Green Logistics as Urban Transportation Category

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ABSTRACT

The aim of this paper is investigate green logistics as previewed determined theory categories. By bibliographic research the study presents, describes and relates the concept of green logistics approaching theory and practices analyses with urban transportation categories. The results show that green logistics is less associated than expected.

Keywords: Urban Transportation, Category, Sustainable Logistics

Introduction

The evolution of industry, the emergence of technology, the development of the market and higher quality demand by consumers, whether for services or products, has generated super production, high competition and, consequently, interference in the environment. Companies, schools, institutions, organizations in general, driven by capitalism, produce in excess searching for greater profit, cost reduction, market dominance. Therefore, they seek various systems to facilitate their processes in order to reach their goals satisfactorily.

In addition, the environmental factor has become a critical point for the sustainability of the business, being considered a strategic variable that raises social, ecological and economic benefits, directly impacting products, processes and operation procedures, control and their form of management.

Thus, the future challenge of organizations is to reconcile economic growth with the preservation of natural resources.

In relation to environmental deterioration, the literature shows that the rise of mass society has substantially changed raw material consumption and that predatory exploitation of natural resources has caused changes in the environment, such as global warming, acid rain, soil depletion, desertification of the Aral Sea, and etc., elevating the importance of environmental

protection (MEDEIROS, 2014).

Also, Nunes (2003) affirms that the scientific community has been warning that human action is interfering in the radiation balance. Changes in soil use and various activities have increased the proportion of gases that absorb the radiation reemitted by the planet, trapping it near the Earth's surface, raising the temperature. And, when it comes to pollution, urban transport is cited as an influential and large spreader of its effects. (CARVALHO, 2011). In this context, it becomes common and viable to relate sustainable development with public policies, social practices, sustainability and the various other activities involved in all sectors (PHILIPPI, 2001; ALMEIDA, 2002; SAFATLE, apud 2006 MENDONÇA; ARAÚJO, 2009).

Therefore, in an effort to change the paradigms of unlimited economic growth, environmental deterioration and disobeying of environmental regulations and to satisfy the pressures for adaptation and minimization of environmental risks, there is a growing concern of public and private organizations in investing in a management system capable of developing an ecologically correct operation and building a culture based on environmental values that is adapted to the reality of each organization.

Sustainable logistics has an important role in urban transport for the improvement of its management, mobility, user satisfaction and, essentially, the environment. There are categories that define or represent the areas of urban transport-related studies. These categories were extracted from a deep study of theses related to the subject in order to understand the complexities, accessibility and possibilities that urban transport offers in the social, environmental and economic context.

Therefore, researching and studying the interfaces between urban transport, urban freight transport, city logistics, sustainable logistics, green logistics and the environmental and economic issues becomes imperative in the current scenario.

The overall objective of this work is to analyze 228 PhD theses elaborated in the 2005-2009 period with a focus on Urban Transport and, in particular, highlight the knowledge that is being generated through these publications and if the subject green logistics has been a subject of interest of researchers in this area. This was done through a selected literature review of previous research and accomplished using DAI - Dissertation Abstracts International, via ProQuest.

The specific objectives that direct this research are: to present urban transport categories selected through preliminary study, validate the categories with specialists and associate the concept of sustainable logistics to the categories of urban transport.

Methodology

According to Prodanov and Freitas (2013), methodology is used for the construction and improvement of knowledge about a particular subject, through the application of procedures and techniques that must be observed in order to validate the information and its usefulness to society.

Qualitative research analyzes and interprets the phenomenon and seeks a solution to the problems presented, interpreting data, theories, facts, among others. The data obtained are analyzed inductively. (GIL, 1988). Exploratory research aims to provide greater familiarity with the issue, with a view to make it more explicit or build hypotheses (GIL, 2007).

