International Journal for Innovation Education and Research

ONLINE ISSN: 2411-2933 PRINT - ISSN: 2411-3123

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Published Date: 10/31/2019 **Page.123-132** **Vol 7 No 10 2019**

DOI: https://doi.org/10.31686/ijier.Vol7.Iss10.1756

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Due to the great potential of the fertilizer market in Brazil in reason of its productive characteristics, the goal of this article was to present a study about the perspective of informational flows aiming at the mapping of the relevant information inherent to the stages of the fertilizer importation process. By using the observation method, it was possible to map this information from the beginning of the process, which is the fertilizer output from the international seller to the final buyer in Brazil. The case study was conducted in an American company, with an office in the city of Paranaguá -PR (Brazil), which imports fertilizers.

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1. Introduction

According to a survey accomplished by the consultant Global Fert (2019), the fertilizer importation into Brazil in 2018 was 24.96 million tons, making Brazil one of the 6th largest fertilizer consumers in the world. The large consumption of the product reflects a growing worldwide demand for food since Brazil is one of the world's largest agricultural producers. Additionally, there is the potential factor of production considering that there are still large areas unexplored by agribusiness, many of which are still used as pastures and others awaiting government demarcations.

The importance of the fertilizer market for Brazil illustrates the growing concern of organizations in this context, as they are inserted in an environment where certain factors can directly impact in the financial results and market positioning; such as exchange rate variations, ship waiting lines, lack of storage space for products in rear warehouses, uncertainties related to the country political and economic contexts, as well as the changes in market regulations, among others.

In this sense, it is emphasized that this is an environment where information is an important support for decision making, especially considering its specificities. It is argued that environments with complex characteristics that suffer different influences, need special attention related to the information strategic management. By mapping the informational flow in the logistics context, especially in the scope of importation, the creation of positioning tools and strategies can be very efficient.

Considering this scenario, the present paper sought to map the informational flow of importation in a fertilizer importing organization that operates in Paranaguá-PR (Brazil), city which has the second largest Brazilian port in terms of movement volume.

2. Literature Review

2.1 Business Informational Flow

Information is a fundamental element for all organizational activities, regardless of the company sector. Since it is an important subsidy that flows across all areas as part of the organization chart, the information requires that the management can be done specifically. Such management aims to support both business processes and planning using instruments that make information and its articulation more efficient and accessible in all areas of the company.

However, in order to the organization to be able to manage strategic information, it necessary to map out its information flow so that it can understand what information is generated and for what purposes. Initially, the informational flows mapping considers the existence of formal or informal informational flows, and both of them permeate all company environments, and it may exist in registered and unregistered form. In this sense, Lopes (2010) argues that "formal flows are due to the company own structure, in other words, routines and elements applied to the productive processes, being related to the company organization chart. In this case, the recorded information goes through the formal systems of the company: corporate portals, Intranets, reports, records, documents containing rules and codes, among others. And in unregistered form through formalized meetings, courses and events, but not registered in any form of support. As for informal flows, these can arise spontaneously, in a meeting or even in a conversation between employees, being related to the intellectual structure of each individual acting in the company. It is noteworthy that informal flows, in general, take the form not recorded, considering that they come from dialogues and interactions not formalized among people and, therefore, not registered in any support." (LOPES, 2010, p. 30

In this context, it is necessary to understand the need of establishing access policies in the organizational context, but more than that, policies that provide the knowledge of the existing informational flows necessary for the productive activities. In this sense, Beal (2004) argues that for information management to be effective, it is necessary to establish a set of policies that allow access to relevant, accurate and quality information, and such information must be disseminated in a timely manner, at an appropriate cost and ease to users access.

McGee and Prusak (1994) point out that the value of information in the organizational context is determined by the user, that is, the flows exist because of the use needs. Then it can be said that the information to be useful depends on the analysis performed by the user according to his/her need and circumstances of

applicability in the context.

Thus, it is argued that informational flows in the organizational context depend essentially on needs and, therefore, it is essential that before the organization conducts any strategic, tactical or operational in order to start a decision-making process, it is fundamental to map relevant information in this context.

