

Analysis of activities that generate logistical costs in an operation in Brazil to import a containerized cargo: a case study

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Abstract

Paper aims: This article aims to analyze the activities that generate logistics costs in the process of importing a containerized cargo transported through a port terminal.

Originality: The scientific literature states that logistical costs are one of the main factors to be mitigated to improve the country's position in the global competitive scenario. The applied methodology offers a conceptual contribution to the area of supply chain, logistics and costs.

Research method: In this regard, it was necessary to map the process of importing the granite prime cargo, identify the agents involved in the process, survey the activities, and segregate which activities generate logistical costs. Data collection was carried out through the application of semi-structured interviews. Towards the end of each interview and observation, a compilation and data crossing along with the documentary analysis were performed. Then, the logistical costs were segregated by the following types: Supply, Plant, and Distribution.

Main findings: The article proves to be especially important due to the complex nature of the import process in the country, which involves many independent agents who need to communicate to lead the process. Through the information collected in the interviews with employees involved in the process of importing cargo and document analysis, it was possible to map the process, adding it with the systematic review of the literature realized on activities classified as generating logistical costs, it was possible to segregate them.

Implications for theory and practice: In this context, so it was possible to carry out the analysis of activities generating logistical costs. Properly mapping and analyzing the logistical cost-generating activities involved serves as a basis for decision-making by the agents involved in the various points of the cargo import process, since dealing directly with port terminals and agents responsible for import operations, it is possible to understand the causes of port inefficiency at the operational level.

Keywords

Analysis of activities. Logistics. Supply chain. Foreign trade. Costs.

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1. Introduction

Logistics is an important source of economic growth and also a field that offers great potential for business opportunities. In a globalized world, business logistics has an increasing tendency to be networked, specialized and standardized, and the effective management of logistics costs has become a key factor for the company to obtain competitive advantages (Wang, 2014).



Bearing in mind the high competitiveness in the international scenario, it is necessary to continuously evaluate the factors that determine Brazil's position in foreign trade and, mainly, the vulnerable points that prevent a better logistical performance of the country, such as, the excessive customs bureaucracy and precarious infrastructure (Souza & Bouchut, 2017).

The problems in the Brazilian infrastructure, the tax burden, and trade barriers are major obstacles to the country's economic development. Operating costs and Brazilian port barriers also contribute to impair exports and the competitiveness of Brazilian products in the international market (Ripoll, 2012), due to the worn out, chaotic and problematic logistics infrastructure in the country (Simões et al., 2018).

The integration between the members of the import process and the ports is seen as a critical factor in the economic development of a region and they explain how the complexity of the relationships of the entities involved in the process affect foreign trade. According to Ripoll (2012), the proper functioning of logistics systems is the main strategy that Brazilian companies can use to achieve levels of efficiency that benefit the economy of the company and its customers, since their optimization allows for a reduction in logistics costs, then, increasing the profit margin of the products.

Authors such as Škerlić & Muha (2016), Engblom et al. (2012), Ishii et al. (2016), and Laraswati et al. (2016) carried out practical works addressing logistical costs, and even though these works have been applied in different markets, all authors have reached similar conclusions about the importance of logistical costs for the positioning of the modern company. Additionally, they pointed out logistical costs as a decisive factor in the company's cost management.

The Brazilian logistic panorama is currently pointed out as a deficit. In a country, which lacks long-term planning and investments through public-private partnerships, public investment in infrastructure corresponded to less than 0.5% of GDP in 2019 (Globonews, 2020) a percentage much lower than other developing countries, for instance: China, Chile, India, and Peru. Resende et. al. (2018) corroborated this finding, since it demonstrated that logistical costs represented 12.37% of the Brazilian GDP in 2017, a percentage well above the USA and Europe (Souza & Bouchut, 2017).

Often the prices of products in consumer markets, even when they have advantages such as natural resources and the best price in production or elaboration, lose market because the final cost ends up being high, precisely because Brazil has higher logistical costs (Lopez, 2000). This view can be corroborated by Brazil's position in the world ranking of logistical performance shown in Figure 1.

Although it ranks among the 15 largest economies in the world, Brazil only occupied the 56th position in the 2018 ranking. Supported by the importance of logistical costs, not only in the port context but also for companies. Moreover, also considering the position the country occupies in the global logistics and containerized cargo transportation scenario. Therefore, this paper aims to answer the following research question: How does the analysis of logistical costs contribute to the cargo import process?

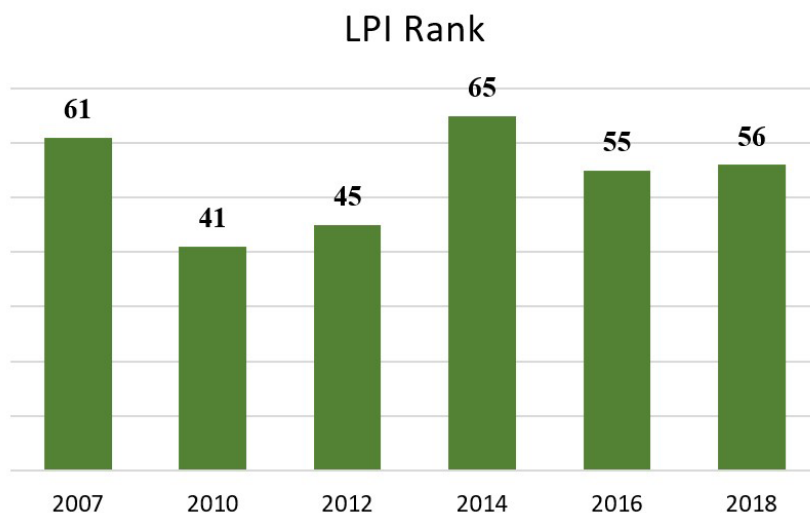


Figure 1. Brazilian logistics performance index (LPI) from 2007 to 2018. Source: The World Bank Group (2021).

For this, the granite prime product chain was mapped and the activities in the literature as generating logistic costs were properly analyzed. What can be observed is that the literature is rich in research evaluating port logistics and studies demonstrating the importance of logistic costs for the sector, focusing on improving port efficiency through the investigation of its infrastructure and analysis of port management models, as well as the involvement of private sector port operators and customs reforms.