Based on the exposed so far, this research is qualitative in nature and exploratory in its approach as it parses and interprets issues associated with green logistics as a category of urban

transport and seeks to understand some aspects of the existing interface between urban transport and environmental and economic issues.

The research is divided into three stages, the first of which was conducted through a selected bibliographic survey with the purpose of maturing and deepening the research problem through books, articles, websites, dissertations, magazines and others which deal with the issue. In the second step, the researchers, through the DAI (Dissertation Abstracts International, via ProQuest), collected 228 PhD theses elaborated in the 2005-2009 period with a focus on Urban Transport, with the purpose of cataloging the knowledge that is being generated through these publications and categorizing the main areas of study. Thus, the first two steps of the research formed the basis for researchers to assemble 10 categories related to urban transport and check if the experts in this area of knowledge have been studying issues related to sustainable logistics, Green logistics and all related aspects.

In the third step, the researchers were careful to validate the categories created together with specialists in the area, so that they can serve as a reference for professionals who work in teaching, research and extension.

To do so, as a method of measuring the validation of categories, scales were used that are composed of a certain number of propositions and a smaller number of responses. In this case, the Likert scale was used, created by Rensis Likert, deemed psychometric, to register the level of agreement or disagreement with a statement provided. This scale has items, denominated, likert, generally ranging from 1 to 5, from fully approving to totally disapproving, measuring a positive or negative response to a statement.

The Delphi methodology was utilized as a research method, representing a qualitative form of knowledge enhancement. This method has as its premise the use of technological research, because it is a search and data analysis tool.

The Delphi method, as summarized by Sakman (1975), is the collection of experiences and opinions of specialists in a structured and organized way, by means of a system that searches for effective results. In order to achieve a consensus of answers and valid and satisfactory results it uses interactive and individual quizzes among experts, seeking the anonymity of responses, offering *feedback* of the results achieved at the end of each stage, including consensus about a certain level.

Theory Background

The concept of logistics and urban logistics

It is important to understand the concept of logistics, which can be applied to several sectors of society. Logistics has been studied and developed, resulting in a complex and strategic component, essential for the survival of companies in the globalized market.

According to the Council of Logistics Management (CLM), logistics is the process of planning, implementing and controlling the efficient and effective flow of goods, services and information from the point of origin to the point of consumption in order to meet the clients' requirements (BALLOU, 2006).

Society has sought means to facilitate its survival. In other words, people seek for accessibility, ease, agility, versatility, economy and mainly effectiveness in their plans, aiming to achieve their goals satisfactorily. In this way, logistics has contributed to the evolution of society as it has continuously conquered new methods and means that facilitate the daily life of society.

Urban logistics, usually known as *City logistics*, according to Taniguchi (2001), is based on the improvement and enhancement of the activities of private organization logistics in urban areas, whereas the existing flows, from the point of view of traffic, traffic congestion and the consequences for the economy. Therefore, urban logistics aims to improve the flow of society's needs in an urban context, whether in large cities or small towns, focusing on accessibility, responsiveness and cost reduction for everyone involved, both for the public and the private sectors.

Sustainable Logistics, Green Logistics and Reverse Logistics

The social and economic context of the market on global environmental issues has impacted the logistic processes of most companies.

Many companies have come under mounting pressure to reduce the environmental impact of their logistics operations. This impact is diverse, in terms of the range of externalities and the distances over which their adverse effects are experienced. The distribution of goods impairs local air quality, generates noise and vibration, causes accidents and makes a significant contribution to global warming. The impact of logistics on climate change has attracted increasing attention in recent years, partly because tightening controls on pollution and road safety improvements have alleviated the other environmental problems (MCKINNON; BROWNE; WHITEING, 2012).

In recent years, companies have used the terms “green” and “sustainable” frequently, typically to sort their operations and even obtain a competitive advantage associating their brand to social and environmental responsibility.

