesses or turn them into strengths for the organization.

• ST strategies. These are max-min strategies, in the sense that they use the strong elements of the organization to avoid or reduce existing threats in the external environment. They are defense strategies, but they can turn into attack strategies if the ratio of internal forces to external ones is correctly evaluated.

• WT strategies. These are min-min strategies and aim to minimize weaknesses, while avoiding threats from the external environment. They are defensive strategies and they are used especially when the organization is in decline, to avoid its bankruptcy.

Performance can be defined according to the chosen metrics and parameters. For the following we will refer only to four global indicators: efficiency, quality, innovation and sensitivity to consumer demand. Performance strategies aim to obtain the highest possible values for each of these global indicators, in the reference system specific to the organization and for the metrics attached to each indicator. These are also called strategies at the functional level of the organization and aim to achieve competitive advantages by improving core operations, such as production, materials management, marketing, research and development, as well as by better use of human resources of the organization. Although these strategies can focus on one or more functions, they encompass the entire life of the organization and generate synergistic effects.

Efficiency strategies

Any organization can be considered in the abstract as a system that turns inputs into outputs. Inputs are represented by the main factors of production: land, capital, labor, production infrastructure, production technologies, etc. Outputs are products and services. The measure of efficiency is given synthetically by the amount of inputs required to produce a unit of outputs. In other words, efficiency is the ratio of outputs to inputs, expressed in the same units of measurement. The higher the value of this ratio, the greater the efficiency.

A well-known strategy in increasing efficiency is to increase production volume, while keeping fixed costs at the same level. This can be achieved through a better division of labor and, respectively, a greater specialization of the labor force. The classic example is Ford's introduction of mass production and the belt assembly process for the T model car. Ford thus managed to produce the most popular and cheapest car of the time. As a result of the increase in production volume, the cost of a Ford car dropped from $ 3,000 to only $ 900.

Increasing efficiency can also be achieved by capitalizing on learning processes. The effects of learning are seen especially in the realization of new and very complex processes and products. For example, the reduction of costs due to learning effects, by repeating the same activities, is much more obvious in the case of a process that involves 1000 sequences of different activities, than in the case of a process that involves only 100 sequences. Another correlation that the researchers highlighted is that of reducing unit costs with increasing experience in making a product and integrating it into the knowledge curve.

An important increase in efficiency can be obtained by making the production lines more flexible, respectively by switching from rigid assembly lines in the case of mass production, to flexible production cell lines. Each flexible production cell groups 4-6 machines capable of performing a variety of operations in order to produce a family of components of complex equipment or even simpler equipment.

A strategy that has been developed in recent years in materials management is called JIT (Just-In-Time) and contributes significantly to increasing efficiency. This strategy is simple, but requires a computerized materials management system and a reliable and

efficient supply system. The basic idea is to reduce the stocks of materials needed for production and to schedule them to arrive from suppliers just in time for their introduction into the production process. The disadvantage of the strategy is that any delay in receiving materials from suppliers causes delays in the production process and therefore unjustified increases in costs. Therefore, the JIT strategy must be combined with the creation of buffer stocks, much smaller than the classic material stocks.

Labor productivity is an important factor in increasing efficiency and reducing production costs. However, labor productivity is linked to the performance and motivation of human resources. Three strategies can be used to increase labor productivity:

- training staff to increase their qualifications,

the creation of self - management work teams and

- financial recognition of performances.

Research to highlight the work efficiency of Japanese people compared to that of Americans has shown the importance of continuing education for a company's employees. For example, of the approximately 30,000 employees of the Japanese company Sanyo, approximately 10,000 employees go through the training programs of the Sanyo Corporate Educational Training Center each year.

The creation of flexible production cells led to the idea of forming work teams to serve them and to have almost total autonomy. This means building teams of 5-15 employees who can make a whole product or group of products and who enjoy managerial autonomy, respectively to have selfmanagement. This reduces decision-making time and therefore helps to increase efficiency.

People work for money and so it is easy to accept the idea that everyone should be paid according to the quantity and quality of work. This would be an important factor in increasing motivation. However, the strategy of motivation through salary increases is not so easy to implement, and sometimes the barrier of mentality is even difficult to overcome. Perhaps an interesting example of this is the fact that until recently a university professor received the same salary, regardless of what he did and the university in which he worked. With the change of the financing mechanism of the universities, the problem of the differentiated salary of the professors was raised, both from one university to another and within the same university. Due to the egalitarian mentality, the implementation of this strategy encounters serious difficulties. As such, work efficiency is also low because performance is not recognized as such and is therefore not encouraged by the system.

Quality strategies

Quality management occupies an important place in strategic management. It has spread to all types of organizations, including non-profit and public administration.

The TQM (Total Quality Management) strategy is the one that has started to be accepted more and more, with its success in American and Japanese companies. This strategy is based on the five ideas formulated by Deming:

• Better quality means lower costs because it recovers less, makes fewer mistakes, delays less and uses time more efficiently.

• As a result of the first step, labor productivity increases.

• Better quality means increasing the market segment and therefore the possibility of increasing prices for those products.

• This leads to increasing the profitability of the company and its sustainability in business.

• As a result of the above, the company can create new jobs.