Regarding the context studied, the paper is especially important due to the complex nature of the import process in the country, which involves many independent agents who need to communicate to carry out the process. Thus, the research brings practical and theoretical contributions to the studied area. The practical contributions are the mapping of the prime granite import process and analysis of activities generating logistical costs. The theoretical contributions consist of increasing the range of papers involving port logistics costs in Brazil and adding knowledge to port studies in general.

2. Literature review

2.1. Logistics

As stated by the Council of Supply Chain Management Professionals (2013) logistics is the process of planning, implementing, and controlling the flow of transport and storage, goods and services effectively and efficiently from the point of origin to the point of consumption, in order to meet consumer requirements.

In addition, logistical activities are totally related to supply chain management. Supply chain management can be characterized as the planning and integration of material flows, finance, internally product and information, and between companies, from primary suppliers to final consumers, in order to add value to customers through finished products and services (Cano et al., 2015). Since logistical activity is one of the main elements for ensuring compliance with customer requirements, such as increased satisfaction and the level of customer service (Wang, 2014).

In recent years, a movement known as logistics 4.0 has also been highlighted, which seeks to provide solutions that integrate tools, practices, and new technologies. It implies the use of tools such as radio frequency identification, the internet of things, Big Data analytics transactions, additive manufacturing, wearable technologies, autonomous guidance vehicles, and humanoid robots (Zuluaga-Mazo et al., 2018).

Furthermore, other approaches such as that by Dornier et al. (2000) also include the flow of information in the context of logistical processes. The perspective concerning logistics found in the works of Dornier et al. (2000), can be expanded by the one described in Amaral (2012), an author who presents the notion that logistics can be subdivided into three macro processes: supply logistics, distribution logistics, and plant logistics. Based on what was extracted from the CSCMP, the work of Dornier et al. (2000) and Amaral (2012) a generic representation of these macro processes was constructed, whose scheme is shown in Figure 2.

It is highlighted by Saez-Mas et al. (2020), for example, that in the automotive industry, logistics is divided between these macro processes. Supply logistics related to the activities of receiving parts from suppliers. Distribution logistics related to the return of empty containers to the assembly line or final product delivery to consumers. Plant logistics, associated with the movement of parts to the assembly line, as well as the reverse flow of empty containers.

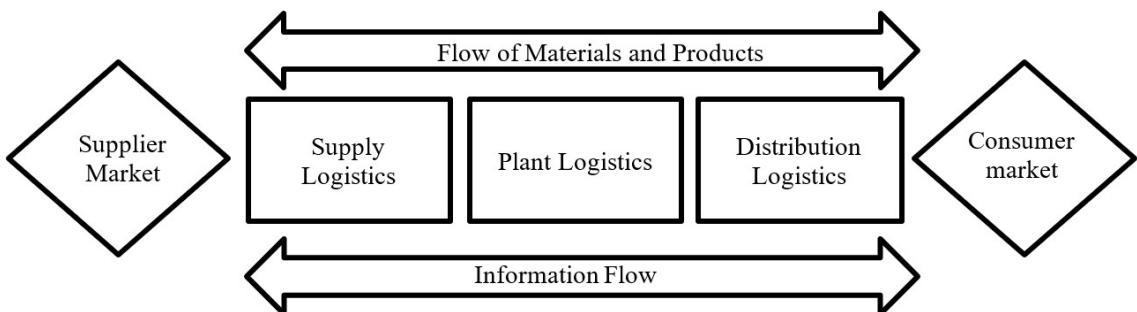


Figure 2. Generic scheme of macro logistics processes. Source: Adapted from Amaral (2012).

In this manner, supply logistics is the link between the company and its suppliers, plant logistics comprises activities carried out within the company's borders and distribution logistics represents, finally, the link between the company and the consumer market.

Another important point to consider is the emphasis given to globalization, which contributes to the logistical processes becoming more complex. As a consequence, we have an increase in the complexity of logistics, thus having a global reach, one of the ways of acquiring materials is through international trade. According to Sharapiyeva et al. (2019), logistics services at an international level are an important part of the business, so the most important aspects of logistics efficiency are logistics costs and supply chain reliability.

To meet supply demands in countries, one of the most used forms is the import process. In order for these processes to materialize, several companies interact with each other to bring cargo from one country to another, often using the waterway modal, where traffic is being operated through ports. As port operations increase in complexity and extent, the role of ports has become powerful enough to influence the performance of supply chains (Lam & Gu, 2013). Marine container terminals, for example, are a key part of global supply chains. A container terminal is an area where the containers are delivered before being exported to other countries or imported into the mainland port.

Therefore, some studies, including the current one, focus on the creation of methodologies and analysis aiming at increasing the performance in containerized cargo traffic. (Wong et al., 2012) point out that in addition to the basic operations carried out at a maritime terminal, the operators of these terminals need to create value in their activities by providing new services. Thereby, it is possible to notice the importance of logistics over time and the need to optimize logistics processes and purchase materials through import. What makes it necessary to study its activities, use of resources, and costs involved.

2.2. Logistics costs

The logistics activity and its key elements consist of ensuring increased customer satisfaction and aim to improve the level of service. Each component of the logistics system will determine whether the customer can receive the appropriate products, under suitable conditions, at the appropriate time and place (Wang, 2014). Therefore, decision-makers need cost-efficient systems that give visibility to the accumulation of costs throughout the process.

The main obstacle encountered is the creation of comprehensive structures sufficient to capture the logistical costs. Hence, clear structures must be created, and all costing items must be forecasted. This includes determining cost sources, cost allocation, among other factors (Sternad, 2018). Thus, it is possible to infer the impact of logistics costs on economic development, whether for a specific company or nationwide.

During the review of the literature on the topic, two distinct groups of work were perceived within the scope of logistical costs. The first group includes those who discuss the issue of logistical costs at the national level, conducting their research in government and international financial institutions databases, in order to obtain an overview of logistical costs within the context of the sectors of the economy of each region, such as agriculture, mining, wholesale, among others (Souza & Bouchut, 2017; Sharapiyeva et al., 2019; Hansen et al., 2014; Havenga et al., 2015, 2017; Sternad, 2018; Wang et al., 2020).

