

MULTIMODAL LOGISTIC PLATFORMS STRUCTURE ANALYSIS WORLDWIDE: A COMPARATIVE STUDY BETWEEN BRAZILIAN AND FOREIGN PROJECTS

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ABSTRACT

Multimodal Logistic Platforms – MLPs – provide integration of different modes of transportation, enabling flexibility in the logistic system and generating competitive advantages. Seeking to point out characteristics that an MLP should have to meet the market's need, this study aimed to a comparative analysis between MLP structures operating in Europe, Asia, and North America and two advanced Brazilian projects. Therefore, we present a comparison based on variables such as the nature of the modal, management system, resided area, and types of cargo handled. The results support that the Brazilian projects are similar to the international MLPs and can reach the same level of competitiveness.

Keywords: Multimodal Logistic Platform; Modal integration; Logistics; Cargo transportation.

1. INTRODUCTION

Cargo transportation by more than one type of modal characterizes multimodal transportation (SteadieSeifi *et al.*, 2014), thus a Multimodal Logistic Platform – MLP – is defined as the place where more than one transportation modal meets in an integrated way (Alumur *et al.*, 2012). This meeting point increases the transportation flow efficiency making it more reliable, flexible, and sustainable (SteadieSeifi, *et al.*, 2014).

Research conducted on MLP support that the use of multimodal transportation provides benefits, such as the optimization of the logistic infrastructure, the decrease of in transit time of goods, the reduction of logistic costs, and the simplification of logistic processes (Gutiérrez, *et al.*, 2006; SteadieSeifi, *et al.*, 2014; Alumur *et al.*, 2012; Ballou, 1997).

The benefits presented by the multimodality allow for better delivery deadlines, reducing the costs and increasing flexibility towards uncertainties that may occur during the logistic flow (Harris *et al.*, 2015).

Another factor that allows for the reduction of costs is the consolidation of cargo that has similar destinations and characteristics, allowing the cost to be apportioned by the transporting companies responsible for the shipment. A good understanding of a MLP provides cost reduction, by offering a multimodal structure consisting of ground and air transportation, in addition to Road transportation (Alumur *et al.*, 2012).

The management of a successful platform should be based on public partnership for the formalities and bureaucratic operations; and private initiative, to manage the organizational performance of the unity (Dubke *et al.*, 2004). Establishing connections and partnerships forms an integrated network, increasing the efficiency and effectiveness of services rendered with a steady flow of cargo movement, making the market more attractive for suppliers, distributors, and consumers (Long *et Grasman*, 2012).

According to Dias (2005) there are three MLP classifications: Port Logistic Activity Zones (maritime terminals), Air Cargo Terminals (specialized in air/land Exchange), and Dry (container) Ports (terminals without waterway access located inland).

Based on the presented context formerly discussed, the aim of this study is to perform a comparative analysis between MLPs considered relevant cases in North America, Europe, and Asia and the more advanced projects in Brazil.

2. METHODOLOGY

There are several Brazilian projects and studies for the construction of platforms throughout the country with the intent to improve the logistic infrastructure to make it more competitive. However, until the present moment, there is not a working platform complete that may be adopted as a model for others. Therefore, this study sought international models that could be used as reference for the Brazilian projects.

Initially, through literature review carried out in the Capes Database Portal and the national database of theses and dissertations, the field of knowledge of Brazilian Multimodal Logistic Platform was researched. Twenty-two (22) MLP intentions were obtained in Brazilian soil; however, of these, only two projects are at a more advanced level, and thus have relevant data to this study, which are Campinas-SP and Anápolis-GO (AD Diper, 2008; SEGPLAN, 2013; Dubke, 2006; Carvalho *et al.*, 2010; Bastos *et al.*, 2009; Silva, 2008; Silva, *et al.*, 2013; Braga, 2011).

With respect to the MLPs operating in other countries, Boile *et al.* (2008) have identified the structures in Europe, Asia and North America. According to these authors international database of MLPs are 16 in Asia, 50 in Europe, and 13 in North America.

In order to reach the aims of this research, a full investigation was carried out in places and official documents relating to the platforms formerly identified by Boile *et al.* (2008), to characterize each of the identified facilities. Considering the 79 analyzed structures, only those without ports and with the same modals existing in the Brazilian projects were considered for the study and therefore served as a parameter for the purposes of this research.

The selection of international MLPs submitted to the study resulted in twenty European platforms, two Asian, and four North American, which will be presented in the next section.

