LOGISTICS – EVOLUTION THROUGH INNOVATION

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Abstract: *The current economic conditions, the rapidity with which the exchange of information, resources and products in the market takes place makes the logistics seem appreciably less significant. However, the importance of logistics has been presented in the military field, through strategies that have led to wining of the great wars that mankind has seen, through the supply of troops with food or moving military equipment. The literature in the field of logistics has numerous works on this topic. But while most focuses on efficient ways of carrying out the component activities of logistics or the strategies of organizations with regard to logistics or its functions, research on dynamics of logistics is underdeveloped. To be able to propose new methods or strategies of logistic activities is necessary to understand the development of this concept, determinant factors and economic and social conditions that gave rise to such developments. Thus, after a presentation of the main landmarks of the historical development of logistics we highlight the importance of the innovation within an organization's value chain innovation, in particular, and how to conduct the business in general. Using generations of innovation identified in the literature, we determine the generation of logistics development, taking into account innovation and how to conduct business. In addition for a better highlight of the own vision over the logistics generations identified, we will present the graphical concept for each generation in part. Last but not least, for each generation identified we try to allocate the chronological landmarks featured in order to reinforce the importance played by innovation in the development of the logistics industry and to give future directions of research within this topic. The study took into account the information presented in articles, books and websites of the relevant specialty in logistics and innovation to be able to build and expose a conceptual theoretical model on the topic.*

Keywords: logistics, innovation, value chain, strategy

JEL classification: L9, M1, N7, O31, R41

1. Introduction

Logistics is a term often used in various fields of activity, but is based on a fairly simple meaning. Most often, logistics means to transport (Chopra and Meindl, 2001), where we can draw the conclusion that this simplicity can lead to confusion due to the lack of a universally applicable definition, but with features for every field in which the term is found.
The importance of logistics played in the world economy lead us to examine the past to determine the present and to give future directions in the development of strategies in this field.
At the same time, it should be taken into account the catalyst of logistics evolution to establish development boundaries in this field, the periods that can be examined in future studies, to highlight the progress and potential for development of this subject.
In this article, we will refer to logistics, as a whole, because it gives a general perspective that can be taken into account and analyzed and we don't look at the functional level,

since logistics would require an in-depth analysis of each operation individually, which would imply a greater volume of data to be analyzed.
While retaining the simplicity, the future directions of research will provide images that are representative of each period in part, contributing at the same time to the depth of field.

2. The evolution of logistics – short chronological perspective

Currently we are so accustomed to the presence of certain services that simplify everyday life that we do not give any importance to the understanding of how this services had developed, starting from its origins and so far, but nor to any future forms of manifestation of them, considering that it is a normal trend, imposed by market conditions in which the organizations operate.
Thus logistics has played a fundamental role in the evolution of mankind, but too few specialties papers treats the topic from strategic perspective, most offering a functional approach, or from the perspective of the various areas of activity. It is therefore necessary to review logistics from a chronologically point of view, to be able to understand the determinants that have led to this development.
DHL Logbook in partnership with the Technical University of Darmstadt presents a history of the development of logistics from the construction of the pyramids in Egypt until our days, by this:

- in the years around *2700 BC* we are talking about a material handling technology in constructing the pyramids.
- around the years *300 BC* we encounter revolutionary Greek oar vessels.
- around the years *700* AD we can talk about logistics procurement for the construction of the Mezquita mosque, the pillars arriving in Spain from all over the Islamic Empire.
- around *1200* years appears the international network known as the Hanseatic League - a international maritime transport cooperation.
- around the year *1500* we see the postal service in Europe - the first service of sending letters in a defined period of time.
- around the year *1800,* the discovery of new means of transport for both road and railroad led to the expansion of the logistical tasks through new technologies and means of transport.
- in the *1940s*, military logistics during the two world wars led to the transfer of concepts in the business world.
- in the year *1956* the invention of container shipping led to the structural development of world trade and to a boom in the international flow of goods.
- around the years *1970-1980*, Kanban and Just-in-time (JIT) concepts have been developed and introduced in Japan at Toyota Motor by Taiichi Ohno in order to connect with other logistics operational functions.
- in the *1990s*, technologies like quick response (QR) and efficient consumer response (ECR) are implemented by many companies in the retail and wholesale.
- in the *present days* management of the supply chain is being watched as a group of key business processes from one provider to the end user.