With a more comprehensive view, (Mawhinney, 2000 apud Pedroso; Zwicker, 2007) define sustainability as a systemic concept, a means of configuring civilization and human activities with the continuity of the economic, social, cultural and environmental aspects.

In the business context, sustainability means that business activities are to protect natural resources and the environment, serve the common good for society and be economically sustainable. This definition captures the three intrinsically related dimensions - social, environmental and economic – according to the triple bottom line framework structure for sustainability (ELKINGTON, 1998 apud WU; PAGELL, 2011).

Thus, based on the concept of sustainability, (Bouzan; Rodrigues, 2012) claim that sustainable logistics is the process of planning, executing and controlling the flow of materials and information from the point of origin to the point of consumption in order to meet the needs of all *stakeholders*, from sustainable development based on social responsibility in preserving the environment and the economic efficiency of the processes. For these authors, Green Logistics represents the environmental pillar of sustainable logistics.

Mckinnon, Browne, Whiteing (2012) define 'green logistics' as the study of the environmental effects of all the activities involved in the transport, storage and handling of physical products as they move through supply chains in both forward and reverse directions. It assesses the nature and scale of these effects and examines the various ways in which they can be reduced.

For Chunguang et al. (2008), Green Logistics is the logistics system responsible for the environment, which includes not only direct logistics processes, but also includes the reverse processes or reverse logistics, dealing with reuse, remanufacturing, recycling and final disposal.

Reverse logistics is the process of planning, implementing and controlling the efficient and effective flow of raw materials, in-process inventory, finished goods and information related

to products from the consumer endpoint to the point of origin, with the aim of recovering value or disposing properly (ROGERS; TIBBEN-LEMBKE, 1998; EL SAADANY; JABER, 2011; GOVINDAN et al., 2012). For Stock (1998), reverse logistics deals with the return of products, recycling, material substitution, material reuse, waste disposal and reform, repair and remanufacture of returned goods.

In short, for Rodrigues; Bouzon (2012) the use of the term "sustainable" refers to any practice or concept that has its foundations in the *triple bottom line* of sustainability: environmental, social and economic. The term "green" addresses environmental concerns, which represent part of a structure based on sustainable development. Therefore, it is stated that Green Logistics is a pillar of sustainable logistics in a company context, alongside the other two pillars: social responsibility and operational efficiency.

Cost was defined in the past in purely monetary terms. With green logistics, the cost can also be understood now as the external costs associated with logistics: climate change, air pollution, waste (including packaging waste), soil degradation, noise, vibration and accidents. In this sense, the importance of including the category of sustainable logistics - green logistics in studies and research focused on urban transport area is clear.

Urban Transport

Urban transport also opens a space for discussion about its definitions and applications in the context of urban logistics. One senses a strong interaction and dependency on resources for its objective to be achieved in a satisfactory manner. This function boils down to carrying persons or loads through some kind of urban street in general.

According to the Teaching and Applied Research Center, Cepa (2009), urban transport is regarded as the movement of people and goods within a city, with the use of collective or individual means of transport.

In the case of urban transport, as the Rights Charter (2014), it is collective or individual, public or private. Public transport is considered the one funded or regulated by a government or local prefecture, not belonging to the users. Private transport is used mostly by its owners or is controlled and monitored by private companies. All types of transport are supervised by responsible bodies and must remain in compliance with the traffic and transport restrictions and regulations.

Urban logistics, sustainable logistics and its pillar, green logistics, are influenced by the various existing means of transport, which require proper planning for their efficiency and effectiveness to be achieved successfully.

Analysis and Discussion of Results

To fulfill the first part of the purpose of this article, we conducted a survey of doctoral theses in the field of knowledge of urban transport in the period 2005-2009 through the DAI - Dissertation Abstracts International, via ProQuest, using key words related to the topic under study 228 doctorate thesis with a focus on Urban Transport were catalogued and after a selected literature review and study of theses, 10 categories of study in this area were listed, including sustainable logistics as evidenced in table 1.