To identify the structural impact of the platforms, content analysis was performed resulting from the review of the literature of this work. Content analysis is the thorough analysis of the texts developed by experts; the opinion of an expert in terms of the thread has a considerable value (Kitchenham *et al.*, 2009). Analyzing systematically the works of SteadieSeifi, *et al.* (2014), Alumur *et al.* (2012), Harris *et al.* (2015), Long *et Grasman*, (2012), Carvalho *et Carvalho* (2010), Boyle *et al.* (2008), Ballou (1997) and Gutiérrez *et al.* (2006), we observed by word count, presented by Table 1, the incidence of variables: management model, size, types of loads transported, and modal interconnected services. These characteristics of the PLMs were adopted as comparative parameters between platforms.

Table 1. Result of content analysis.

Author	Words				
	Management	Area, Size, Dimension, Extension	Cargo	Services delivery, Services rendered, multimodal services	Modals, Modes
SteadieSeifi et al.	22	0	12	16	8
Alumur et al.	2	0	6	13	5
Harris et al.	12	2	2	2	6
Long et Grasman	3	4	0	1	4
Carvalho et Carvalho	6	12	1	6	3
Boile et al.	15	107	20	217	85
Ballou et al.	5	2	0	17	0
	Organization, Management	Geographical area, Physical space	Goods, Product	Services	Modes of transport
Gutierrez, Lopez et Uruga	7	4	10	5	8

Font: authors.

The choice of works to be analyzed by means of content analysis was carried out according to the relevance of the work problem involved and the main works that structure the conceptual basis of this research were considered, resulting in eight works. Because the words have different meanings, depending on the context, the authors decided to count manually the words at the moment of reading the work, because there are times when words are mentioned; however, they do not display the feeling desired by the authors; therefore, they cannot be considered.

International MLPs

The European transportation infrastructure planning is part of the agenda discussed in the Europe 2020 Strategy, whose main goal is to contribute to the mobility of people and goods, in a continuous and safe manner, collaborating to economic growth and competitiveness (EU Official Journal, No. L348, 12\20\2013). The following structures are considered references of the European MLPs (Gran Europe Group):

- MLP Scandinavian Transport Centre (Freight Village) in Denmark has Road, Air, Rail and Waterway modals, with an area of 1,300,000 m². The services rendered are transshipment, distribution, storage, consolidation and assistance for general shipment. Its management is public-private;
- MLP GVZ Bremen in Germany has Road, Air, Rail and Waterway modals, with an area of 4,720,000 m². The services rendered are distribution, storage, loading and unloading of general shipment with a public-private management;
- MLP GVZ Hamburg in Germany has Road, Air, Rail and Waterway modals, with an area of 560,000 m². The services rendered are movement, storage, loading and unloading, repackaging, reassembling, and transshipment for shipments in general. Its management is public-private;
- MLP GVZ Kassel in Germany has Road, Air, and Rail modals with an area of 850,000 m². The services rendered area production, storage, trade, loading and unloading of shipments in general. Its management is public-private;
- MLP GVZ Koblenz in Germany has Road, Air, Rail and Waterway modals, with an area of 2,200,000 m². The services rendered are movement, consolidation, transshipment, loading and unloading, distribution and storage for shipments in general, refrigerated chambers, and dry bulk. Its management is public-private;
- MLP GVZ Rostock in Germany has Road, Air, Rail and Waterway modals, with an area of 1,510,000 m². The services rendered are production, storage, trade, unloading and loading of shipments in general. Its management is public-private;
- MLP Rheinhafenge Sellschaft Weil am Rhein in Germany has Road, Air, Rail and Waterway modals, with an area of 260,000 m². The services rendered are movement, transshipment, consolidation, storage, loading and unloading of shipment in general, refrigerated chambers, and dry and liquid bulks. Its management is public-private;
- MLP BILK Kombiterminal in Hungary has Road, Air, Rail and Waterway modals, with an area of 1,000,000

m². The services rendered are movement, transshipment, consolidation, assistance, storage and loading of shipments in general, refrigerated chambers, and dry and liquid bulks. Its management is private;