We can see that logistics was and is in a continuous change, change influenced by a number of factors in the political, economic, social, technological, environmental and legal environments. The company culture, the need for evolution, means and possibilities of the organizations they had at that moment put their mark on the development of logistics since ancient times. But once with them, innovation has played an important role.

3. Innovation – necessity, implications and challenges

Innovation is the result of human creativity, an idea to change into something better already, but at the same time can also be the result of experiments or accidents. However, what is actually innovation? Innovation is the act of *innovating* and its innovation process outcome depends a great deal of knowledge, especially tacit knowledge, in essence, the key capabilities within an organization - human resources.
According to Boer (2002) continuous innovation is the interaction between deployed operations, incremental improvement, learning and radical innovation aimed at the efficient combination of the effectiveness of operational and strategic flexibility, mining and exploration.
Literature (Lee, Olson, Trimi, 2012) propose the following classification of forms of innovation, taking into account the organization's value chain.

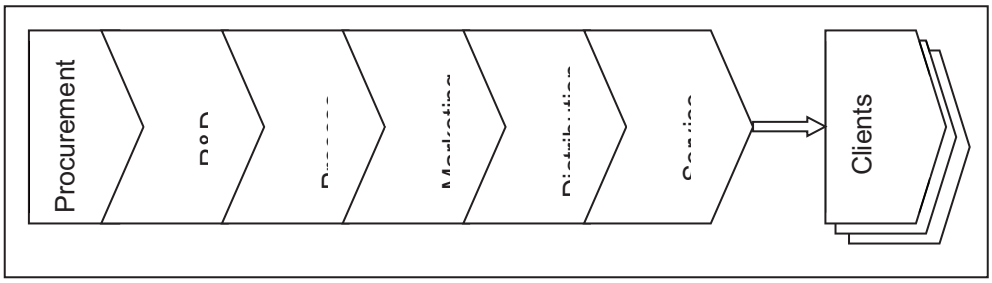

Figure 1: The value chain of an organization
Source: Lee, Olson, Trimi, 2012

Thus, we can speak about *the closed innovation*, *collaborative innovation*, *open innovation* and *co-innovation*. All these forms of innovation can manifest in the value chain of an organization, having various implications, as follows:

- *Innovation 1.0 (closed innovation)* – the organizations use to develop unique internal powers, sometimes secretly, fully from outside organizations, such competitive advantage based on these internal unique powers allow the company to be the first to take a step on the market.
- *Innovation 2.0 (collaborative innovation)* - unique expertise of an organization are not sufficient to develop a sustainable competitive advantage. Organizations perceive seeking world-class companies, for working with them, as being much easier. Many new forms of partnerships, strategic alliances, joint ventures and investment arrangements for the pooling of patents/technologies are becoming popular.
- *Innovation 3.0 (open innovation)* - the basic idea of open innovation is to build a chain of world-class value through a new ecosystem of innovation where different complements can be combined through perfect coherent solutions to create value based on cooperation agreements. The global economy and the emergence of information and communication technology that supports the exchange of knowledge on a large scale have opened the possibility of a much more extensive cooperation in the field of innovation.
- *Innovation 4.0 (co-innovation)* - the key element of innovation is to offer a compelling experience with network effect for value creation. Thus, co-innovation is a platform where new ideas or approaches from various internal and external sources are applied differently to create a new value or experience for all types of stakeholders, including consumers. The co-innovation, experience and commitment include a co-creation of value that is quite difficult to counterfeit by

the competition. Co-innovation platform is built on principles of convergence of ideas, collaboration agreement and experience co-creation with the stakeholders.

