LAST MILE BARRIERS IN THE BRAZILIAN E-COMMERCE AND APPLICABILITY OF NEW DELIVERY SOLUTIONS

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The evolution of electronic commerce has triggered a true revolution in the market, due to that the increase of deliveries changed the urban freight pattern flows and vehicles’ traffic in the cities. The objective of this paper was to assess the main barriers and challenges for e-commerce last mile using an exploratory research, based on the literature. Barriers in last mile for e-commerce segment were presented, and are related to security, urban mobility and missed deliveries. This results were presented in a semi structured interview to specialists of the e-commerce transportation sector, whom has pointed out the main barriers according to their experience and the applicability of new solutions. According to the literature and validated per specialists, there is a high potential to use pick up points and crowd shipping to deliver e-commerce purchases, these solutions mitigate the main barriers identified during the research. It is important to highlight that the adoption of good practices and strategies in e-commerce last mile distribution can influence positively the society in general, achieving the main objective of city logistics.

Palavras-chave: E-Commerce, city logistics, last mile barriers, pick up points, crowd shipping
1. Introduction

The technology evolution in recent decades and, specifically electronic commerce (e-commerce), has triggered a true revolution in business relations. According to Santos (2006), the creation of e-commerce reduced the solid time-distance model, generating the possibility of "instant synchronization", as numerous operations began to be performed at the same time, regardless of the distance between the involved parts, replacing traditional sequential operations.

International e-commerce will grow by 26.6% between 2013 and 2020 (IPC, 2015), and in 2016, it had already reached a growth of 7.2% in parcel volumes (IPC, 2017). In Brazil, 61.6 million people are online shoppers, nearly 30% of the population. This number represents the percentage of the population that did at least one purchase in 2014 (E-bit, 2015).

For Alves et. al. (2014), the e-commerce has had a major impact on the supply chain, affecting acquisitions, purchases, commercial partnerships and customer service, directly modifying trade relations. However, the e-commerce emergence and expansion mainly affected logistics management in distribution, since it requires precision, speed and reduced response time, in order to guarantee customer satisfaction by delivering the product in good conditions and on time (CHAER, 2012).

For Comi and Nuzzolo (2016), the increase of deliveries changes the urban freight pattern flows and vehicles' traffic in the cities. Online shoppers' attitudes and preferences are key elements to be investigated, due to their impact on last mile operations. In this context, it is also necessary to analyse the impacts brought by this new consumption trend, as in a broader perspective, the e-commerce growth increases the number of home deliveries.

The objective of this paper is to assess the main barriers and challenges for e-commerce at last mile deliveries in Brazil. The method consists in an exploratory research, based on the literature related to this issue. A literature review was used to show up concepts and academic references in order to guide the research properly. The literature review presents some difficulties on last mile delivery regarding the security, urban mobility, sustainability and missed deliveries due to customer absences. These results were presented to seven specialists of the e-commerce transportation sector. They were interviewed following a semi-structured form and their answers pointed out the main barriers and challenges of last mile delivery, according to their experience. Additionally, the applicability of new solutions, as pick up points and crowd shipping, was discussed to solve or at least minimize the main barriers of last mile distribution in Brazil.
2. Literature Review

The concept of last mile delivery and city logistics represent a recent field of study. In order to better understand the different approaches and their applications in a structured way, information found in literature is subdivided in three sections: electronic commerce; logistics and city logistics and e-commerce last mile logistics.

2.1 Electronic Commerce

According to Kotler (2000), the term e-commerce encompasses a wide variety of types of electronic transactions, such as sending purchase orders to suppliers through EDI (electronic data interchange), banking transactions, as well as buying and selling goods and services in the internet, the latter modality to which this study is based, known as business to consumer (B2C) transactions.

E-commerce has developed rapidly around the world, based on the evolution of internet technologies, with the objective of complementing the sales process and eliminating intermediary stages in the supply chain. The e-commerce was developed to assist the globalization of the economy through partnership and business, lowering geographic boundaries, changing market behaviour and creating business opportunities (KOTLER, 2000). With the consolidation of the virtual stores, the main challenges of those companies are to meet and even exceed customer expectations through efficient logistics management in its operations: inventory planning, picking, physical distribution and returns (ALVES et al., 2014);

For many years, the retail activities have had their logistics operations oriented to distribution in stores, moving consolidated cargo. However, the emergence of e-commerce required improvements in the traditional supply chain. The outbound activities must guarantee competitiveness in the online environment, as the consolidated cargo changed to individual items and small parcels for deliveries. Delivery times changed too: in traditional retail they were tied to deliveries to stores with weekly or monthly frequency, while with the advent of e-commerce, deliveries are done within 24 to 48 hours.