The second group of works consisted of cost data from specific companies, having been carried out based on interviews, questionnaires, and other forms of data collection in the focal companies (Aulin et al., 2019; Duraccio et al., 2015; González-Ramírez et al., 2020; Ishii et al., 2016; Laraswati et al., 2016; Peng et al., 2019; Soliani et al., 2020; Wiratchai et al., 2018).

Table 1 displays which types of activities are treated as logistical cost-generating, according to the two groups analyzed.

Analyzing the works that investigated logistical costs in the form of case studies, or similar modality, exposed in Table 1, logistical costs can be interpreted as the monetary value consumed, or the accumulation of expenses with resources in the process of transportation, storage, logistics administration, waste, material handling, and information technology. These components are detailed below:

- Transport includes the costs incurred in moving the cargo to the port and from the port to the final destination, such as costs with sea freight, insurance, drivers' salaries, fuel costs, depreciation of vehicles, and indirect costs of the person responsible for the activity;

Table 1. Activities classified in the literature as logistical cost-generating.

Authors	Transport	Storage	Administration	Waste	Material handling	IT infrastructure
Hansen et al. (2014)	X	X	X	X	X	
Havenga et al. (2015)	X	X	X		X	
Duraccio et al. (2015)	X	X			X	X
Laraswati et al. (2016)	X	X	X		X	X
Ishii et al. (2016)	X	X			X	
Engblom et al. (2012)	X	X	X		X	
Havenga et al. (2017)	X	X	X		X	
Souza & Bouchut (2017)	X	X	X		X	X
Zhang & Li (2018)	X	X	X	X	X	
Solakivi et al. (2018)	X	X			X	
Stemad (2018)	X	X	X		X	
Wiratchai et al. (2018)	X	X	X		X	X
Soliani et al. (2020)	X	X			X	
Peng et al. (2019)	X			X	X	
Aulin et al. (2019)	X	X	X		X	
Sharapiyeva et al. (2019)	X	X	X	X	X	X
Wang et al. (2020)	X					X
González-Ramírez et al. (2020)	X	X	X	X	X	X

- Storage comprises costs incurred for maintaining stored cargo, depreciation of equipment, costs for renting the site, direct and indirect labor;
- Administration contains indirect labor costs that contribute to cargo planning, acquisition, or operation;
- Material handling embraces costs incurred during cargo handling at port terminals, such as unloading, weighing, scanning, the salaries of the employees involved, depreciation of the equipment used;
- Waste consists of costs incurred due to failures, such as delays or material damage during transport, material handling, or storage operations;
- IT Infrastructure takes in communication expenses used to coordinate other logistical activities.

The studies previously analyzed served as a basis for structuring costs in the case study carried out in this article, but when it comes to logistical costs at the port level, other factors must also be considered, for instance: the fees incurred for each type of product, tariffs charged at ports, sea freight, insurance, and the surcharge fee. The latter is especially important, since in Brazil overtime is always a possibility, whether due to predictable congestion issues in times of high traffic or operational problems in ports, such as the lack of mooring berths, insufficient storage capacity, and impediments due to bureaucracy (Simões et al., 2018).

3. Research methodology

To development of research, the case research method was used, following the steps proposed by Voss et al. (2002) (Figure 3) and detailed in the next subtopics. According to the authors, many of the breakthrough concepts and theories in operations management, from lean production to manufacturing strategy, have been developed

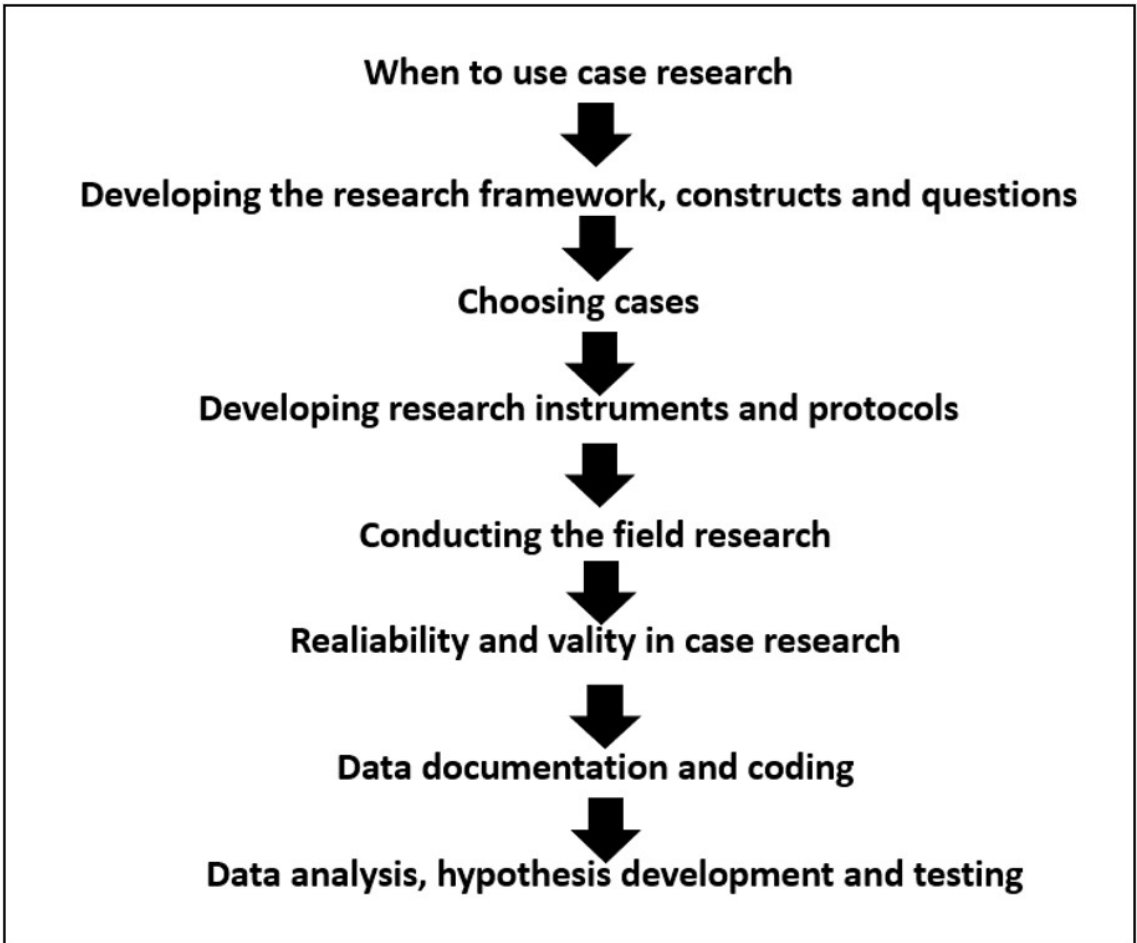


Figure 3. Steps to development of case research. Source: Voss et al. (2002).

through field case research. In conjunction with the case study method, this article carried out a systematic review of the literature to obtain a sample of articles relevant to the theme and its objectives.