In this way, the classic value chain, shown in Figure 1, suffers changes as regards redrawing the business model through reinventing the concept of customer value (Govindarajan and Gupta, 2003), redefining the customer database and creating shared value, the identification of new suppliers of products or services, or even outsourcing certain services carried out by an organization (Premkumar and William, 1994).

4. Logistics x.0

Because as we have shown above, innovation has played an important role in the development of organizations, logistics has developed with the evolution of the innovation presented.

At the same time we can fit logistics in various generations of development, exemplifying by taking into account the evolution of logistics chronologically presented above.

The basic shape, *logistics 1.0* may be considered classical logistics, characterized by the transport operations that organizations relied on. This form is based on the internal competencies of the organization (Hamel and Prahalad, 1994) to cope with the challenges of the environment in which it operates.

We can represent this basic form as follows:

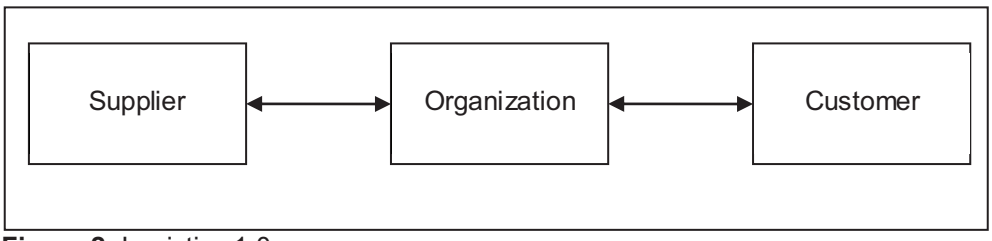

Figure 2: Logistics 1.0
Source: author's own design

The second form, *logistics 2.0*, manifests itself by adding new links to the classic form. They may represent partnerships with other organizations, which increases the value added of an organization through the synergy of core competencies (Spanos and Prastacos, 2004; Peteraf & Bergen, 2003) of the organizations, which lead to a differentiation in services offered to customers.

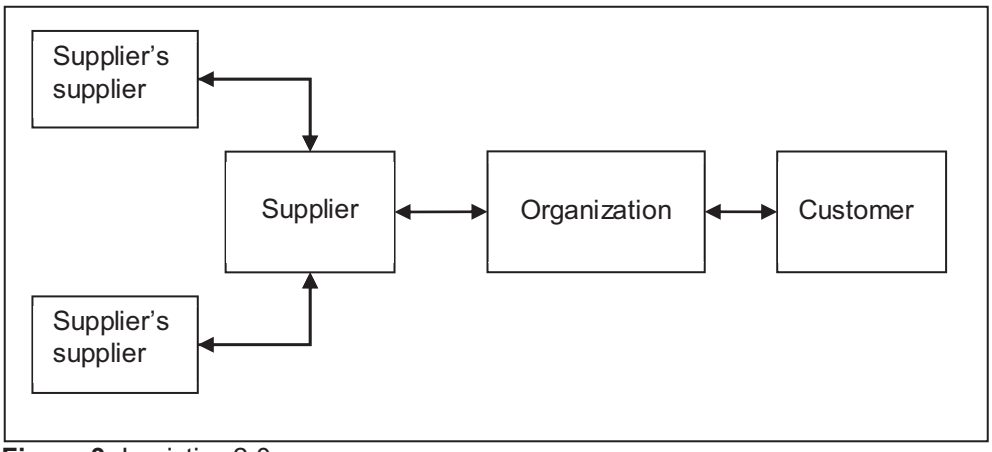

Figure 3: Logistics 2.0
Source: author's own design

The third form, *logistics 3.0*, follows the previous pattern. We encounter the same classical structure which allows the addition of links to complement fully the added value created by logistics. In addition to incorporating the communicational technologies that facilitate rapid access to information (Hill, 1994; Mentzer, 2001; Lee et.al., 2000), may encounter various organizations to support the logistical arrangements.