Deming developed these ideas and formulated 14 points for quality management. These are:

• To create a constant concern for improving the quality of products and services, in order to become competitive and to stay as much as possible in business, in the given competitive external environment, creating new jobs.

• To adopt a new philosophy, being in a new economic era. Western management must learn its new responsibilities and take control of change.

• Abandon the quality assurance inspection. Eliminate the need for inspection in basic processes by implementing quality in all phases of production of products and services.

• To continuously improve the production and service system, having as final results the improvement of the quality of products and services simultaneously with the decrease of the total costs.

• Introduction of on-the-job training.

• Leadership training. Its purpose is to help people work better.

• Eliminate fear so that people work in a free atmosphere, without constraints and without fear of being penalized for every mistake.

• Eliminate barriers between departments. Employees in a company must work as members of a single family.

• Eliminate slogans and slogans that are only about appearances and not the essence of the production process. The real cause of the low level of quality is in the construction of the system and is therefore beyond the behavior of employees.

• Eliminate quantitative standards and evaluations of results and introduce leadership everywhere.

Eliminate barriers that prevent people from being proud of their work and that often make merit recognition an attribute of leadership. Most workers thus lose themselves in the anonymity of recognition.

• Introduce a vigorous training and self-improvement program.

• To make every person in a company make the necessary change. Change is for everyone, not just management.

Although many of these ideas formulated by Deming, as well as other theorizations of TQM existing in the literature, implementation is more difficult and time consuming. Recent studies by the American Quality Foundation show that only 20% of American companies regularly evaluate quality assurance programs, while this percentage is 70% for Japanese companies.

The implementation of TQM in an organization can only be done if there is a general consensus from all their employees. Otherwise, there is a risk of developing excellent quality improvement programs, but the final results will be below expectations because not all employees will participate in the implementation of these programs. For example, when Xerox launched its TQM program in 1983, the first step was to train all employees on the concepts and benefits of this quality improvement system. It started with the top of the management pyramid and then each trained group trained other groups of employees, as in a waterfall. Thus, all the almost 100,000 employees of the company were trained.

The most important thing when implementing TQM or another quality strategy is to establish a metric to evaluate the success of the implementation. In the case of companies that place products on the market, statistical evaluations are usually used, such as the number of defects per million products or components delivered. In 1987, when Motorola introduced the TQM program, the quality level was characterized by a statistic of 6000 defects for one million parts produced. In 1992, as a result of the TQM program, statistics indicated only 40 defects per million parts produced.

It is a dramatic and significant decrease for the success of TQM implementation.

The Japanese company Hitachi began implementing TQM in 1978. At that time, the company produced software with a consumer failure rate of 100 failures / 1000 computers. In 1992 this failure rate dropped to only 2 defects / 1000 computers. In 1978, Yokogawa Hewlett Packard (YHP) began implementing a TQM program. Then the defect rate was 4000 ppm (parts per million). In 1982, the defect rate was reduced to only 3 ppm. At the same time, workers' productivity increased by 91%, total costs decreased by 42, and profits increased by 177%.

Innovation strategies

From several points of view, innovation is the most important component of competitive advantage. The success of product or process innovation is a unique feature for any organization competing with other similar organizations. There are companies that have become famous precisely by adopting an innovation strategy. For example, Du Pont has made a number of innovations and inventions that have long been part of everyday life. These include cellophane, nylon, freon and telephone.

Although the innovation strategy leads to the achievement of competitive advantage, we must recognize that the failure rate of new products is relatively high. A study conducted for 16 companies in the field of chemistry and electronics suggests that only 20% of products that represent innovations and inventions manage to stay on the market and become a real success for the company. Another study conducted in one chemical company and two pharmaceutical companies shows that only 60% of research and development projects reach the technical realization phase, 30% can become commercial and only 12% achieve market success.

Specialists distinguish between:

- quantum innovation strategy: the resulting product or process is a total novelty, respectively they move away from known technologies. For example, the development of the World Wide Web on the Internet is a quantum innovation. Another quantum innovation is the first Xerox photocopier.

and

- incremental innovation strategy: refers to an extension of what already exists. For example, the Intel Pentium Pro microprocessor is an incremental innovation, as it was made in an existing series of microprocessors, but with lower performance.

The degree of uncertainty of market demand is higher for quantum innovation than for incremental innovation and therefore the failure rate associated with the quantum innovation strategy is much higher. To these is added an insufficiently developed marketing for the introduction of novelties on the market. Sometimes there is even a kind of technological myopia on the part of those who approach innovation strategies, without being prepared to introduce new products on the market and focus only on technological performance.

A classic example of technological myopia is the new computer produced by NeXT in the late 1980s. NeXT was founded by Steve Jobs, who came up with the idea for the personal computer and founded Apple. From a technological point of view, the computers produced by NeXT contained a series of high-performance technical features, superior to other computers. But technologically focused, the manufacturers did not think about the beneficiaries and did not develop equally innovative software facilities. Therefore, the computers produced by NeXT have not turned into a market success.

Innovation strategies are closely correlated with strategies to make the manufacturer aware of consumer requirements. It is not enough to know what consumers want, but to respond to these requirements as soon as possible with new products with the most diverse characteristics. In other words, the time constant to meet consumer requirements must be

as small as possible. This awareness of production is an important capability for a company and directly contributes to achieving a sustainable competitive advantage.

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