2.2 Logistics and City Logistics

According to the Council of Supply Chain Management Professionals - CSCMP (2015) logistics management is an integrated function that coordinates and optimizes all logistics activities, also integrating processes with other functions, including marketing, sales, finance
Urban areas are characterized by a high concentration of small commercial activities which generally results in a high number of vehicles movements, often uncoordinated and performed with less-than-truckload shipments (Ehmke, 2012). Taniguchi et al. (1999) conceptualize the term city logistics as the process of efficiency in logistics execution by private companies in urban areas, considering the traffic environment and energy consumption. According to Ehmke (2012) the concept of city logistics highlights the need for efficient and environmentally-conscious urban transportation policies, that can improve the efficiency of transportation systems, as well as reduce energy consumption and vehicles emissions. For Muñuzuri and Onieva (2005), to improve city logistics, several cities have decreed regulations regarding urban freight transport. These often limit certain types of vehicles at specific times of the day, depending on vehicle characteristics such as dimension and type of consumed energy.

Benjelloun and Crainic (2009) emphasize that transportation causes disruption to city life, compromising the urban mobility. However, the authors reinforce that the urban distribution of cargo cannot be summarized only to the problems that these operations cause to the society, since it is essential for the functioning of the city, contributing to economic and social development.

### 2.3 E-commerce last mile logistics

The urban distribution of goods represents one of the last activities in the supply chain, so it is also known as "last mile" logistics (ANTUN, 2013). In this context, Dutra (2004) describes the problem of last mile, as the issues related to cargo distribution in the end of the logistics chain. Cámar (2004) attributes the problem of the last mile mainly to e-commerce, regarding the distribution of goods to final consumers, whose deliveries are at home.

For Ferrucci and Bock (2014), besides the benefits, rapid e-commerce growth has resulted in an increasing volume of parcel deliveries and returns. Due to that, it is also necessary to analyse the impacts created by this new consumption trend. According to Duranda and Gonzalez – Feliu (2012) apud Nuzzolo et. al. (2015), this new shopping trend can have an impact on freight traffic in urban areas because the purchased products need to be delivered to the customer’s houses thought delivery routes that cannot be optimized.

The increase of online sales resulted in a fragmentation of freight shipments. Logistics service providers are constantly challenged to cope with high competition, a consumer-driven
economy, failed delivery issues, reverse logistics and environmental measures taken by policymakers. The last-mile of these deliveries, widely accepted as the most expensive part of the trip, is a trade-off between internal costs, externalities and density of deliveries (CÁRDENAS et. al., 2017).

According to Van Duijn et. al. (2016) one of the major problems of home delivery is the high number of missed deliveries (25%), which results in more distance travelled, pollution emissions and additional costs. The main reason for deliver failure is the customer not being at home to receive the goods ordered.

Another issue faced during the last mile deliveries is related to cargo theft. According to Casella (2011), stolen cargo is a serious problem globally, but in each region of the world has its own specific characteristics. In a context of weak economy, the risk of stolen cargo increases with people willing to steal goods and cash-strapped consumers become more willing to buy pilfered products, a risk for businesses that buy or sell goods in a vulnerable position. Theft of cargo can result in a financial loss for the retailer and for the buyer but will also disrupt the supply chain.

In Brazil, cargo thefts generate significant losses for the whole supply chain, increasing the security costs, in which companies invest money to guarantee the delivery of the orders, added to the losses of the stolen cargo. E-commerce suffers from this type of loss and occurs a migration of road robberies to urban areas. When theft occurs, the disruption begins: the consumer is harmed and, even if notified of the delay, receives the purchase late and has the sensation of a bad customer experience (FECOMERCIO SP, 2017).

E-commerce loses business due to the increase in cargo theft, so online stores restrict deliveries in high-risk areas or suggest pick up point for customers from these areas. This was the alternative that retailers found to mitigate cargo theft during the last mile delivery (CHIARA, 2017).