- MLP CIM Interporto di Novara in Italy has Road, Air, and Rail modals with an area of 840,000 m². The services rendered are storage, assistance, and loading and unloading of shipments in general. Its management is public-private;
- MLP Ce.P.I.M.S.p.A. in Italy has Road, Air, and Rail modals with an area of 2,500,000 m². The services rendered are reception, storage, consolidation, shipment handling, loading, unloading and classification of goods for all types of shipments. Its management is public-private
- MLP Interporto Quadrante Europa in Italy has Road, Air, and Rail modals with an area of 2,500,000 m². The services rendered are storage, consolidation, and loading and unloading of shipments in general. Its management is public-private; - MLP Bilkakobo-Aparcabisa in Spain has Road, Air, and Rail modals with an area of 200,000 m². The services rendered are consolidation, storage, loading and unloading of shipments in general, refrigerated chambers, and dry and liquid bulks. Its management is public-private;
- MLP Centro de Transporte de Coslada in Spain has Road, Air, and Rail modals with an area of 1,079,000 m². The services rendered are reception, storage, loading, unloading and distribution of shipments in general. Its management is public-private;
- MLP ZAISA in Spain has Road, Air, and Rail modals with an area of 402,000 m². The services rendered are reception, storage, consolidation, loading, unloading and distribution for shipments in general, and refrigerated chambers. Its management is public-private;
- MLP Centro de Transportes de Madrid in Spain has Road, Air, and Rail modals with an area of 338,500 m². The services rendered are storage, consolidation, loading, unloading and distribution for shipments in general. Its management is public-private;
- MLP Centro de Transportes de Vitoria in Spain has Road, Air, and Rail modals with an area of 700,000 m². The services rendered are reception, loading, unloading, express deliveries, permanent display, vehicle Sales, service station and technical inspection for shipments in general, and refrigerated chambers. Its

management is public-private;

- MLP Ciudad del Transport de Pamplona in Spain has Road, Air, and Rail modals with an area of 608,000 m². The services rendered are storage, distribution, consolidation, loading and unloading of shipments in general, and refrigerated chambers.
- MLP Azuqueca Dry Port together with the Intermodal Rail Terminal in Spain has Road, Air, and Rail modals with an area of 960,000 m². The services rendered are storage, consolidation and distribution of shipments in general, and refrigerated chambers. Its management is public-private;
- MLP Logistics Platform of Zaragoza (PLAZA) in Spain has Road, Air, and Rail modals with an area of 13,117,977 m². The services rendered are loading, unloading and consolidation of shipments in general, refrigerated chambers, and dry and liquid bulks. Its management is public-private;
- PLM ZAL Barcelona in Spain has Road, Air, Rail and Waterway modals, with an area of 715,584 m². Its movement is for shipments in general having a public-private management.

Chakraborty (2006), discussing the infrastructure in Asia, highlights the efforts put forth in the connectivity to other continents, by establishing strategic links. The MLPs presented stand out in the Asian continent (Bacovis, 2007; Miller, 2009; Schwarzkopf, 2014; Apex, 2011; Ross, 2013):

- MLP Busan New Port Distripark in South Korea has Road, Air, Rail and Waterway modals with an area of 3,070,000 m². The services rendered are consolidation, customs clearance, packaging, repackaging, and loading and unloading for all shipments. Its management is public-private;
- MLP Gamcheon Distripark in South Korea has Road, Air, Rail and Waterway modals with services rendered in manufacturing, storage, distribution, loading and unloading for shipments of marine and coast products. Its management is public-private.

The MLP projects in the United States are initiated with studies of logistic systems demands, which later are executed through partnerships between the government and private initiative. The MLPs presented are the ones that stand out (U.S. Department of Transportation, 2015; IL STAFF, 2008; Alliance Global Logistics Hub, 2015):

- MLP Alliance Texas in the USA has Road, Air, and Rail modals with an area of 180,000,000 m². The services

rendered are distribution, consolidation, loading, unloading and storage for shipments in general. Its management is private;

- - MLP Pureland in the USA has Road, Air, and Rail modals with an area of 12,140,618 m². The services rendered are manufacturing, assembly, storage, distribution, loading, unloading, research and development for shipments in general, refrigerated chambers, and dry and liquid bulks. Its management is public-private;
- MLP Rickenbacke in the USA has Road, Air, and Rail modals with an area of 5,260,934 m². The services rendered are exchange, distribution, and consolidation. Its management is public-private;
- MLP Halifax Gateway Logistics Park in Canada has Road, Air, Rail and Waterway modals with an area of 505,850m². The services rendered are receipt, transshipment, loading, unloading, distribution and storage for shipments in general, refrigerated chambers, and dry and liquid bulks. Its management is public-private.

BRAZILIAN MLPS

The Brazilian logistic systems are quite outdated compared to the international scene. Problems with infrastructure, communication, investments destined to no bottleneck operations, and lack of long-term planning are the main barriers found (Ribeiro *et Ferreira*, 2002).