3.1. When to use case research

In this paper, the case research was used to apply or testing the existing knowledge. In this case, the approach proposed by Dornier et al. (2000) and Amaral (2012), to represent the logistics macroprocess, applied with division proposed by Vasconcelos (2015) to define the activities that generate logistics costs. The research was carried out within the context of the import process of a containerized cargo. In this context, a single embedded case study was adopted for this research, which is characterized by the investigation of multiple units that structure a single case.

3.2. Developing the research framework, constructs and questions

This research has a qualitative approach that allowed an analysis of the agents involved, their relations, and the particularities of the case to map the process and survey the logistical generating-costs activities.

The research was divided in two main steps, the first aiming to map, from the viewpoint of the agents, the participation of each one in the import process, and then their activities related to each process of each agent

to be analyzed and segregated according to the approach used. The Figure 4 resume the research development in each agent.

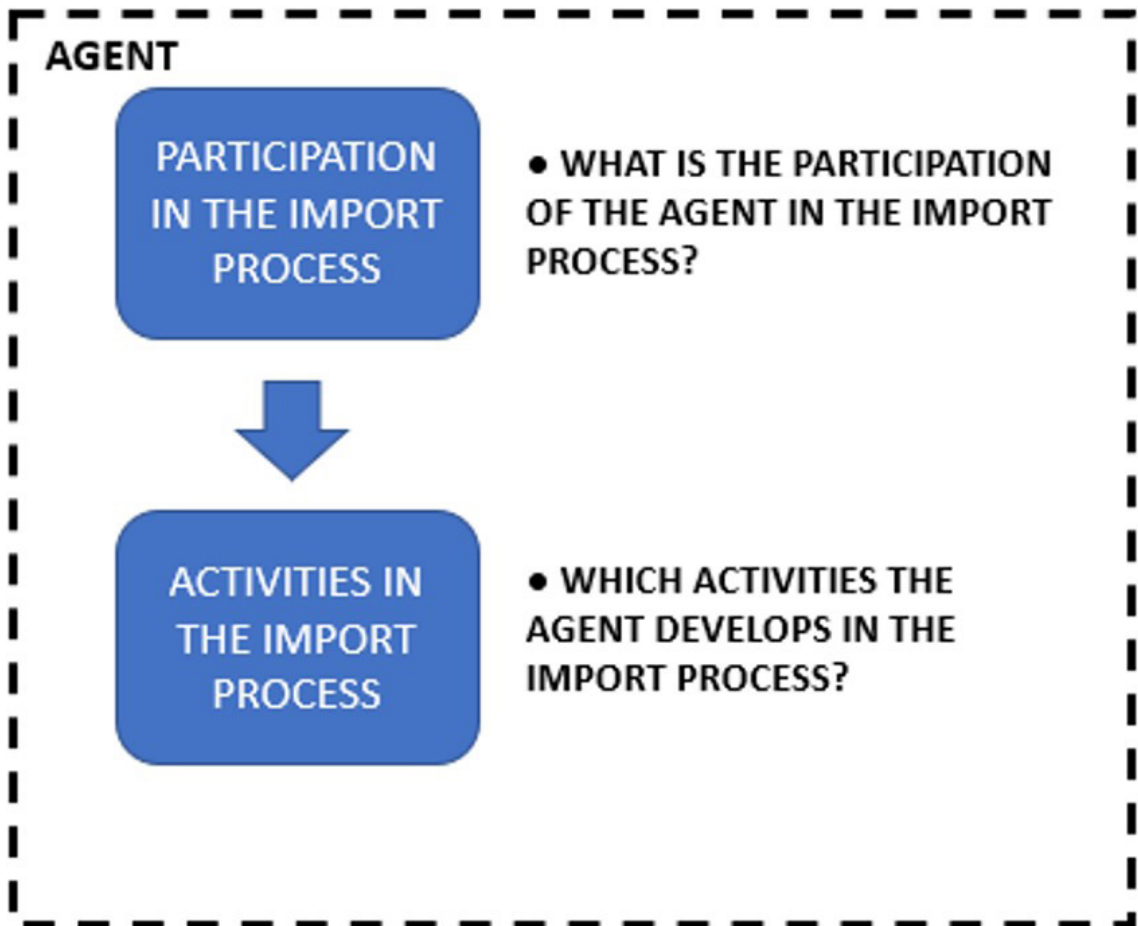


Figure 4. Research framework to the agents. Source: Authors.

3.3. Choosing cases

This article shows the study carried out in the import chain of the product granite prime, a rock with a high degree of hardness and widely used indoors, imported from China, and transported from containers. The choice of this cargo was due to the availability of data and due permission given by the trading agent, responsible for managing the granite import. Thus, the main agents participating in this import are the importing company, which works with the processing of ornamental stones, the trading company, already mentioned, the cargo agent, responsible for the maritime transport of the cargo, the port, which operates the unloading of the ship, and the customs warehouse, which offers storage space while the cargo is nationalized.

3.4. Developing research instruments and protocols

To the initial mapping, about the participation of the agent in import process, was built 6 forms intended to the six agents involved in the import process. The forms were used to conduct semi-structured interviews, where the main subject was to evaluate the participation of the agent and the activities developed by them.