2.2 Specific situations in the fertilizer importation process in Brazil

The main role of fertilizer is to provide the nutrients necessary for the growth of a particular type of crop during its development phase, because the soil where is cultivated does not always have all the nutrients necessary for the full development of the plants, which in any time lead to the loss of productive potential. The main nutrients responsible for crops development are: N (Nitrogen), P (Phosphorus) and K (Potassium), being the Nitrogen responsible for the plant photosynthesis and reproduction, Phosphorus is responsible for growth and Potassium mainly for plant resistance (Reetz, 2016).

Despite being worldwide among the major agricultural producers, Brazil is still not self-sufficient in fertilizer production, and about 75% of domestic demand is imported, in other words, only 25% of the fertilizer consumed in Brazil is produced in the national territory. According to Anda (2019) only in 2018 Brazil imported about 24.96 million tons of fertilizers that were distributed among several productive regions of the country.

According to Kotler and Keller (2006), the decision of buying a product is a process that goes through five steps: "recognizing the problem, seeking information, evaluating alternatives, deciding on the purchase and finally the post-purchase.

Thus, in relation to the fertilizer purchase process, in addition to the process of demand analysis based on the needs, the search for information about the best products and suppliers, the evaluation of alternatives such as choice of modal and costs of the purchase process, it is necessary to consider the need to fulfill a series of steps, so that the product can be released, be a requirement from Brazilian Federal Revenue and/or Ministry of Agriculture, for example.

The liberation process of the product initially goes through an application for Import Authorization (IA) with the consenting agency. In the case of fertilizer this document is issued by the Ministry of Agriculture. In the IA is recorded the basic information of the purchase: who is the importer; what is the country of origin and exporter information. Subsequently, the IA is released to the responsible agency, and an Import Declaration (ID) must be registered in the Brazilian Federal Revenue, which with the Siscomex system manages import information data: from the importer and exporter, means of transportation, form of payment and all relevant product information (Lopes; Gama, 2013).

2.2.1 Logistics in the fertilizer import process

The fertilizer import process has three steps in general. Each step generates a specific informational flow and involves different processes according to their specificities. The import process begins with the transportation of the producing source to Brazil and, after the internal procedures inherent to the port sector, the product goes to its final destination. Initially, it is important to highlight the relationship of this process with the transportation and the choice of the modal. According to Faria (2001), "the transportation of something is basically between its origin and its destination, and may occur in modes: Maritime, Air, Land

or even combinations of modes".

Shipping is responsible for handling about 90% of all that is traded among countries around the world and because of this volume is necessary to use large ships, in addition to the need for ports to receive, loading and unloading that must be prepared to meet the demand, considering that the port efficiency directly influences to the productivity, considering the efficiency and speed in the process, besides the logistic cost reduction for the organizations (Machline, 2011).

In Brazil, according to the report done by the National Waterway Transportation Agency (Agência Nacional de Transportes Aquaviários – ANTAQ, 2019) the movement of foreign trade using maritime modal is responsible for moving the trade among countries in about 95%.

Related to the port structure, according to the report of the Administrative Council for Economic Defense (Conselho Administrativo de Defesa Econômica – CADE, 2019), only in 2018, around 998 million tons of goods were handled in the public and private ports of Brazil. "The movement was divided among: solid bulk, liquid and gaseous bulk, containers and general cargo". Specifically, the fertilizer falls within the category of solid bulk.

According to Anda's report (2019), in 2018, Brazil imported about 24.96 million tons of fertilizers, taking into account the total movement in the ports of Brazil, the importation of fertilizers represents about 3% of what is imported by maritime modal.

For the fertilizer entry to happen, the importer must choose the final destination, taking into account its logistics demand, costs and port efficiency, because due to different port terminal regulations the fertilizer ends up disputing docking preferences in ports with other products.

After choosing the port for destination of the product entrance, the importer will have, in addition to the costs with cargo handling services that depend on the *incoterm* that it was chose, costs with the following service providers, according to Figure 1.

Figure 1. Port services indicators

Service	Service Provider
Ship agency and expedition	Shipping agente
Help for navigation and use of headlights	Brazil Navy
Ship health surveillance and inspection	ANVISA (Agência Nacional de Vigilância Sanitária) - National Health Surveillance Agency
Foreign entry and exit control	Federal Police
Customs Inspection	Brazil Federal Revenue
Practice	Practicing companies or association of practitioners
Towing	Port tugboats companies
Port watchmen	Freelancers
Mooring	Terminal operator or port administration

Source: ANTAQ (2019)

Once the maritime transportation process has been overcome, the cargo that enters Brazil needs to be transported from the port structure to the final destination and for the transportation of the product. Two modes of transport stand out: the first and most popular is the road and also the rail.

