E-COMMERCE WILL NOT GO UP THE HILL!

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1. INTRODUCTION

Brazil is home to 11,403 *favelas*, which collectively house approximately 18 million people residing in 6.6 million households. Among these 11,000 squatter settlements, the ten largest, in terms of household count, are found in the states of Rio de Janeiro, Bahia, São Paulo, Maranhão, Amazonas, and the Federal District (G1, 2023). Table 1 shows the most densely populated communities.

Table 1. List of the ten *favelas* with the highest number of households in Brazil.

City/State	Number of households
Sol Nascente, DF	32,081
Rocinha, RJ	30,955
Rio das Pedras, RJ	27,573
Beiru, Tancredo Neves, BA	20,210
Heliópolis, SP	20,016
Paraisópolis, SP	18,912
Pernambués, BA	18,662
Coroadinha, MA	18,331
Cidade de Deus; Alfredo Nascimento, AM	17,721
Comunidade São Lucas, AM	17,666

Source: (G1, 2023)

The population residing in Brazilian *favelas* surpasses the combined populations of Belarus (9,485,300), Serbia (7,114,393), and Luxembourg (562,958), as reported by InvestNews (2022). These residents have their own needs, desires, and income and contribute to the movement of approximately 119 billion reais per year through physical retail or e-commerce transactions (Agência Brasil, 2020).

The existence of *favelas* or squatter communities is an undeniable reality, with the number of households and residents in unsuitable and unplanned areas steadily increasing in recent years. Recently, Sol Nascente (DF) was identified as the largest *favela* in Latin America (G1, 2023). One of the vulnerabilities of these settlements is the invisibility of their population in the eyes of the State, primarily due to the lack of access to education, healthcare, and security services. This invisibility also extends to retail companies, as they are unable to reach citizens' homes to deliver consumable products and services in the B2C (Business to Consumer) modality.

The advent of the Internet has partially contributed to the social inclusion of slum residents, as it allows retail platforms to observe their purchasing activities. However, the geographical and social inaccessibility of these areas prevents them from receiving the products and services they order. This poses significant challenges for urban transportation and distribution logistics. Taniguchi et al. (2001) emphasize the importance of optimizing logistics operations, considering factors such as the environment, traffic, cost, risk, and energy involved in service provision.

In the context of *favelas*, citizens are overlooked in the entire value chain, as marketing fails to complete the product execution as a result of the limitations in delivering products and merchandise to the final customer. While mobile technologies have enabled the inclusion of people from all classes in online retail, *favela* dwellers remain unreachable by the distribution channels of most retail companies operating in Brazilian e-commerce. Therefore, whether due to insecurity within the socio-geographical context or the limitations of service providers, this unassisted scenario results in the exclusion of a significant segment of e-commerce consumers.

For example, the issue of insecurity is depicted in the movie Pacified (Winters & Aronofsky, 2022), where vehicles used for delivering parcels purchased through online retail are frequently targeted for robbery, leading to misplacement of the cargo for subsequent resale within the community. Such incidents have a highly detrimental impact on the e-commerce sector, increasing the cost of product distribution and consequently affecting the entire production chain.

Thus, the objective of this study is to identify the main undesirable effects and their respective causes within the current urban logistics scenario of *favelas* while investigating how Brazilian e-commerce has overcome delivery restrictions in high-risk areas. This will be achieved by analyzing the perceptions of residents and experts and identifying the distribution methods and modalities used by major marketplaces in the country. This research aims to expand the understanding of this phenomenon beyond the B2C consumer relationship within e-commerce, providing insights into the social vulnerability experienced by marketplace organizations' delivery service partners and the underserved consumers residing in Brazilian *favelas*.

The United Nations (UN) has established 17 goals for the sustainable development of the planet, known as the Sustainable Development Goals (SDGs). The issue investigated in this research is directly associated with SDG 11 – Sustainable Cities and Communities, which seeks to create inclusive, safe, resilient, and sustainable cities and human settlements by 2030. This goal aims to ensure access for all to safe, adequate, and affordable housing, basic services, and the urbanization of slums and *favelas* (UN, 2023).

According to IPEA (2020), Brazil has made progress towards achieving this goal, as the State aims to guarantee access for all to decent, adequate, and affordable housing, basic services, and the urbanization of precarious settlements, with special attention given to vulnerable groups.

