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Sustainability within Logistics Operations: a Brazilian experience

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Abstract:- This work aims to discuss logistics sustainability considering the nine activities identified in the model proposed by Ballou. In order to reach the goal proposed herein, studies based on the gathering of secondary sources were conducted. Analysis on the logistical sustainability was conducted based on some Brazilian companies. From this analysis, it is observed that all logistic operations influence sustainability in the organization, though some with a higher impact than the others. The transportation and packaging operations are the ones posing the highest impact over social, ecological and economic dimensions.

Keywords:- Sustainability, Logistics, Triple bottom line, Transportation, Brazilian companies.

I. INTRODUCTION

The Keeping business competitiveness, sometimes, leads managers to leave aside the focus on the sustainable development not including it in their strategic planning. The change from a point of view which had as the main corporate goal the profit-gathering for its shareholders, to the view that spreads these goals to all the company's stakeholders, has shed some light over the worry with maintaining the necessary resources to the business operations. This is a consequence of the higher questioning people are having on the role of companies throughout the society [1].

Logistics has been considered one of the most important instruments for increasing companies' competitiveness in several sectors. Major companies have created logistics departments and boards and visualize their material, information and financial resources flows from an inter functional point of view [2]. However, this fact has forced companies to implement new sources of competitive advantages, urging for a continuous innovation process.

Along with this process, the sustainability concept has been broadened and presented as one of the mechanisms towards a new competitive advantage, but it has been poorly embraced by corporations [3]. Through the organizational environment, creating a sustainable enterprise means decreasing its impact using an economically viable way, using preventive approaches along with principles of continuous improvement, in such a way to ensure current actions do not limit the scope of the economic, social and ecological options for the future generations [4, 5].

However, what is observed in literature is that the scope of sustainability within the logistic aspect is restricted to few themes and studies. What is observed is that the association between the themes logistics and sustainability in scientific articles only relate to reverse logistics. Nevertheless, the actions that enable a company to reach sustainability from the logistics point of view are not exclusively related to product post consumption or post sale processes of proper removal and destination.

Thus, the goal of this article is to discuss logistics sustainability considering the nine activities identified in the model proposed by Ballou [6].

II. THEORETICAL REFERENCE ABOUT LOGISTICS

The true consciousness about logistics as a science had its origin in theories created and developed by Lieutenant-Colonel Thorpe, from the United States of America Navy Marines who, in 1917, published the book "Pure Logistics: the science of preparing for war". According to Thorpe, the strategy and the tactics provide the scheme of conducting military operations, while logistics provide the means. Thus, for the first time, logistics is on the same level of strategy and tactics in the Art of War. From the 50s and 60s on, the companies started to consider client satisfaction as a very important matter. It was then when corporate logistics was created, moved by a new consumer attitude. After the 80s, logistics started having a real revolutionary development, propelled by demands coming from globalization, from the changes in the global economy and from the use of computers throughout management. In this new context of globalized economy, the companies started competing globally, even within their local territory, being forced to change from multinational operations patterns to global operations patterns [7]. Thus, logistics started having a paramount role at the competitive advantage gain.

The Logistics concept used in this article is that proposed by the Council of Supply Chain Management

Professionals (CSCMP):

"Logistics: the process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services, related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements. This definition includes inbound, outbound, internal, and external movements." [8]

Still according to the CSCMP [8], logistics activities include transportation management, fleet management, material storage and movement, order fulfillment, design of logistic chain, stock management, supply/demand planning and third-party logistics service providers management.

Thinking alike, Ballou [6] proposes a model for Logistics Management, with two main operation channels: physical supply and distribution. The physical supply channel refers to the connection between adjacent material sources and their processing spots. Physical distribution refers to the movement of finished products from the company to the immediate clients. In both channels, this connection may be either external or internal. For each channel, the author highlights a list of activities as presented in Fig. 1.