Thus, a form were built to each agent, and the questions was referred to the responsibilities of each one in the import process, what activities they made, who hire it, who delivery the cargo to it, who received the cargo

from it, what other agents he have related to execute his process efficiently, further specifics questions about their function, made in the interview. Besides that, all the forms were validated with specialists before to be applied.

3.5. Conducting the field research

To get to know the agents involved in this process, initially, there was contact with the trading agent, this is the intermediary between the importing company and the main agents related to cargo import, in this study: the prime granite.

Six companies were investigated during the conduct of the study: the trading company, the customs broker, the port terminal, the dry port, the cargo agent, and the importing company (owner of the cargo). Following, Chart 1 presents the characterization of the survey respondents.

The interviews lasted an average of 45 minutes and the recordings were later transcribed to identify the activities of each agent in the import process.

Chart 1. Characterization of respondents.

Characterization of respondents		
Agent	Function	Total time working for the company
Importing company	Lawyer	15 years
Custom broker	Director	8 years
Trading	Accounting	2.5 years
Navigation Agent	Commercial Manager	6.5 years
Customs warehouse	Commercial analyst	2.7 years
Port	Business consultant	1 year

3.6. Reliability and validity in case research

All the forms applied were previously validated by specialists, and after the interviews, the information was sent to the interviewee validate with what was captured by the researchers to verify if it was in accordance with the reality of the company's operation.

3.7. Data documentation and coding

All the interviews were recorded with the interviewer's permission and transcribed later. To mapping the process and the participation of each agent were written reports and to schematize the activities were used spreadsheets with support of the software Microsoft Office Excel.

3.8. Data analysis, hypothesis development and testing

The data were analyzed by two ways, the first one segregating the activities according to the logistics classification proposed by Dornier et al. (2000) and Amaral (2012), and after defining what was logistic or not according to Vasconcelos (2015).

Based on interviews and documentary analyzes, it was possible to map the process of importing containerized granite prime cargo. In this fashion, the process was mapped, covering all agents, and the processes mapped for each of the agents involved individually. The processes developed by each are classified into three categories: supply logistics, plant logistics, or distribution logistics.

To fit this vision in the context of this research, the maritime terminal and the dry port were considered as the location where plant logistics occurs, in other words, the central link of the perspective. The activities that contribute to the import operation, even if they are not carried out by these two agents, were considered as part of the plant logistics. Therefore, what was related to the prior steps to the arrival of the cargo at the terminal was considered as supply logistics, and the activities developed in the movement of cargo from the dry port to the importing company were considered as distribution logistics.

3.9. Segregation of logistics activities

Once the activities were mapped, it was segregated which ones generated logistical costs. This step was performed based on the studies presented in Table 1.

In the section Logistics costs, a summary of what is considered logistical costs in the literature was made, and the following classes were defined: Administrative activities, IT infrastructure, storage, material handling, transport, and waste. Then, the activities of each agent were segregated according to these categories since this is the parameter to determine whether or not the activity generates logistical costs. Table 2 shows the methodology used to segregate logistical activities, which was adapted from Vasconcelos (2015).

If the activity can be classified into any of the categories in the columns, it is considered to generate logistical costs. In the interest of identifying it, it is marked with an “X” at the intersection between the activity line and the category column.

Table 2. Framework applied to segregate logistics activities.

	1. Administrative logistical costs	2. IT logistical costs	3. Logistic storage costs	4. Logistic costs of material handling	5. Logistic transportation costs	6. Logistic waste costs
Agent Activity Dictionary	It includes costs incurred for maintaining stored cargo, depreciation of equipment, costs for renting the site, direct and indirect labor. This type of cost varies according to the type of cargo accommodated.	Includes communication costs used to coordinate other logistical activities.	It includes costs incurred for maintaining stored cargo, depreciation of equipment, costs for renting the site, direct and indirect labor. This type of cost varies according to the type of cargo accommodated.	It includes costs incurred during cargo handling at port terminals, such as unloading, weighing, scanning, the salaries of the employees involved, depreciation of the equipment used.	It includes the costs incurred in moving the cargo to the port and from the port to the final destination. Such as sea freight costs, insurance, drivers' salaries, fuel costs, depreciation of vehicles and indirect costs of those responsible for the activities.	It includes costs incurred for failures, such as delays or material damage during transport, material handling or storage operations.
Activity 1						
Activity 2						
Activity n						

Source: Adapted from Vasconcelos (2015).

4. Results

4.1. Characterization of agents and cargo

There are five main agents involved in the process of importing the cargo studied: the importing company, which is acquiring the cargo; the trading company, which is responsible for managing the purchase and clearance of the cargo; the port terminal, which receives the cargo when it arrives in the country; the customs warehouse or dry port, second cargo stop in the country and where nationalization takes place; and the cargo agent, who is responsible for renting the space of the ship where the container will be transported.

The importing company is located in the state of Paraíba-Brazil and has been operating in the production and marketing of granite and marble since the early 90s. It is among the largest ornamental stone processing companies in Brazil and operates in all phases of the productive process: research, extraction, processing, and commercialization.

The trading company works with solutions for international trade. Acting in both import and export processes. The port terminal is located in the municipality of Cabo de Santo Agostinho-Pernambuco-Brazil. It is connected to more than 160 ports in the world, with direct lines to countries in Europe, South America, and North America. The customs warehouse is the second cargo stop in the country, and it is where the nationalization of cargo takes place. The shipping agent offer an integrated network of communication systems and processes with ports, airports, airlines, shipping, and customs companies.

The imported product is prime granite, which is an ornamental stone intended for internal use. It is composed of marble powder and resin. Because it is more resistant and durable than traditional marble, this stone has

gained space in the national market. The cargo is imported from China and is transported as a container to the port studied in this work.

4.2. Mapping process

The first step carried out in the research was the mapping of the prime granite import process. To achieve this goal, interviews were conducted with employees of the companies involved, as well as direct observations and documentary analysis. The processes are discussed within the perspective of macroprocess logistics, in which each of the activities is categorized into supply, plant, and distribution.

The mapping of the import process shows the conjuncture of the agents involved based on their activities performed in the process. Following is the graphical representation of the mapping import process.

The interactions among each of the agents shown in Figure 5 are represented by means of a direct link, which indicates the relationship between a previous process and the subsequent process in the general procedure for importing the cargo.