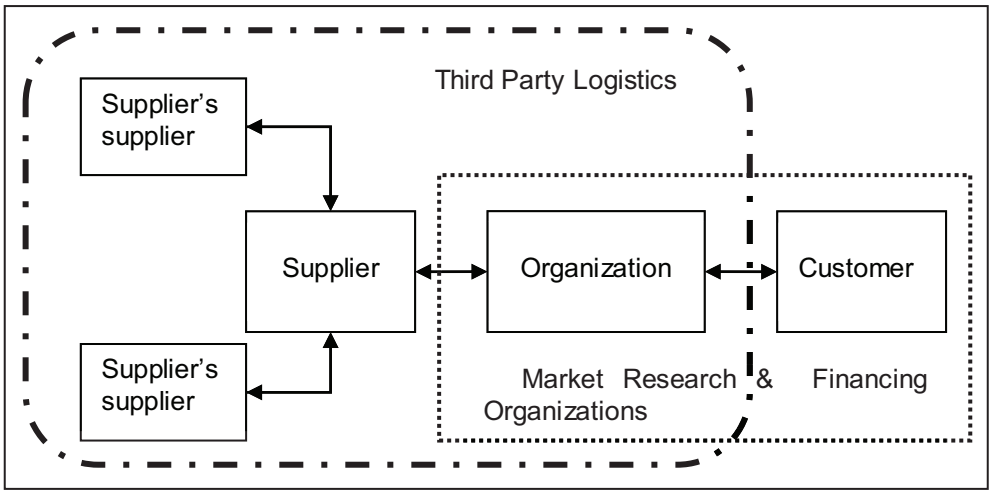

Figure 4: Logistics 3.0
Source: author's own design

Also like the innovation, the fourth form, *logistics 4.0* aims to create a platform where logistics is the central element. Thus, through logistical platform and communicational technologies existing in the present it's wished that the pooling of resources used by the above links in order to provide added value by such interconnections is desired.

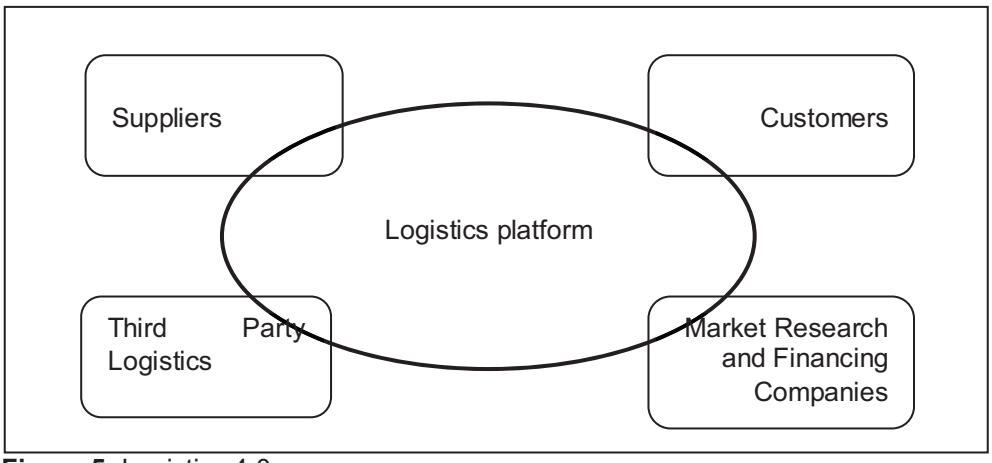

Figure 5: Logistics 4.0
Source: author's own design

In this way we can highlight the influence of innovation in logistics, setting a succession of logistics forms that can be encountered in practice. The complexity of each generation is given by the awareness of the organizations in the field of logistics over the importance of cooperation in gaining competitive advantage by exploiting core competencies and dynamic capabilities related.

5. Findings

Because logistics plays an important role in the world economy for more than 5000 years, we can transpose the chronological developments presented above in the form of the following graph.

