SUSTAINABLE LOGISTICS, AN INTELLIGENT BUSINESS MODEL

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Abstract: *Businesses gain competitive advantage if they manage to integrate corporate sustainability with environmental performance, economic contribution and social responsibility. The reduction of waste and environmental pollution, the use of non-polluting energy and the efficiency of the use of natural resources positively affect not only the environment, but also logistics, by reducing costs. A company's performance can be measured by resource productivity and waste reduction because waste does not add value to an activity. Adopting sustainable logistics is profitable for a business because the effect of responsible practices in sourcing, transportation, storage, packaging is cumulative. If sustainability intervenes at the level of each logistics activity, then we can talk about the integration of sustainable logistics. The implementation of sustainable logistics strategies becomes extremely important in the current global context. All sustainable logistics strategies are interdependent and interdependent. Waste management helps improve the quality of finished products, which could lead to reduced returns and reverse logistics efforts. Better information to stakeholders could reduce overstocking and subsequently waste. Such an intelligent business model facilitates the implementation of each strategy and generates a synergistic effect.*

Key-words: *logistics, sustainable logistics, business model, sustainable logistics strategies.*
JEL Classification: *Q01, M21, L21.*

1. Introduction

The concept of sustainable logistics is closely related, in the specialized literature, to intelligent business models. In today's environment, businesses gain competitive advantage if they manage to integrate corporate sustainability with environmental performance, economic contribution and social responsibility. Most companies focus on reducing waste and environmental pollution, using non-polluting energy and making the use of natural resources more efficient, with the aim of reducing the impact on the environment, but also with the aim of reducing the costs of logistics activity.

When organizations apply sustainability at the level of each logistics activity, we can talk about the integration of sustainable logistics. The implementation of sustainable logistics strategies becomes extremely important in the current global context. Smart business models facilitate the implementation of each sustainable logistics strategy and generate a synergistic effect.

2. Sustainable logistics and smart business models

In order to increase profitability, market share and reduce costs, logistics must operate at an interfunctional level, it must mediate and harmonize the activities of multiple sectors, departments or functions within the company. According to the author Ilieș (1999, pp.93-102), logistics is a transversal function, and its approach within the organization, respectively the optimizations, are done on processes, and not on functions.

The essential objective of logistics must be to ensure the competitive advantage, namely to ensure a sustainable superiority over the competitors, starting from the idea that the level of service to consumers and the cost are significantly influenced by it. The source of competitive advantage can be operating at a lower cost or providing a greater "value" to the client (Ganescu, 2016, p.157).

Logistics is a classic example of a systemic approach to business problems, respectively to the analysis of the total cost of logistics activities. Because the systemic approach requires compatibility between the objectives of the major functions in the company and its general, fundamental objectives, a logistics system, however efficient and effective, cannot suit all companies, which have different goals and objectives.

Sustainable logistics management includes sustainable planning, sustainable marketing, sustainable production, sustainable logistics. Sustainable logistics has thus become the "soul" of sustainable development.

There are many definitions of sustainable logistics in the specialized literature. Sustainable logistics represents the process of friendly use of environmental resources and the transformation of these inputs into outputs, which can be reused at the end of their life cycle, for the creation of "green" or sustainable logistics chains (Kumar and Candrakar, 2012, pp.1-6).

According to another view (Srivastava, 2007), sustainable logistics integrates environmental principles in logistics chains, including production planning, selection of resources and sources, production process, delivery of the final product to the customer and end of product life after the period of use.

Sustainable logistics is a broader concept, also taking into account the economic and social implications of activities, strivind to improve economical, ecological and societal interests simultaneously (McKinnon, 2010).

Companies also expect to increase sustainability performance through implementing sustainable practices because of the negative environmental impact of their business operations (Agyabeng-Mensah et al., 2020).

The framework of sustainable logistics comprises three elements: society, environment and economy, each with its own objectives. The objectives of these three elements are oriented towards people, planet and profit, being basically a three-way exchange (Macharis et al., 2014, p.14).

Sustainable logistics strategies are becoming important in today's global context. The specialized literature presents different types of sustainable logistics strategies, such as (Mohanty, 1997, p.276):

- The strategy of using information technology (electronic data exchange is a computerized system through which consumers, suppliers and producers can transmit information in real time; this supports the maintenance of an optimal level of stocks, allows quick adoption of decisions);
- The strategy of reverse logistics (it is based on the reduction of resource consumption, reuse and recycling of materials);
- Waste management strategy (based on three principles: waste reduction, waste control and prevention).