The activities of each of the mapped agents were combined with the perspective of the macroprocess logistics - supply, plant, and distribution. To fit this view in the context of the research, the maritime terminal and the dry port were considered as the location where plant logistics takes place, in other words, the central link of the perspective. The activities that contribute to the import operation, even if they are not executed by these two agents, were considered as part of the plant logistics. Therefore, what is related to the previous steps and the arrival of the cargo at the terminal is considered as supply logistics, and the activities carried out in the movement of cargo from the dry port to the importing company are considered as distribution logistics.

The importing company is the agent that initiates the import process, and its internal needs generate the action of acquiring the prime granite cargo. Around it, agents are aggregated throughout the import process. The first agent with which the company relates is the trading company, which is responsible for managing the purchase and who will interact with most agents.

In the process of importing prime granite, the company does not hire a customs broker. He would be responsible for running cargo nationalization procedures, ensuring that all documentation involved is in accordance with the government's consenting bodies, such as the federal revenue and agriculture ministry. These activities are absorbed by the trading company and by two company employees, one operating directly at the head office and the other in the city where the maritime terminal and dry port are located.

A carrier is hired, which is responsible for taking the prime granite cargo from the dry port to the importing company, where the last step in the import process is fulfilled, which consists of packing the cargo in the company's warehouses.

The trading company is central to the process of importing prime granite cargo, as it manages the purchase, cargo transit, and cargo nationalization. It is the agent who has the most connections within the process.

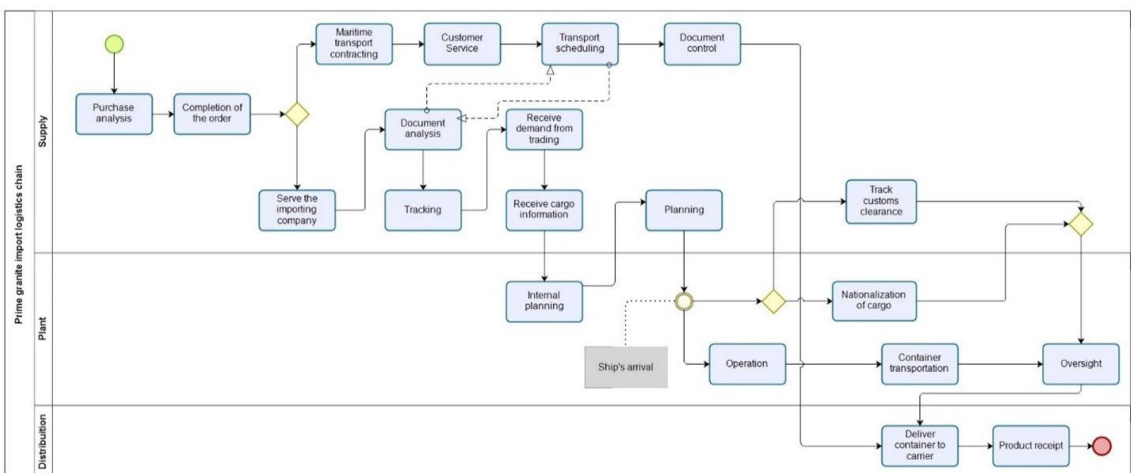


Figure 5. Mapping of the cargo import process.

The cargo agent is the shipowner's representative (actual owner of the ship) at the port of destination. The shipping agent is responsible for subletting spaces on vessels for exporters and importers interested in carrying out maritime trade.

The maritime terminal is the first point of contact for cargo in the country. It will carry out the operations of mooring the ship and unloading the cargo. As mentioned earlier, in the case of importing prime granite, the cargo after being unloaded at the terminal is taken to the dry port.

The dry port is the second stop of cargo in the country and the last before being transported to the importing company, its final destination in the import process. The dry port carries out the procedures for monitoring the location of the ship responsible for transporting the cargo, monitoring the state of operation of the ship at the terminal after its arrival in the country, and preparing the yard to receive the container. Subsequently, the container is scheduled to be removed at the maritime terminal and transported to the dry port where weighing, scanning, inspection, and storage are performed. The cargo is stored until it is nationalized by the trading company.

4.3. Classification and analysis of logistics activities

Table 1 shows the types of activities that the authors studied considered as logistical activities. Consequently, the activities considered were transportation, storage, administration, waste, material handling, and IT infrastructure.

Once the logistical activities were separated, it was possible to classify them by type of logistics. Besides, considering the macroprocess logistics perspective, it was possible to classify these activities in supply, plant, or distribution. Table 3 displays Trading activities related to the logistic cost categories.

Table 3 illustrates the classification of which activities were considered logistical for the trading company. Assessing the data above, it is possible to observe that none of the macro activities identified is entirely logistical since some of their micro activities are not classified in any of the categories present in the columns - transport, administration, storage, material handling, waste, or IT infrastructure.

All activities of the company that were characterized as being logistics were classified into the categories of IT administration or infrastructure. This is due to the very nature of the services offered by the company. Management activities include those that contribute to cargo planning, acquisition, or operation. The IT infrastructure is composed of those activities related to communication used to coordinate the other logistical activities.

The only macro activity of the company considered as a plant is the nationalization of the cargo. As a result of the fact that this activity is carried out while the cargo remains in the port terminal and in the dry port. These activities are performed to promote the removal of cargo from the maritime terminal and move it to the dry port.

The process closure is classified as distribution logistics because it represents the efforts of the trading company to transport the cargo from the dry port to the importing company. Some of the stages of closing the process are performed to meet legal demands and are not efforts to move the cargo. Next, Table 4 shows the classifications of the importing company's logistical activities.

Evaluating what has been exposed, it is possible to observe that, unlike trading, all the macro activities identified were fully logistical. This is because all micro activities are classified in one of the logistical cost categories.

As for the type of logistics, the company is present in the supply and distribution phases. The activities included in the supply phase relate to the company's efforts in acquiring cargo, contracting, and communicating with other agents to move cargo from the port abroad to the national terminal.

The company is also present in the distribution phase, as the activities executed at the maritime terminal and in the dry port are considered as plant logistics. And the activities that contribute to the removal of cargo from the customs area and its transport to the importing company, are considered as distribution logistics. In this manner, the company's activities related to the hiring of the carrier, and those carried out to accommodate the cargo in its own yard are included in this type of logistics.