Table 1 - Categories of Urban Transport

Categories of Urban Transport		
No.	**CATEGORIES**	**DEFINITION**
01	**Urban Transportation Modes**	Means of transporting people or cargo around urban roads, such as: bus, train, subway, ferry, taxi, minibus, car, pick-up, truck, motorbike, bicycle.
02	**Transit and Traffic Engineering**	The use of roads by people, vehicles and animals, alone or in groups, conducted or not, for the purposes of circulation, standing, parking and loading or unloading operations. Traffic jams, traffic improvements, movement of vehicles and pedestrians on the public roads. Vehicular traffic and pedestrians moving by paths and routes, people or goods transported by urban road, air, train or ship with commercial purposes. Safety in traffic, study of traffic accidents.
03	**Urban Transportation Planning**	Planning, routing and scheduling of vehicles, buses, school buses, safety and accidents, strategies, used as a means of improving transport efficiency and organization, land utilization plan.
04	**Urban Transportation politics**	Regulations, standards, and socioeconomic policies linked to accessibility and sustainability.
05	**Transportation Geography**	Study of the spatial aspect, location and transport strategies in relation to the environment, development of networks, interaction and movement of goods and people, aspects of unhealthiness in transportation, availability of roads between points of departure.
06	**Urban Mobility and Accessibility**	Concerns with pedestrians in the sense of quality of life and safety, sidewalks and adapted pavements, cycle lane, technologies that improve mobility and accessibility, tariffs and investment in public transport, use of the automobile, signaling systems, housing and central areas, corridors, parking lots, access ramps.
07	**Transportation System**	This involves the processes of locomotion, from the beginning to the end of the journey, involving aspects such as transport demand, networks, logistics and transportation infrastructure, flows and location and the interaction between the elements for an effective, agile and secure trip.
08	**Technological Innovation in Urban Transportation**	New systems of traffic and signaling technology, new projects and design of vehicles.
09	**Urban Logistics**	Planning, implementation, and effective control of the flow and storage of materials and related information, within a context that involves an urban scale. It refers to the movement of goods, urban freight, in other words, the movement of people or goods from the initial to the final destination.
10	**Sustainable Logistics/Green Logistics**	With an emphasis on the environmental pillar *green logistic*, regarding the topics of environment x transportation, making urban transport greener, access to green areas, amount of moving vehicles, transit and speed policies, visual intrusion, noise pollution, air quality, energy consumption, fuel consumption.

Source: Created by the authors in 2014.

After the examination, it was clear that the knowledge generated through these publications is related to classical categories of this area of knowledge as: modes of transport, Transit and Traffic Engineering, Urban Transport Planning, Urban Transport Policies, Transport Geography, sustainable urban mobility and Accessibility, Urban Mobility and Accessibility in the socio-economic context, Transport Systems and Technological Innovation in urban transport. In relation to the subject of urban logistics, only two theses referred to the movement of loads in the cities. In relation to *green logistics*, nothing was found. These issues have been dealt with in the areas of logistics and supply chain management and other correlated subjects.

Analyze the problems involving environmental issues, urban logistics, sustainable logistics, the pillar *green logistics*, the need to study these topics in the context of urban transport became clear.

The worsening of the collapses of natural order triggered by man and the indiscriminate use of available resources, renewable and non-renewable and the concern of people and organizations with social sustainability is becoming an important factor. On the other hand, the number of companies 'greening' their logistics has multiplied and many governments have been intensifying their efforts to reduce the environmental damage done by freight movement. These factors require that studies and research be generated for society to develop itself in the context of social, economic and environmental sustainability.

To fulfill the second part of the objective proposed in this article, which is related to the validation of the categories, forms were used to identify the opinions of people who specialize in the area as teachers or professionals to validate and supplement the categories of urban transport, as well as enhance the study of urban logistics within the context.