All sustainable logistics strategies are interdependent and interdependent. Waste management helps improve the quality of finished products, which could lead to reduced returns and reverse logistics efforts. Better information to stakeholders could reduce overstocking and subsequently waste. The implementation of each strategy generates a synergistic effect (Ganapathy, 2014, p.13).

The recent digitalization advancements have provided new opportunities for the business to enhance the value creation of the logistics functions through achievements of the sustainability goals (Shreyanshu et al., 2022). Sustainable logistics 4.0 creates a dynamic system capable of responding to customer requirements while still respecting environmental protection objectives.

2. Innovative business techniques, philosophies and mindsets

The most important techniques for the success of logistics management, with a role in the fulfillment of strategic objectives and in solving the essential problems of an organization, are the Just-in-time method, Lean Manufacturing, Kanban systems and Total Quality Management, which lead to high quality, quick response and low costs.

The industrial revolution had important implications on the development of manufacturing management. At that time, in industry, the equipment and machines were fixed to the ground, and the employees performed the operations around them. Within this type of production organization, product quality was high, conversion costs were high, but productivity was low. In 1913, repetitive production appeared, which led to a decrease in conversion costs, but also in product quality, so that, in 1944, Ford's first production plants appeared, with assembly lines. After 1950, by combining Just-in-Time with Kaizen, Total Quality Management, Total Productive Maintenance, Cellular Manufacturing and Six Sigma, the Lean Manufacturing production system appears.

In the 1990s, logistics management integrated different concepts, such as Quick Response (QR), Efficient Consumer Response (ECR), Just-in-Time and Keiretsu networks. The first two contribute to increasing speed and flexibility, while Keiretsu resolves partnership relations.

The Quick Response (QR) program was created by the textile industry in the mid-1980s and required the organization to respond more quickly to consumer needs by sharing information, resulting in better customer service and lower inventory. In the mid-1990s, Efficient Consumer Response (ECR) was developed by the food industry, with the aim of increasing the competitiveness of distribution channels. Thus, the points of sale of the stores transmit, by computer, to distributors and manufacturers, information regarding the stock. Keiretsu-type networks represent coalitions between Japanese producers and their distributors, which are generally based on the financial support of the producers, offered to the distributors. But logistics management is most strongly associated with the Just-in-Time concept.

Even though most believe that Henry Ford and his company invented Just-in-Time practices, the term was originally associated with the name of Taiichi Ohno and the Toyota production system.

Just-in-Time represents a philosophy and a mentality that permanently accompanies the problem of reducing stocks, a way of organizing and controlling the production and management of the company's stocks, aimed at reducing the volume of stocks that the organization manages, based on the principle of "zero stocks ” of raw materials and finished products and a sustained flow of production (Ganescu, 2016). The principles of the classic Just-in-Time system were (Krajewsky, Ritzman and Malhotra, 2007): producing a quantity that is needed, no more, no less; products must be completed at the planned time, neither earlier nor later; a supplier must deliver exactly the quantity ordered and at the time requested.

The name Just-in-Time has varied over time: zero stocks, minimum stocks, the Toyota system, Japanese-style production or continuous production.

Just-in-Time is based on the following principles:

a) The elimination of losses is imposed as an objective necessity at any stage in which the product is found, from the raw material until it reaches the customer's warehouse. The elimination of losses requires the company to pay attention to every factor that can cause, at a given moment, a damage to the production activity: the lack of correlation between the existing production capacity and the needs corresponding to a certain period of time, the oversizing of the personnel required, errors in the development process production, mismatch between production and market demand, etc.;

b) Continuous improvement is necessary to always be one step ahead of competitors, in the conditions of a world economy characterized by oversupply in almost any branch or sub-branch. At the level of the production process, the continuous improvement of the

manufacturing process is aimed at, which leads to an increase in labor productivity and, implicitly, to an increase in the economic efficiency of the entire activity;

c) Perfect quality (zero defects) must be ensured both for the product and for production, hence the major importance of quality management within the enterprise. In the case of Just-in-Time systems, quality is ensured at each workplace, and the worker who performs an operation is directly responsible for each machined part that leaves his machine;