All activities of the company that were characterized as being logistics were classified in at least one of these three categories: administration, IT infrastructure, or material handling. Management activities include those that contribute to the planning, acquisition, or operation of the cargo. The IT infrastructure is composed of those activities related to communication used to coordinate the other logistical activities. Material handling activities concern those performed in the company's yard. Table 5 below, presents the segregation of the freight forwarder's logistical activities.

Appraising Table 5, it is possible to observe that, not all the macro activities identified were considered as totally logistical. In the case of this agent, only a micro activity was not included in any of the categories of logistical cost in the columns of Table 5. Most because this activity concerns the internal control of the

Table 3. Activities generating the logistics costs of Trading.

Logistics type	Macro activities	Micro activities	Logistic Cost Category							
			Transport	Storage	Administration	Waste	Material handling	IT infrastructure		
Supply	Serve the importing company	Receive supplier data by the customer							X	
		Check if the customer has a valid import license								
		Contact exporter							X	
		Request proforma invoice from the exporter							X	
		Pass quotation to the importing company								
	Document Analysis	Contact and pass information to the cargo agent								X
		Request invoice and packing list from supplier								X
		Request bill of lading from cargo agent								X
		Analyze invoice, packing list and bill of lading				X				
		Negotiate quote								
	Tracking	Pass quote to customer								
		Check if the customer has paid for the product								
		Booking with the cargo agent				X				
		Inform the booking to the customer								X
		Receive bill of lading from the cargo agent								X
Plant	Nationalization of cargo	Cargo tracking on the shipowner's site and informing the customer				X				
		Schedule with warehouse - arrival details				X				
		Receive physical and e-mail documentation from the exporter								
		Check electronic knowledge on the merchant navy website				X				
		Raise nationalization costs				X				
		Pass nationalization quotation to the customer								
		Check if the customer has paid the nationalization costs								
		Making import declaration				X				
		Make payment of federal taxes				X				
		Check which channel was given by the IRS				X				
Plant	Nationalization of cargo	Fill Map form				X				
		Contact carrier and deliver documentation				X				
		Receive documents stamped by the PB and PE revenue								
		Check if the customer has paid the freight (payment is only made after the cargo arrives)								
		Make payment of the cargo agent				X				

Source: Adapted from Vasconcelos (2015).

Table 3. Continued...

Logistics type	Macro activities	Micro activities	Logistic Cost Category					
			Transport	Storage	Administration	Waste	Material handling	IT infrastructure
Distribution	Process closure	Check if the shipowner has released the removal of the cargo			X			
		Make land freight quotation			X			
		Pass land freight quote to the customer						
		Pass documentation to the customs warehouse			X			
		Schedule container pickup			X			
		Check that the container has been returned			X			
		Pass the process documents to the customer						

Source: Adapted from Vasconcelos (2015).

Table 4. Activities generating the logistics costs of the importing company.

Logistics type	Macro activities	Micro activities	Logistic Cost Category					
			Transport	Storage	Administration	Waste	Material handling	IT infrastructure
Supply	Purchase analysis	Receive product order from internal inventory control			X			
		Request a quote from Exporters via email						X
		Analyze quotes and order the product			X			
		Receive invoice			X			
		Send invoice to management asking for purchase authorization			X			
		Make payment of 30% of the product value			X			
	Completion of the order	Send proof of purchase			X			
		Inform product data to the trading company						X
		Receive Certificate of origin and invoice and send to the trading company						X
		Make payment of 70% of the product value			X			
	Maritime transport contracting	Request a quotation from Cargo agents						X
		Analyze quotation and send data to the chosen freight forwarder			X			
	Track customs clearance	Receive invoice from the trading company and make payment			X			
Pay freight to the trading company when the goods arrive at the national port				X				
Perform inspection of the container with MAPA				X				
Hire a carrier to remove the container from the customs warehouse				X				
Distribution	Product receipt	Receive product					X	
		Check product					X	
		Putting granite in the show room						X

processes received at the office and does not generate an effort to move the cargo. As for the type of logistics, the company is only present in the supply phase, as all activities are related to the efforts made to move cargo from the port abroad to the maritime terminal.

Table 5. Activities that generate freight agent logistical costs.

Logistics type	Macro activities	Micro activities	Logistic Cost Category					
			Transport	Storage	Administration	Waste	Material handling	IT infrastructure
Supply	Attend customer	Attend Importer			X			
		Receive invoice, packing list and contract from exporter						X
	Transport scheduling	Instruct office located at the origin of the product			X			
		Contact exporter via local office						X
		Receive the cargo deadline from the exporter						X
		Reserve space on the ship with the Shipowner			X			
	Document control	Issue bill of lading and send it to the trading company			X			
		Internal document control						
		Track cargo and follow up with the customer			X			
	Process closure	Receive freight payment			X			
		Make payment to the Shipowner			X			
		Charge the customer for returning the empty container			X			

As in the case of the trading company, all activities of the company that were characterized as being logistics were classified into the categories of IT administration and infrastructure. Administration activities include those that contribute to the planning and operation of cargo at the terminals. The IT infrastructure, on the other hand, consists of those activities related to communication used to coordinate the other logistical activities. Table 6 below, presents the segregation of the logistical activities of the maritime terminal.

According to Table 6, it is possible to observe that, all the macro activities identified were considered as totally logistical. As for the type of logistics, this agent is present in the supply and plant phases. The activities included in the supply phase relate to efforts to prepare the terminal for receiving the ship that carries the cargo.

The company is also present in the plant logistics phase, whose activities are those related to the operation of mooring and unberthing the ship, unloading and moving the container to the defined area to be removed by the dry port.

All the company's activities that were characterized as being logistics were classified into at least one of the four categories - administration, storage, IT infrastructure, and material handling. Management activities include those that contribute to cargo planning and operation. The IT infrastructure, alternatively, consists of those activities related to communication used to coordinate the other logistical activities.

Material handling activities concern those carried out in the terminal yard, such as unloading the container and positioning it for its removal through the dry port. Storage activities are those designed to accommodate the container until it is removed by the dry port. Table 7 below, shows the segregation of the dry port's logistical activities.