The Multimodal Logistic Platform found in Goiás (MLPG) is a project that is still under construction, allocated strategically in the city of Anápolis, in the countryside of Goiás due to its geographic location and to the transport flow of goods (Deloitte, 2013; Bacovis, 2007). The same reasons justify Campinas's MLP as it is the countryside of São Paulo. As to the variables studied, the Brazilian projects are characterized as such:

- MLP Multimodal Logistic Platform of Goiás in Anápolis has Road, Air, and Rail modals with an area of 6,967,790 m². The services rendered are consolidation, loading, unloading, and storage for shipment in general, refrigerated chambers and dry and liquid bulks. Its management is public-private;
- MLP Multimodal Logistic Platform Viracopos in Campinas has Road, Air, and Rail modals with an area of 7,000,000 m². The services rendered are consolidation, loading, unloading, and storage of shipment in general, refrigerated chambers, and dry and liquid bulks. Its management is public-private.

Comparative analysis between the foreign and Brazilian MLPs

The consolidation of the data of the international MLPs presented as a characteristic of functional structure, 100% the presence of road, rail, and air modal. As to the waterway modal the frequency observed was of 42%. The projects in Campinas – SP and Anápolis – GO have the road, rail, and air modals, and thus, considering these aspects, they are compatible to the international platforms. The absence of the waterway modal does not jeopardize the proper functioning of the platforms because 58% of them do not present this modal and, according to Boile *et al.* (2008) classification, they operate in satisfactory levels.

Most of the international MLPs have on average 9 million m² of useful area to carry out their activities, with the exception of the Asian MPLs which have only 3 million m². The Brazilian projects have approximately 6 to 7 million m², which corresponds to approximately 72% of the parameter reference.

The area destined for Brazilian facilities do not present a strong index of compatibility with the international models. However, this cannot be regarded as something negative, since two Asian platforms are part of the international market with only 33% of the reference area. Thus, the Brazilian projects need to be well designed and distributed within their possible physical space.

The most common services observed were loading and unloading, consolidation, storage and distribution, all linked to shipments. The MLPs rent their area to several logistic service providers. They are responsible for storage and distribution, and for preparing the shipment for loading and unloading.

The good performance of an MLP is fully connected to the flow of shipment that it is able to move and store, because these points characterize its main demand. This movement of goods is not in real time for all intended destinations, thus the need of warehouses to guarantee the standard conditions for the vessels.

Seeking cost reduction, the logistic service providers agglomerate the shipments that have the same destination making only one trip and dividing the costs between the service providers involved. The consolidation of cargo is fundamental in terms of reducing logistic costs.

Regarding the type of cargo, it was found that 85% have infrastructure to transport and store in general; 35% have refrigerated chambers; 27% have dry bulk; 4% have liquid bulk and; 4% have the capacity for all cargo type mentioned.

The *Agência Nacional de Transportes Aquaviários* (ANTAQ - National Waterway Transport Agency) defines general cargo as any kind of cargo that may be packaged in boxes, bags, barrels and crates. Shipments of the dry bulk type are dry shipments that are deposited directly in the containers that will be transported. The same definition applies to liquid bulk; however, these shipments are not dry. Refrigerated cargo corresponds to shipments that need mild and constant temperatures throughout the transport and storage cycle (ANTAQ, 2009).

The Brazilian projects will have an infrastructure capable of storing and transporting cargo in general, refrigerated and dry bulk compatible with the highest international indices. In addition, according to ANTAQ (2013), the most transported cargo in the Brazilian soil are grains, minerals, and cargo in general packed in containers; thus, the projects in Anápolis and Campinas are also compatible to the domestic market demand.

MLPs' management is run 73% by public-private partnerships. The document analysis carried out by the research allows the classification of public agency as a facilitating agent, assisting in bureaucratic issues, such as customs, taxes and tax laws. The private agency is normally responsible for the platform's management, controlling their service providers and accounting for the maintenance and development of the platform.

The Brazilian platforms are also structured by the public-private partnership. However, because of the fact that the projects have not yet been concluded the position of the public and private sectors was not observed. The public-private partnership stands out as a way of MLP management; however, this imposes no obligation on a model because there are other platforms in operation with satisfactory levels of performance where only the private sector administers the platform's operation.

Final considerations

Besides improving the economic and social development of the region next to its installations, the MLPs bring benefits to businesses in terms of cost reductions and improvement in the flow the cargo transported. Furthermore, it also contributes to the market in a worldwide scale.

The study observed that the Brazilian project is compatible with the Asian, European, and North American when considering the dimension occupied by the platform, the type of management, integrated modals, and types of cargo transported and stored.

New studies should be developed in order to analyze the

access of the modals in the Brazilian projects, whether the transport capacity they have is able to meet the demand flow of shipment.

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