d) Zero stocks is one of the principles with the most implications and links manifested directly in the production process. The application of this principle requires: the creation of absolutely mandatory premises related to the company's activity not only in the actual production, but also in its other functions, the elimination of uncertainties, the need to have stable and reliable suppliers, the appropriate design of products, parts and sub-assemblies, reducing to zero the probability of accidental failure of machinery and equipment, compliance with quality standards at any time and at every workplace, compliance with market requirements and concern for their satisfaction at any time, etc.;

e) Respect for the human factor is the principle that requires the longest period of time to be implemented. It assumes that every employee is treated as very important, regardless of the position they occupy in the hierarchy of the respective organization. It's not about the salary (this must be the consequence of the work done), but the person is just as important, regardless of whether he is an executive president, a manager or a simple worker. Organizations must implement an information system for all staff;

f) Long-term activity orientation is a principle according to which Just-in-Time must be seen as a long-term investment, both from the point of view of the costs it involves, but also from the point of view of the competitive advantages brought to the organization.

Just-in-Time remains an extremely current approach in modern management, but it must be remembered that it is created and based on a strong organizational culture.

For logistics management, Just-in-Time offers the following advantages: reduction of preparation time; a better quantitative control of stocks; more efficient use of employees with more qualifications; production planning and scheduling can be synchronized with demand; increasing and strengthening relations with suppliers; balancing the demand for materials with the availability of stocks; minimization of storage space; much smaller errors reported at certain time intervals, regarding the quantitative control of stocks.

The Just-in-Time philosophy has the role of releasing considerable cash flows and solving the increasingly thorny problem of storage spaces (Mincu and Comanescu, 2015, pp.55-80). The two rules that must be respected are: the elimination of everything that does not contribute to the increase of the added value of the products; cost reduction is not only based on calculations, but also on the knowledge of the phenomena manifested in the production process.

The Just-in-Time system is based on four fundamental dimensions:

- product modeling (quality, production modeling within the manufacturing cells, reducing the number of levels corresponding to material bills);
- process modeling (reducing the levels of bill of materials; in case of configuration with less than three levels of bill of materials, products enter the warehouse and leave only once during the production process);
- characteristics of human and organizational resources (ensuring the continuity of the learning and improvement process);
- production planning and control (production plan, capacity planning, demand planning, etc.).

The concept of fluent production, Lean Manufacturing or Lean Management, aims at the adaptability of the enterprise to market fluctuations (Badea and Burdus, 2009, pp.168-

179). They are systems capable of quickly adapting to all changes in the environment. The term Lean Manufacturing or Lean Production appeared for the first time in 1990, in the book "The Machine that Changed the World", written by James P. Womack, Daniel T. Jones and Daniel Roos, a book that explains the evolution of the Lean concept and industry practices auto.

Lean Management is a management system that focuses on eliminating all losses along the entire length of the logistics chain and in all processes in an enterprise and on placing human resources at the center of the device of exploiting all their intellectual capacity, throughout the enterprise structure and at all its echelons (Todorut and Cirnu, 2011, pp.153-160).

The key principles of Lean production are: perfect quality; minimizing losses by eliminating activities that do not add value; continuous improvement; flexibility and long-term relationships with customers and suppliers.

The Lean Management model enables adaptation to change and sustainable business development. Starting from the Just-in-Time method, the concept of fluent production considers the following aspects (Deac, Badea and Dobrin, 2010):

- Dimensioning the life cycle, because the logistics chain does not start at the entrance to the production space and does not end at its exit;
- Dimensioning of industrial processes, because losses in production do not result only from the production process, but from all the company's processes;
- Dimensioning of product ranges, as fluent manufacturing envisages the development of new products, in accordance with market requirements, within a short period of time.

To be effective, lean manufacturing must have two engines of progress: continuous improvement and incremental quality improvement. The appearance of non-conformities requires the application of two principles:

• the "iceberg" principle (information regarding a non-conformity highlights a very serious problem; the visible non-conformity is only the visible part of an iceberg; the Japanese specialist Ohno, a manager at Toyota, recommends that, when a non-conformity appears, five times the question "Why?" to find out its source);

• the "magic candle" principle (a non-conformity is like a magic candle that always burns; since most non-conformities are current issues, it is necessary to do a detailed analysis of each non-conformity to determine whether it is within the scope continuous improvement or on a segment of production).