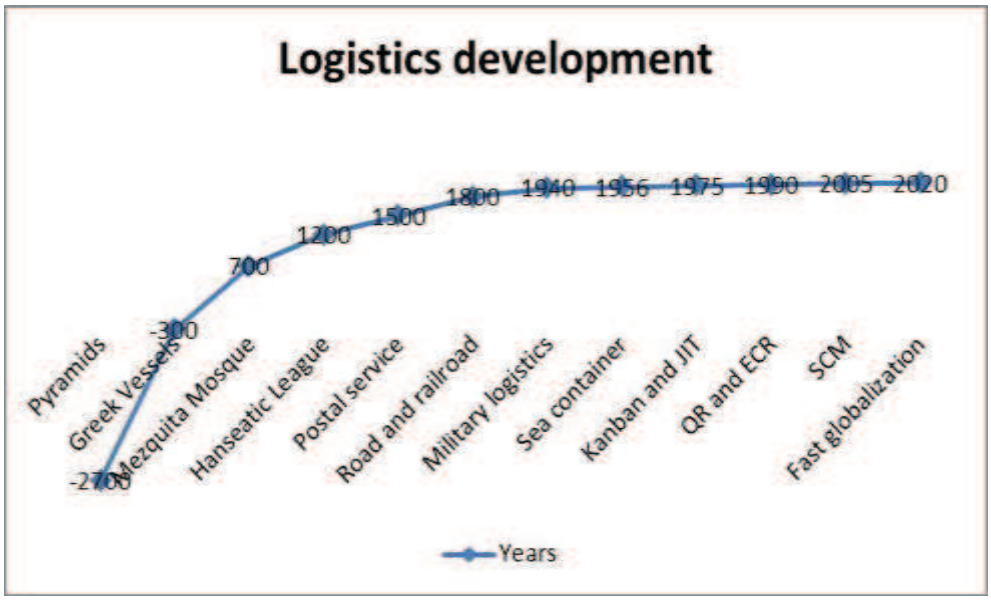

Figure 6: Logistics development
Source: author's own design

We can observe a sharp logistics development from the early 13th century, with the beginnings of organizational forms, which require a more developed logistics, account being taken of the dynamic capabilities (Teece et.al., 1997), organizations at the same time being based on cooperation.
In the case of analysis performed, we took into consideration logistics in general, including its components as well as activities like handling, transport, storage, logistics main activities to be able to pursue further research on the elements related to strategies adopted during the period of development, taking into account the potential available both at the level of the organization (Kotzab, Grant, Teller, and Halldorsson, 2009) and the potential available at that time, in terms of technology and human resource, viewed as whole, and to be able to establish the organizational progress and the way it was, is and will be influenced by the other two items presented, strategy and potential.
We can also fit the evolution of logistics as shown in Figure 6, taking into account the generations listed in Chapter 4. Thus, for *logistics 1.0,* we can consider the period between 2700 BC and 700 AD, during which focused more on efficient ways to meet the daily challenges.
Logistics 2.0 is allocated to the period from 700 AD and 1960 when the classical transport activities meet various forms of collaboration; identifying new partners and new means of transport.
Logistics 3.0 covers the period 1960-2010, significant period in logistics development, because allow integration of new links just because of market conditions and awareness of any benefit which each link plays in providing end customer products and services the client needs, which in turn is aware of his importance in the logistics chain.
Logistics 4.0 begin to appear with the 2010s, when there are established national and regional strategies with regard to logistics, great logistics parks appear that combines the advantages of transport by road, rail, air and sea, putting together the resources and powers of the various key players in the logistics market (Pache, 1998).
Thus, taking into account previous presentations on innovation, future studies may focus on analyzing each generations identified, presenting major logistical methods or models of innovation that formed the basis for progress in this area, as well as the need for evolution.
This paper intends to be an important starting point for future studies regarding the importance of logistical activities classification carried out by organizations within a generation to be able to propose new strategies for development in this area, the use of new resources to be able to offer the end customer added value for the goods or services intended to benefit and to determine new directions with regard to the identification of future generations in this area.

6. References

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