3. Method

The research was done through a systematic study of the main issues for the last mile delivery in the e-commerce segment, and possible solutions to mitigate them in the literature.

The literature review was an important guidance to identify the main barriers and challenges on last mile deliveries for e-commerce purchases. These findings were presented to specialists in the e-commerce transportation sector in order to conduct the next step, an interview.

Seven Brazilian specialists from this sector: e-commerce logistics managers (4) and commercial carrier managers (3), with more than 5 years of experience in their specific areas.
They were interviewed using a semi-structured questionnaire to assess the main issues that, in their opinion, their companies face in last mile delivery and which would be the best solution to mitigate them.

The semi-structured questionnaire was composed of two sections and was filled in two different moments: at the first moment the specialists were asked about the main barriers and in the second moment some performance objectives were presented, and they should classify how the new technologies could impact the delivery performance.

The main performance objectives considered important in the e-commerce were identified by means of the literature review and the specialists’ perception regarding these were analysed at this second moment.

For Corrêa and Gianesi (1993), organization support is a competitive advantage, which is achieved by means of adequate management, manufacturing and services. According to the authors, it must be used as a powerful weapon within the organization It must contribute effectively and not only cost-effectively. Modern competitive companies should focus on excellence and on what really matters to the organization and to customer expectations. The following criteria were considered in this research:

- Quality: For Juran (1997) the non-failure concept is an important quality definition. Campos (1993) adds that quality is a dimension that must be defined by the customers, according to their expectations of what is desired;
- Cost: According to Slack (2002), cost savings could mean a higher profit margin. However, it is important to balance costs related to the benefit that it brings to the organization;
- Reliability: For Slack (2002), reliability is related to company’s capacity to deliver the customer purchases on time, correct quantity and suitable quality;
- Velocity: According to Corrêa and Gianesi (1993), agile service is the key factor in today's and future markets. Time reduction in the processing is an advantage for consumers;
- Flexibility: For Ritzman and Krajewski (2004), the flexibility of a company is its power to react to the needs and demands of customers quickly and efficiently, giving priority to customization and volume variation;
- Transport Security: Transport is the main component of the logistic system (FLEURY, 2002), and one of the most important decisions in logistics operations is related to the security of the goods transported in the supply chain (MEIXELL & NORBIS, 2008).
Sustainability: According to Gasparino (2006), sustainability practices balances social, economic and environmental performances, called “triple bottom line”. With this assessment, the list of this criteria were evaluated, and these were ranked by the specialists, according to importance and effectiveness of the performance objectives.

4. Results
According to the interviewed specialists the barriers faced during last mile step for e-commerce deliveries in Brazil are available on Table 1.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Specialists</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Risk Areas Deliveries</td>
<td>7</td>
<td>100%</td>
</tr>
<tr>
<td>Receiver not available</td>
<td>7</td>
<td>100%</td>
</tr>
<tr>
<td>Wrong address/ not enough information for delivery</td>
<td>4</td>
<td>57.1%</td>
</tr>
<tr>
<td>Misrouting (sequence of zip codes and numbers not logical)</td>
<td>3</td>
<td>42.8%</td>
</tr>
</tbody>
</table>

Source: Developed by authors

Based on the barriers highlighted by the specialists, a new investigation on the literature was conducted to find out solutions to overcome or minimize these barriers. For Esposito (2015), e-commerce organizations must add value and differentiate themselves through service for their consumers. This is a key point that justifies investments in distribution, to reduce total logistical costs and increase the service speed, guaranteeing to the customer an increase in perception of value in the product/service provided.

To deal with the growing volumes and returned parcels, increasing customer expectations and being competitive in the market, retailers and logistics service providers are exploring and implementing innovative tools, once that e-commerce created a demand (DUCRET, 2014). According to Morganti and Dablanc (2014), to overcome parcel delivery issues, alternative solutions, such as pick-up points and automatic delivery stations (ADSs), have been implemented in Europe and in the United States, consolidating the final deliveries in specific points.

Crowd shipping is also a mode by which the vehicle activity required for parcel deliveries can be reduced. This involves enlisting people who are already travelling from points A to B to take a package along with them, making a stop along the way to drop it off. Common citizens, who are already making journeys and have a previous knowledge about the region, act as
carriers for these purchases, creating new informal logistics networks (US POSTAL SERVICE, 2014).