The methods and tools used in Lean manufacturing are: 5S activities and visual management, standardization of work, Kaizen, teamwork. For a work environment where waste is eliminated, the five "S" operational practices are of particular importance. Thus, the 5S methodology for organizing and supporting a productive work environment aims (Mincu, 2014):

- sorting ("Sorting") involves separating necessary things from unnecessary ones;

- placing each thing in the right place ("Straightening") offers the possibility of easily observing the status of activities;

- cleanliness at the workplace ("Shining");

- standardization ("Standardizing") suggests the establishment of a program and work methods that facilitate the preparation for manufacturing and offering the products to the customer at every moment;

- the imposition of discipline ("Sustaining") consists in the persistent application of discipline in carrying out the other 5S practices.

The Kaizen method is a teamwork methodology used to systematically solve problems and apply improvement solutions, first implemented by the Toyota company. In martial arts, Kaizen means "moving forward with small, quick steps". In business, Kaizen principles aim at continuous improvement, maintaining order and efficiency of processes. Kaizen management involves all employees, who develop the spirit of initiative and involvement in the achievement of objectives. The Kaizen management system is the only management system that provides the development of performance culture at all levels of the organization, addressing all key processes and systems that contribute to the company's success.

Kaizen can be implemented if several conditions are met:

- the openness and involvement of the top management (it recognizes the favorable long-term impact and has an image of the evolution of the organization, directly leads the process of continuous improvement; creates a climate of trust and mutual respect);
- completion of an annual Kaizen Project, led by a dedicated manager;
- continuous training of employees, correlated with the organization's strategy.

The application of Kaizen management leads to significant financial performance, generated by continuous learning, the continuous increase of the value of employees, of the company, by eliminating, step by step, losses, excesses and discontinuities.

3. High-performing business models through Kanban and Six Sigma systems

Kanban is the generalized name that refers to a card-based signaling system that transmits information about the need to replenish a workstation. The Kanban system correlates all operations at the production level by flow, through cards, signs, buffer stocks. For the proper functioning of the Kanban system, the card signaling system is used simultaneously with the creation of Kanban surfaces or other methods in the same category.

The Kanban method is part of Just-in-Time and derives from a simple finding: "people who work in factories tend to overproduce". By means of the Kanban method, the establishment of product stocks is avoided, making the required product at the required time and in the required quantity (Buliga and Ignat, 2014, pp.241-244).

The Kanban system presents two reference elements (Chira, 2016, p. 182). First, this system promotes the decentralization of the coordination of material resource flow, so that the various warehouses only hold stocks of components and materials at a minimum level, corresponding to Just-in-Time production. Secondly, the system allows a self-coordination of the flow of materials between the manufacturer and suppliers, ensuring the prerequisites for the correct implementation of Just-in-Time.

The advantages of implementing the Kanban system are: speeding up the flow of materials; reducing the level of stocks; reducing the costs associated with the internal transport of material resources; increasing the quality standards associated with the production process.

Six Sigma is a methodology for reducing the number of defective products and increasing organizational excellence. This system, implemented in 1900 by Ford and perfected by Motorola, helps organizations to achieve increased competitiveness. It is based on a structured methodology, with statistical techniques, used to increase process performance or the quality of products or services by reducing process variation. Apart from statistical techniques, the methodology also uses other concepts, such as financial analysis and project planning.

The Six Sigma philosophy involves a structural and systematic approach to achieve outstanding improvements and progress. Increasingly, organizations applying Six Sigma are integrating the Lean method into their existing process improvement framework.

Although, initially, Lean and Six Sigma were applied separately by organizations, it was found that the two techniques are complementary, supporting the continuous improvement of the activity. Thus, fluent production without Six Sigma leads to obtaining fast but quality production; Six Sigma without fluent production means quality production but no value; fluent manufacturing with Six Sigma generates quality production at low cost.

In practice, logisticians use Lean Six Sigma Logistics techniques without realizing it. Given that the strong competitive environment involves changes in business models, companies apply Lean and Six Sigma to support cost reduction and quality improvement.

The concept of Lean Six Sigma Logistics represents the elimination of stocks through disciplinary efforts to understand and reduce variations, increasing speed and flows through distribution channels (Goldsby and Martichenko, 2005, p.6).