The road modal transports products by road, street and highways, whether paved or not. It is the most used modal in Brazil (Alavarenga; Novaes, 2000).

This is the most widely used modal for transporting fertilizers from the port to the final producer. And according to Novaes (2007) yet, the road modal is the most expressive in the transportation of cargo in Brazil, and reaches practically all points of the national territory.

Subsequently, it is highlighted the railway modal, also used in the transportation of fertilizers. Although the costs are lower with this modal, especially considering the amount of fuel used, this modal is limited to the number of railway lines that do not receive expansion in Brazil, besides the fact that it is a transport that does not offer flexibility and speed in delivery.

In this sense, the main advantage in the use of the rail modal is the transportation of high loads, as well as low energy consumption. However, its disadvantage is the low number of routes, the delay in the route and the large exposure to theft (Keedi, 2004)

3. Results and Discussions

3.1 Materials and methods

In order to accomplish the present study, it was used the method of participant observation research and case study. For participant observation, May (2001) argues that the great advantage is that the researcher can establish a long-term relationship with the investigated ones, because the observer participates in the process that he/she is researching and thus allowing more deeply the interpretation of the context by the researcher.

As for the case study, the advantage is to have more detailed and systematic information about a given phenomenon that allows emphasizing the understandings in a context without forgetting the representativeness, which ends up focusing on the study real context understanding (Patton, 2002).

The case study was conducted at an American fertilizer trader based in Brazil. The company has a commercial office in São Paulo-SP and an operational office in Paranaguá-PR. The organization business is focused on imported fertilizer trade, and it conducts foreign purchase negotiations and sale business in Brazil.

Then, the presentation of the data will be categorized according to the points observed during the process analysis, respecting the informational and procedural flows. Therefore, the analysis considers the following categories.

3.2 Presentation of results and discussions

3.2.1 Category: Purchase Process

In order to make the product purchase, first of all, the commercial department conducts a market demand

study, based on research from expert institutes that analyze the fertilizer market in Brazil. It is based on a trend of how the demand is, in other words, if there is low, medium and or high demand for the offered product, as well as what is the trend of the offered price, if high and or low. Based on the considerations made by the institutes and allied to the market know-how and feeling, the commercial department makes the decision of buying or not the products abroad.

3.2.2 Category: Producer output

As the study was conducted in an American company, despite being in Brazil, it was found that it rigorously analyzes information about supplier countries, considering that this company does not do business with producing countries that are on the list of US trade embargoes, such as Iran and Iraq for example, and careful it do not negotiate with the sanction list countries. It was observed that it is also important to analyze information about companies that have and/or had business with the restricted countries, so the main producers who supply to the organization are located in the United Arab Emirates, Russia and China. The contact with the producer is made by an organization representative that is installed in strategic regions, close to the producer.

The main product traded by the company studied is the nitrogen fertilizer called Urea, which has the utility of supplying nitrogen to the plant helping in the photosynthesis and reproduction process. The main destination is the fertilization of corn and coffee plantations. A detail exposed by the commercial department is that often the cargo is bought abroad and between the loading and transit period, they are still working on sales, in other words, the product is not yet fully sold, which generates a "rush" to the finalization of the process so that must occur in a timely manner.

As for the modal, the cargo transportation from the country of origin to Brazil is done by ship. It is hired by the freight department, which focuses only on hiring and attendance the ship loading.

According to the average made by the director of the logistics operations, the transportation time to Brazil after loading the ship is around 45 days when it is loaded in a Chinese port, the time is about 35 days when is from Russia and it is around 40 days from the United Arab Emirates.

As for information on climate issues, they have strategic importance as they imply in the ship loading and unloading which may be affected according to the weather. For example, it is not possible to operate in a rainy day, which directly affects the cost of the ship, because the longer the ship is moored, the more cost is generated to the importer.