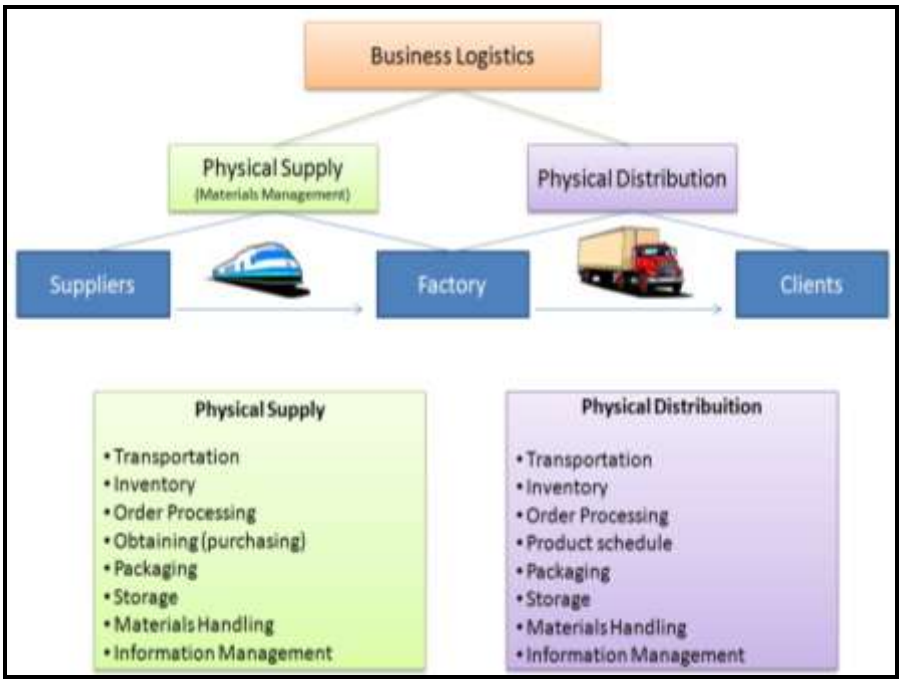

Figure 1. Main elements of the logistics concept model [6]

The strategy for implementing logistics lies on the integration of the several activities performed by the logistics channels and its success is concerned to the integrated management of logistics activities, in such a way to minimize total distribution costs and to keep client satisfaction at high levels [9]. Ballou [6] highlights in his model nine activities, out of which seven are common to both logistic channels, knowing: (i) Transportation; (ii) Inventory; (iii) Order Processing; (iv) Obtaining; (v) Product Programming; (vi) Packaging; (vii) Storage; (viii) Material Handling and (ix) Information Management.

III. ORGANIZATIONAL SUSTAINABILITY

Organizational sustainability concept does not present a unanimous definition, nonetheless, one of the most spread and adopted definitions is that created by Elkigton [5] having described sustainability as mechanisms that seek to ensure that current actions do not limit the scope of economic, social and ecological options for future generations.

The concept is complemented by Fresner and Engelhardt [10] that emphasize three dimensions on which companies should focus: social, ecological and economic, commonly called triple bottom line (Fig. 2).

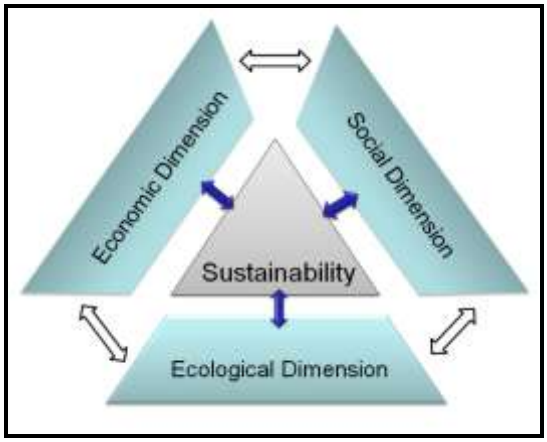

Figure 1 – Sustainability Dimensions - Adapted from [10]

The Economic Dimension comprehends the reduction of operational costs through a systematic management of labor productivity, of expenditures in research and development and investments in training and other forms of human capital [11]. It problematizes the future perspective guided by the expectancy of constant growth and it involves the concept of innovation as a paramount element for its implementation [12].

The Ecological Dimension addresses mainly the impacts coming from the processes, products and services over the environment, biodiversity and human health [11]. Its performance improvement is associated to the reduction of resources used in production and supplies, in order to reduce pollution to the greatest possible extent [12, 13].

Finally, the Social Dimension seeks to guarantee the workers' rights, promoting the continuous refinement of workplace existing conditions and the establishment of adequate health and safety conditions. It also involves the effective commitment of stakeholders, contributing to the proactive participation of the most diverse actors, like: company, workers, associations, clients, government, NGOs, among others [11, 12, 13].

IV. RESEARCH METHODOLOGY

In order to reach the goal proposed herein, studies based on the gathering of secondary sources were conducted. This kind of gathering has as a goal to discover ideas and possible explanations for the fact or phenomenon being investigated. The search in secondary sources is characterized as the third most used source of data on surveys. Feasibility studies, reports, memos, reunion minutes, propositions, newspaper and book articles must be revised and have their contents analyzed in this kind of research [14].