Assessing Table 7, it was possible to observe that not all the macro activities identified were considered as totally logistical. This is because two of the activities surveyed were not included in any of the categories indicated in the columns of this table.

As for the type of logistics, this agent is present in the three phases of supply, plant, and distribution. The activities included in the supply phase relate to efforts to prepare the dry port yard for receiving the container, which will be unloaded at the maritime terminal.

The company is also present in the plant logistics phase, these activities are those referring to the operations executed to move the container from the maritime terminal to its own yard. Weighing, scanning, and packing, as well as perform all necessary movements to allow inspection of the cargo by the consenting parties. The distribution phase concerns the activities that the dry port develops to deliver the cargo to the carrier, which will take the container to the importing company.

All the company's activities that were characterized as being logistics were classified into at least one of the four categories - administration, storage, material handling, and IT infrastructure. Administration activities

Table 6. Activities generating logistical costs for the maritime terminal.

Logistics type	Macro activities	Micro activities	Logistic Cost Category					
			Transport	Storage	Administration	Waste	Material handling	IT infrastructure
Supply	Planning	Receive ship data 48 hours before arrival via Shipowner						X
		Analyze the average time of operation for the ship			X			
		Schedule the mooring of the ship			X			
		Program which equipment will be used			X			
		Receive a list of containers (DTC) from the customs warehouse						X
		Plan the storage location of the containers			X			
Plant	Operation	Supervise the mooring of the ship					X	
		Perform load presence				X		
		Remove containers from the ship with the portainer					X	
		Transporting containers with the transteiner					X	
		Store containers in the programmed location with reach staker					X	
	Traffic	Release the ship's unberthing			X			
		Schedule the collection of containers by the Customs Warehouse			X			X
		Receive truck from customs warehouse					X	
		Loading truck from customs warehouse					X	
		Receive empty container without damage					X	

Table 7. Activities generating logistic costs for the dry port.

Logistics type	Macro activities	Micro activities	Logistic Cost Category					
			Transport	Storage	Administration	Waste	Material handling	IT infrastructure
Supply	Receive demand from the Trading	Receive e-mail with information about the cargo and what services should be provided						X
		Receive cargo information						X
		Send service fee and negotiate pending issues						X
Plant	Internal planning	Receive e-mail with information about the arrival of the ship and documentation						X
		Receive electronic knowledge by email (merchant EC)						X
		Check if the cargo withdrawal will be a customs transit document (DTA) or a container transit declaration (DTC)			X			
		Do internal control						
		Monitor the arrival of the ship on the primary zone website			X			
		Send to container list primary zone						X
		Request scanner dispensation - DTC withdrawal			X			
		Check on the primary zone website, the completion of the ship's operation			X			
		Schedule the removal of containers on the primary zone website			X			
		Schedule the loading of the containers			X			
Supply	Receive cargo information	Schedule of units received and which customers			X			
		Carry out the patio organization					X	

Table 7. Continued...

Logistics type	Macro activities	Micro activities	Logistic Cost Category					
			Transport	Storage	Administration	Waste	Material handling	IT infrastructure
Container transport	Inspection	After scheduling, removal of containers from the primary to the secondary zone					X	
		Transportation of cargo to the secondary area					X	
	Distribution	Deliver container	Weighing ticket issue			X		
			Container scanning				X	
			Inspection of the container				X	
			Container storage		X			
			Receive an email from the customer asking for the container to be moved for MAPA inspection.					X
			Move container to the inspection area				X	
			Receive MAPA tax			X		
			Moving container to the yard		X		X	
Distribution	Deliver container	Wait for the container to clear		X				
		Receive e-mail from the customer to pick up the container					X	
		Transporting cargo to the carrier's truck				X		

embrace those that contribute to cargo planning and operation. The IT infrastructure is composed of activities related to communication used to coordinate the other logistical activities.

Material handling activities concern those carried out in the dry port yard, such as transporting the container from the maritime terminal to its yard, weighing and scanning it, and positioning it for inspection by the consenting bodies. Storage activities are those designed to accommodate the container until it is removed by the carrier.

Based on all responsible agents, it is clear that it is recommended that these companies revisit the current processes in order to optimize them. Improve integration in information systems, as analyzes in the results, there is a lot of participation in IT infrastructure and Administration activities.

5. Conclusions

As pointed out throughout this article, the analysis of logistical activities and costs is essential for the positioning of the modern company, given the current conjuncture of the global economy. Ports are the main gateway for goods in the country and the logistics costs in the sector are identified by academics and the private sector as an obstacle to national development.

Through the information collected in the interviews with employees involved in the process of importing cargo and document analysis, it was possible to map the process. At first, the import process was displayed in its complete form and, in sequence, each of the agents had their roles and activities discussed individually. Subsequently, by applying a methodology adapted from the work of Vasconcelos (2015) and adding it with the systematic review of the literature on activities classified as generating logistical costs, it was possible to segregate them.

It can be observed that the literature is rich in research evaluating port logistics and in studies demonstrating the importance of logistical activities for the sector, focusing on improving port efficiency.

5.1. Practical contributions

Regarding the context studied, the article proves to be especially important due to the complex nature of the import process in the country, which involves many independent agents who need to communicate to lead the process. Properly mapping and analyzing the logistical cost-generating activities involved serves as a basis for decision-making by the agents involved in the various points of the cargo import process, since dealing directly with port terminals and agents responsible for import operations, it is possible to understand the causes of port inefficiency at the operational level.

Besides that, the article contributes with a systematic to be applied by enterprises that execute import processes, to better manage their activities and optimize the processes.

5.2. Theoretical contributions

From a theoretical view, the main contribution of the article is related to the advance of knowledge about logistical processes of import, further the test of the theoretical models proposed by Dornier et al. (2000) and Amaral (2012) to manage logistical process and from Vasconcelos (2015) to segregate logistics activities. Besides that, the research may advance through the costs estimate or analyses of other variables related to the activities.

Considering that the results presented are limited to one type of product in a single import process. One suggestion would be to apply the methodology developed in another import or export process, which may include other agents and imported by another terminal, deepening the processes of the entire supply chain, in order to optimize the resources used.

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