The ten categories were detailed and assessed according to a scale of 1-5, where 5 means fully approve and 1 fully disapprove. Forms were sent to thirty-five contacts previously selected through conferences, publications, appointments, nominations and polls.

The forms also had gaps, in which the volunteers could expose their views and possible improvements to the validation of categories and include them as theoretical reference. Among the thirty-five possibilities, a one-week time for analysis and validation of the categories was granted.

Upon the forms sent, only 6 responses to definitions of categories were consolidated. As regards the first category, Urban Transport Modes, there was a 50% partial approval and 50% total approval, with suggestions for some improvements like the addition of the helicopter and rural routes. For Transit and Traffic Engineering there was a 17% partial disapproval, 17% partial approval and 67% total approval, with no suggestions for improvements, which suggests the category is satisfactory. In the category of Urban Transport planning there was a 50% total approval, a 33% partial approval and 17% of indifference. The volunteers had doubts about the vocabulary, which suggests that the category can be improved.

The category of Urban Transport Policies had a 17% partial disapproval, and transportation geography had 17% indifference, but both had 33% percent of partial approval and 50% of total approval. There is a consideration relevant to the category of Transport Policies that the context is not about policy, which can lead to improvements. It was found that mobility and accessibility achieved 83% of partial approval and 17% of total approval with a consideration that it should be divided into two categories for better understanding.

As with the category of Technological Innovation, the Transportation Systems had a 33% partial approval. But Technological Innovation also had 33% partial disapproval and total approval, different from Transportation Systems, which had 67% total approval. Only

Technological Innovation received the consideration that the definition is not linked to transit.

With the suggestion to check the definition in a theoretical framework, the category of urban logistics obtained a 17% partial approval and partial disapproval and 67% total approval. Sustainable Logistics achieved 53% partial approval and 17% total approval, confusing the volunteers with regard to the vocabulary used.

The categories were partially approved, which suggests the idea of improvements to be carried out and further consideration of a more comprehensive theoretical framework for aspects to be taken into consideration o urban transport can be better defined and contribute to urban logistics bringing benefits to society.

The approval of categories provides a magnification of the study of urban transport, which leads to consequences such as the extension of specific researches that can make urban logistics viable, influencing companies and also the economy, politics and society as a whole.

Final Considerations

This article presented a study of international dissertations that were reviewed. From them, ten categories of urban transport were created, and larger studies and information geared towards a branching of the theme of urban logistics were sought to validate them through the Delphi technique.

The Delphi method proved to be a suitable and effective tool for the implementation of the research, allowing the restructuring of categories reflecting positively on their definitions, but at the same time, it was clear that its effectiveness requires more time to research, in view of the need for availability of the experts requested.

Both practices were complementary in order to achieve the proposed objectives. Both the analysis of dissertations and the Delphi method were essential for the contribution of an academic research based on improving urban transport and urban logistics. The importance of sustainability, accessibility and transport suitable for the everyday life of society was very clear, since this society requires time and agility for its life and expectations to occur satisfactorily.

The validation of categories can add significant value to companies, faculties and researchers as a whole, through the specification of urban transport in relevant aspects that can facilitate and contribute to urban logistics in cities and consequently generate economic, political, social and especially environmental advantages. In a succinct manner, the percentages obtained show an percentual average of the objectives achieved by the validation of categories, which were the object of the study, with the application of the Delphi method: 0% total disapproval, 8.4% partial disapproval, 3.4% indifference, 41.5% partial approval and 46.8% total approval of the definitions and categories themselves, referring to the need for improvement and restructuring of the definitions. Therefore, adding up the total and partial approval, an average of 88.3% of approval was reached, taking into account the improvements that must be made.

We recommend more specific studies about the potential for improvement of the categories and a second research through the Delphi method with more time for the form to stay in the field to allow the possibility of a greater number of analyses and validations, besides the restructuring of the Likert scale for better evaluation of the categories.

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