To complement the information obtained from the secondary sources, another gathering based on the experience of professionals on the logistic sector was also made and, thus, bearing relevant knowledge for this work. This type of study is characterized as a means to obtain and synthesize all the relevant experiences about the theme under scrutiny and, thus, make the researcher more and more conscious about the problematic concerned [15]. In this phase of data gathering, interviews with professionals in the area were conducted using a semi-structured questionnaire.

V. ANALYSIS ON THE LOGISTICS SUSTAINABILITY

As previously observed, the analysis proposed herein is based on the nine logistic activities presented by Ballou model (Figure 1). It is worth to highlight that the analysis is based on the premise which establishes that, for reaching sustainability, it is really necessary to decrease the impact of logistics in an economically feasible way, using preventive approaches along with continuous improvement principles.

Transportation is regarded as one of the most complex and impactful logistic activities for sustainability, because it affects, in several ways, the social, economic and ecological dimensions. The transportation operation has significant impacts over the companies' logistic costs. Performing transportation on a full load basis, taking return loads and using route planning systems, can help economic dimension improvement. The use of route planners, which help at decreasing the distances run by improving the routes, has also direct effects over the amount of CO_2 emitted by the vehicle, helping the ecological dimension. This dimension can also benefit from the performance of constant preventive maintenance in vehicles, keeping them in good working state, as well as from the verification and maintenance of vehicle exhaust filters and usage of less polluting fuels.

Another point which affects not only the ecological dimension but also the economic and social ones is the constant training and awareness of drivers. Driving in a conscious way helps reducing the vehicle maintenances, as well as the risk of accidents. In times, there is the transportation of high added value and/or

dangerous goods, which may generate risks for the population and the environment. Driving defensively avoids losses with accidents that burden companies and harm their image from the social point of view. A clear benefit from this is the program Risk Management, implemented by Unilever for over seven years and that reached a decrease of 77% in the number of accidents. Through a program of selection, consciousness-raising, monitoring and improvements in the driver support infrastructure (with rest rooms, physiotherapy, and a labor doctor, among others), it reached the figure of zero serious accidents [16].

Under the social point of view, it is important that, during training sessions, special care is given to the awareness of the driver about child labor and sexual exploitation, respect and fulfillment of the traffic regulations and the working hours (which must not exceed 8 hours a day) and against the usage of substances (like the use of the so-called "rebite" – a kind of amphetamine, used by Brazilian drivers). Programs like Siga Bem Criança (Keep Well Kids), adopted by Petrobras, seek to raise awareness and fight this kind of practice along with regulating organizations, logistic operators and collaborators [17].

When the Inventory Management is concerned, the main factor with strong impact over the organizational sustainability is the economic dimension. High inventory levels are costly and immobilize a considerable share of the company's capital, besides presenting risks of deterioration, obsolescence, loss and demanding administration costs/management. The social and ecological dimensions must also be considered and worked on, though. The staff training allows them to help the process of minimizing inventory levels, thus bringing economic gains and preventing from excessive movement in their daily work routine.

The Order Processing performs the information flow, affecting the well-being of employees who work performing tasks in this operation. Training sessions seeking to improve the employee's well-being, as well as the search for resources that may facilitate the daily routine are basic points towards the social dimension improvement. The use of tools like the EDI (Electronic Data Interchange), which allows the interaction of data processing systems among institutions with businesses in common, with minimum manual intervention, benefits such points, besides propitiating some reductions in the amount of printing and paper exchange, providing some kind of benefit to the environment and a slight contribution to the cost reduction.

A strong aspect that has been debated throughout organizations, and brings benefits for the three sustainability dimensions, is the Packaging. The worries from some sectors for reducing the impacts caused by the generation of excessive waste is clearly visible, as it happens nowadays in retail, for example, with companies Wal-Mart, Carrefour and Pão de Açúcar Group, which launched campaigns for the utilization of recyclable bags.

These campaigns brings gains to the environment at preventing part of 15 billion plastic bags being discarded annually in inappropriate places, showing the company's preoccupation with the society well-being and also the economy with the purchase of the bags.