Solutions and the criteria were presented to the specialists who classified each criterion for each solution with grades from zero to ten. These grades represented how much each criterion would contribute to the applicability of the technology in the mitigation of the barriers. This method looks for a solution, considering individual quantified answers, with no interference between specialists and the interviewer.

The results considering the Brazilian scenario are presented on Table 2.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Crowd shipping</th>
<th>Pick up points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>2.71</td>
<td>7.43</td>
</tr>
<tr>
<td>Cost</td>
<td>4.86</td>
<td>9.57</td>
</tr>
<tr>
<td>Reliability</td>
<td>6.29</td>
<td>9.43</td>
</tr>
<tr>
<td>Velocity</td>
<td>6.00</td>
<td>9.29</td>
</tr>
<tr>
<td>Flexibility</td>
<td>7.71</td>
<td>7.86</td>
</tr>
<tr>
<td>Transport Security</td>
<td>7.57</td>
<td>8.43</td>
</tr>
<tr>
<td>Sustainability</td>
<td>8.86</td>
<td>6.71</td>
</tr>
<tr>
<td><strong>Solution average</strong></td>
<td><strong>6.29</strong></td>
<td><strong>8.39</strong></td>
</tr>
</tbody>
</table>

Source: Developed by the authors

All specialists considered the contractual cost in the crowd shipping solution a big risk, due to local labour legislation. They classified this criterion with small grades, referencing it as a risk for this solution. Thus, the crowd shipping solution was considered unviable in the Brazilian scenario by the specialists. With 6.29 as average, this solution, according to the specialists, was not totally adherent to avoid missed deliveries due to absent customers.

Analysing the criterion transport security, the main barrier according the specialists, pick up points presented a higher grade, 8.43 when compared to 7.57, crowd shipping average grade. According to the specialist, there are some risks to use crowd shipping once that people responsible to perform the deliveries can deviate the purchase and have a risk to be theft too.
For pick up points, the route is reduced, and the delivery occurs in a specific location, that can be monitored.
Another advantage reported in open questions for pick up points is related to customer’s availability; the goods are delivered in the pick point and customers can pick it when available. It is not necessary to have anyone available at home just to receive the purchase.
Other barriers such as wrong address and misrouting are eliminated too, since the delivery is done in a specific location, in a frequent and catalogued address, avoiding wrong routes and difficulties to find the correct place.
In this context, the solution of pick up points has proved a good alternative in the specialists' view, whether in the retailer or the carrier perspective, with average 8.39. This result reflects what was identified in the literature review.
According to Oliveira et. al. (2017), the problems related to home delivery increased due to electronic commerce and pick up points represent a solution to reduce mislaid deliveries and consolidate drop-off parcels, minimizing distances travelled and the operational cost in urban goods distribution.
The interviewed specialists presented some concerns on the open questions regarding the definition of location for the pick-up points and its respective area security, they highlighted too the necessity displacement for customers that should be analysed in further researches.

5. Conclusions
The objective of this paper is to assess the main barriers and challenges for e-commerce at last mile deliveries in Brazil. There are several challenges at last mile distribution, as security in high-risk deliveries and difficulties to find the customers to receive their e-commerce purchases, due to absences and address issues.
Using an exploratory research based on the literature regarding the theme, to assess the factors that influences last mile deliveries, and a semi-structured interview with specialists, propositions were analysed in order to validate their applicability in the e-commerce market.
According to the literature review, there is a high potential to use pick up points / lockers in Brazil to deliver e-commerce purchases. This solution mitigates the main challenges of undeliverable packages and high-risk area deliveries identified during the research.
Pick up points have potential to reduce last mile deliveries problems in a context of accelerated e-commerce growth. Some concerns as the customer perception regarding pick up points and where locate these points and the safety in the regions were raised by specialists and demand further researches.
It is important to highlight that the adoption of good practices and strategies in e-commerce last mile distribution can influence positively the society in general. Different spheres of logistics and urban mobility improvements can benefit the well-being in a society, achieving the main objective of city logistics.

For further researches is suggested to deep dive in the customers’ perspective regarding the application of these new technologies, to identify if they can meet their expectations. Another proposition consists in attribute different weights for the criteria in the specialists’ perceptions, applying a multi criteria decision analysis (MCDA), to identify if any of these performance objectives has greater relevance in the e-commerce market.

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