3.2.3 Category: Uploading attendance in Brazil

As for the ship departure time it was observed that the average loading of a ship of approximately 43,000 tons with urea is around 8 days under favorable weather conditions. The calculation made to estimate the loading time is agreed by contract, both supplier and importer, which generally corresponds to a total of 7 thousand tons loaded per day. Thus, when there is negotiation of the product purchase the importer receives the information about the *laycan*, which is the window where the supplier needs to start loading the ship. For example, *laycan* 15/06-20/06, it is understood that this period will be the mooring of the ship at the origin and the beginning of loading.

As for the information about the route, the ship route from origin to the destination is defined by the ship

commander, and the principle it to program the best route which offers the best weather conditions and the shortest transit time.

As for the product quality control during transit process, specifically during the journey from origin to final destination, there are no product quality controls, the quality control process is performed only when the ship is being loading. In this case, the importer designates a quality supervisor for the verification and monitoring of the cargo on loading, and at the unloading process another quality supervisor is appointed for verification. This procedure aims to perform a control with the purpose of minimizing quality problems during the transportation. Other relevant information is the fact that the ship charterer should carry out a checklist in order to analyze the ship history, taking into account its age, last loads and flag.

Related to the arrival at the destination, it is noteworthy that during the ship journey the captain sends notifications about the ship progress, informing the estimated day of arrival at the port of destination. At the moment that the captain moors at the port of destination, he sends a statement called: NOR, which means NOTICE OF READINESS, basically stating that the ship is able to dock at the port and it is ready to unload.

3.2.4 Category: Port terminal

Regarding the choice of terminal, it was observed that at the time of closing the ship freight with the charterer, the commercial department requests the freight price of two Brazilian ports for unloading. Although there is a variation in the freight price, this procedure is performed to facilitate the logistics of delivery to customers, since not all cargo is already sold, so the commercial department has the flexibility to meet demands. Thus, the choice of the terminal happens according to the sales negotiations of the imported fertilizer, until its conclusion, and the choice of the terminal is up to the customer. For example: customer buys 10,000 tons of urea opting for delivery at the Port of Paranaguá-PR.

As for ship scheduling, it is done according to the order of arrival at the ports. From the moment the ship arrives at the port of destination and it informs the interested parties that it is able to start the unloading, the ship enters in a mooring line and it is are attended in a sequential order, except in some specific cases of ports where there is a preferred row for mooring.

As for the port internal logistics control, the unloading process is carried out by the port operator which is hired by the ship charterer, however, the operation costs are divided among all importers. The process of moving from the port to the factories is carried out by importers.

3.2.5 Category: The admission in Brazil

Related to the process liberation, for the admission of the urea in Brazil, the analyzed organization is responsible for providing all the necessary documents for the client to make the process with the intervening agencies, including the Federal Revenue of Brazil and the Ministry of Agriculture. The customer is responsible for the liberation of the cargo.

The costs inherent to the customs process are the responsibility of the importing establishment, except in case the seller does not show the documents required by the responsible agencies.

3.2.5 Category: Transportation and the choice of modal

Regarding the modal to send the fertilizer to the final buyer, it was observed that all the importers analyzed in the research use the road transportation modal, mainly due to its ease in terms of time and productivity gains. As for the costs, they are all paid by the importers.

4. Conclusion

This paper aimed to analyze, from the perspective of information management, how the process of fertilizer importation is carried out from its inception, through customs procedures to its final destination. Therefore, a mapping of the informational flow inherent to these processes was performed. The universe chosen for the case study was a fertilizer market trader that operates in the purchase of imported fertilizers and resale in Brazil.

As observed throughout the process, the focus of the organization is on fertilizer trade and the information flow is aligned with the information management and t is present in the organizational process, as the sectors involved communicate continuously during the process reporting deviations dealing with routine matters.

It was also observed that weekly meetings occur in each department, which are deal issues such as ongoing processes, problems and possible complications. This sharing of information facilitates the identification of possible relevant factors regarding process improvements or adjustments. It was observed that the organization has as its principle a horizontal management, a factor that contributes to information management and its dissemination. There are also shared folders on organization web servers and Sharepoints that help it to share information that is essential to building knowledge.

Finally, it is argued that information flow mapping is an important tool, since it enables the knowledge of all stages and details of the processes, which provides subsidies for managers to make decisions in a timely and assertive manner.

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