However, the benefits that may be reached with the packaging are not restricted to this example. The development of new packaging, ergonomic and reusable (avoiding, thus, the one-way type), as well as the use of polymers instead of wood, brings social and ecological gains. A clear example of this is the development, by DuPont, of a cardboard package for substituting the traditional steel at packing food products in liquid and paste forms. These packages have the same capacity of steel cans but are 30% lighter, generating 30% less waste with the same packing capacity (18 liters). They also show the advantage of being 100% recyclable and made from materials with a lower recycling cost. Another important aspect is the shape of the package, squarer, which facilitates handling and piling, optimizing spaces [18].

The development of packages must also be balanced in such a way to protect the product, not excessively, which may be standardized and reduce the need for intermediate wrappers. An example of these applications and benefits (for the social, ecological and economic dimensions) may be observed at Dell Computers, which created a plan for computer packaging simplification, reducing 970 thousand annual tones of packaging material and US$ 2 million. These figures are reached through new desktop and laptop packaging, 10% smaller, with 75% of their components being recyclable for consumers, besides being 40% stronger against physical shocks [19].

The Storage operation deals with aspects inherent to the management of spaces necessary for keeping the stocks. In this aspect, we can find the factories' warehouses and the Distribution Centers (DCs). Reaching social benefits includes the constant training of collaborators, ergonomic evaluations, and the creation of a pleasant, accident-free workplace, allowing the cultural formation of collaborators, like the company Kimberly Clark, which set up libraries in its DCs and warehouses [20].

Benefits in the ecological dimension (which generate gains in the economic dimension) may be reached through the construction or programs for improving the DCs and warehouses physical space, by using natural light and ventilation or halogen lamps, water reuse, setting up solar energy systems and rain water storage. Examples of sustainable DCs in Brazil are rare, like the ones from Bomi Farma, GR Properties and CNH, which were built under the sustainable buildings point of view [21].

The Material Handling operation uses collaborators who perform movements for the transportation of

small amounts of materials and products through relatively short distances. Thus, the constant training of employees for minimizing risks of accidents and for ensuring the correct handling (ergonomics) of materials is essential for guaranteeing their well-being, reaching benefits from the social point of view. The usage of equipments for the movements also brings benefits to the collaborator's well-being, as well as load consolidation, which brings economic and ecological gains to the company. The usage of equipment for movements must happen in a conscious way, as it happens at Kimberly Clark, which installed a route planning program for the equipment through a WMS (warehouse management system) module, where, at receiving a request for material, the operator moves to the address, separates the item and the system finds the closest machine and calculates the route, in order to reduce energy consumption and avoid waste with unnecessary movements. During the Material Handling operation several items are moved and wrappers opened, generating huge volumes of residues, and the company should also adopt internal recycling programs and the use of reusable materials [20].

The logistic activities Information Management, Obtainment and Product Programming present lots of similarities in their gains in terms of sustainability, besides affecting the other operations in case these are not correctly performed. In case they do not promote programming adequately, either at obtainment or client delivery, which is normally done by software, they affect performance in a direct way, thus leading to wrong purchases or order releases. If this order is a material purchase, these newly-bought items will increase stock levels, with unnecessary handling and movements, increases in the number of internal wrappers, among other points. The same happens with the erroneous release for product fabrication, which generates unnecessary movements in warehouses, unnecessary increases in stock levels of finished goods, and depending on the volume to be produced and on the stock level, releases of new purchase orders.

VI. CONCLUSION

Logistics is increasing in importance in on the competitive market, once its goal is to plan, to implement and to control the material and information flow, since the point of origin until the point of sale, aggregating value to end clients in a very economical way. However, with the introduction of the sustainability concept and the inherent possibility of reaching competitive advantages, it is clear that simply delivering the good to the client in an economical way is not the main focus of the business anymore. Thinking about sustainability in logistics goes beyond the concept of reverse chain (or reverse logistics), as both concepts of logistics and sustainability involve other aspects. Based on these points, this article seeks to move into the nine logistics activities Ballou mentioned in his model, and analyze the possible sustainable activities an organization may perform based on the triple bottom line (social, economic and ecological dimensions) proposed by Elkington [5]. From this analysis, it is observed that all logistic operations influence sustainability in the organization, though some with a higher impact than the others. The Transportation and Packaging Operations are the ones posing the highest impact over social, ecological and economic dimensions. Nonetheless, internal awareness actions, constant personnel training, implementation of sustainable practices and actions are the things that may label the company as 'sustainable'. The analysis here introduced is a preliminary study that seeks to present the sustainability concepts to companies and ask them rethink their logistic operations, showing their usage and motivating them to go deeper into the theme in order to take advantage of the benefits coming from them.

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