The Lean Six Sigma model is based on three important principles: logistics flow, logistics capacity and logistics discipline. These principles guide logisticians in their efforts to solve the challenges of logistics activity.

4. Conclusions

Business models that aim to introduce sustainable logistics generate financial performance, high product and service quality, low costs and logistical discipline. Adopting sustainable logistics is profitable for a business because the effect of responsible practices in sourcing, transportation, storage, packaging is cumulative.

Just-in-Time, Lean Manufacturing, Kaizen methods are important techniques for the success of logistics management and sustainable logistics, allowing adaptation to change and sustainable business development, eliminating losses, excesses and discontinuities. Also, Kanban and Six Sigma systems support the effort to reduce costs and increase quality standards associated with the production process.

References:

1. Agyabeng-Mensah, Y., Afum, E. and Ahenkorah, E., 2020. Exploring financial performance, and green logistics management practices: Examining the mediating influences of market, environmental and social performances. *Journal of Cleaner Production*, 258.
2. Azapagic, A., 2003. System Approach to corporate sustainability: A general management framework. *Process Safety and Environmental Protection*, 81(B5), pp. 303-316.
3. Badea, F. and Burduș, E., 2009. Contributions on the Lean Management in the current evolution of a company. *Economia. Seria Management*, 12(1), pp. 168-179.
4. Buliga, Z. and Ignat, G., 2014. Aspecte privind conceptul Just-in-Time. *Lucrări Științifice*, 51, pp. 241-244.
5. Chira, R., 2016. *Logistica mărfurilor.* Vol. 1. București: ProUniversitaria.
6. Deac, V., Badea, F. and Dobrin, C., 2010. *Organizarea, flexibilitatea și mentenanța sistemelor de producție*. București: ASE.
7. Ganapathy, V., 2014. *Introduction to Green Supply Chain Management*, 1st Edition. Bookboon.
8. Ganescu, C., 2016. *Strategii si performanta in managementul logistic*. Pitesti: Independenta Economica.
9. Goldsby, T. and Martichenko, R., 2005. *Lean Six Sigma Logistics: Strategic Development to Operational Success*. Florida: J. Ross Publishing.
10. Ilieş, L., 1999. Logistica – sursă de competitivitate. *Management & Marketing*, pp. 93-102.

11. Krajewsky, L.J., Ritzman, L.P. and Malhotra, M.K., 2007. *Operations Management*. Pearson Prentice Hall.
12. Kumar, R. and Chandrakar, R., 2012. Overview of Green Supply Chain Management: Operation and Environmental Impact at Different Stages of the Supply Chain. *International Journal of Engineering and Advanced Technology*, 1(3), pp. 1-6.
13. Macharis, C., Melo, S., Woxenius, J. And Van Lier, T., 2014. *Sustainable logistics*. Emerald Group Publishing.
14. McKinnon, A., 2010. Environmental Sustainability: a new priority for logistics managers. In: A. McKinnon, S. Cullinane, M. Browne and A. Whiteing, 2010. *Green logistics, improving the environmental sustainability of ligistics*. Kogan Page.
15. Mincu, C. and Comănescu, R., 2015. Operațiuni LEAN și JIT în industria ambalajelor flexibile. In: International Conference of the Institute for Business Administration, Bucharest 2015, pp. 55-80.
16. Mincu, C., 2014. Strategii operaționale digitale în managementul deșeurilor urbane solide. *Revista Calitatea-Acces la succes*, 15(S4), Societatea Română pentru Asigurarea Calității.
17. Mohanty, R.P., 1997. *Essentials of Supply Chain Management*, 3rd Edition. London: Mc Millan.
18. Shreyanshu, P., Kanchan, J., Angappa, G., Kowshikraman, S., 2022. Reflecting on an empirical study of the digitalization initiatives for sustainability on logistics: The concept of sustainable logistics 4.0. *Cleaner Logistics and Supply Chain*, Volume 4.
19. Srivastava, S.K., 2007. Green Supply Chain Management: A state of the art literature review. *International Journal of Management Review*, 9(1), pp. 53-80.
20. Todoruț, A.V. and Cîrnu, D., 2011. Lean Management in the current context of evolution of an organization. *Analele Universității "Constantin Brâncuși" din Tg. Jiu*, Seria Economie, 2, pp. 153-160.