1.1 Research problem and objective

But what is a *favela*? *Favelas* are densely populated settlements characterized by an irregular urban layout. These areas are often occupied in an irregular and unauthorized manner and are characterized by infrastructural, economic, and social vulnerabilities (IBGE, 2020).

Online shopping has become a fundamental aspect of daily life for millions of Brazilians. However, despite the absence of restrictions on online shopping, many individuals face difficulties in receiving their purchases as the parcels fail to reach their doorsteps. The main reasons that make such deliveries unfeasible include poor road conditions; the presence of stairways, alleys, or dead ends that impede access for delivery vehicles; inadequate roads for transportation; the absence of a postal address code (CEP); incorrect addressing; and the risk of attacks on delivery personnel. In certain cases, online stores go to the extent of blocking the addressing of specific regions on their sales platforms, a practice referred to as "Postal Coding from Hell," as reported by Estadão (2017). This practice is due to the heightened risk of robbery or theft of shipments in those areas.

Consequently, marketplaces (i.e., e-commerce platforms) refrain from including postal codes associated with high-risk areas on their platforms, as it results in increased freight costs and insurance premiums. Consequently, consumers in these locations are deprived of receiving the products they have purchased at the designated address, thereby experiencing exclusion and marginalization, even within the online realm. Additionally, this neglect of the buying journey of this segment by the majority of e-commerce companies further exacerbates the issue. Hence,

the research problem can be stated as follows: How has Brazilian e-commerce managed to overcome delivery restrictions in high-risk *favela* areas?

2. THEORETICAL FRAMEWORK

The research employed the principles of the Theory of Constraints (TOC) to comprehend the issue of undelivered parcels at addresses situated in *favelas*. Goldratt and Cox (2002) state that managing constraints within an organizational system leads to systemic gain rather than isolated improvements. In this context, a constraint is defined as any factor that hinders the system from achieving a higher level of performance in relation to its goal. Constraints can take the form of physical aspects (such as equipment, materials, and personnel) or managerial ones (such as policies, procedures, and standards). As an organization moves closer to its goal, it achieves a higher level of productivity.

According to Goldratt and Cox (2002), an organization is a dynamic system that strives to achieve a defined main goal, and its performance depends on the interactions among its various processes. Constraints act as limiting factors that impede the realization of capacity, creating bottlenecks within organizational processes. Chagas, Gomes, and Freitaq (2022) explain that a bottleneck refers to a point in the capacity flow where it decreases, hindering the overall performance of the organizational system and causing activities to fall short of expectations. Cox III and Spencer (2002) highlight that every system has at least one constraint that restricts the organization's performance in relation to its goal. To enhance the system's "gain," the immediate response is to strengthen the weaker capabilities of the subsystems. Figure 1 provides an illustration of two production lines feeding into assembly operation 21, which has the capacity to produce up to 20 units per hour. However, the entire system is impacted by the capacity limit of Operation 20, which can only produce two (2) units per hour. Thus, the bottleneck of this company's system resides here. TOC is employed to identify, address, and reconfigure the constraints that affect the bottleneck.

Figure 1. Example of a bottleneck in a production system.
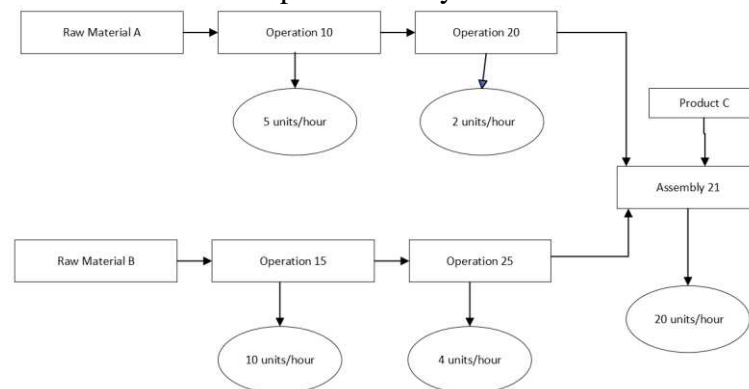
Source: Cox III and Spencer (2002).

In the Theory of Constraints, management focuses on achieving systemic gains (global optima) rather than making localized improvements (local optima). This approach involves addressing three fundamental questions: a) what needs to be changed? b) what is the desired outcome of the change? and c) how can the change be effectively implemented? According to Pegoraro et al.'s (2023) application of the theory, five steps are proposed to maximize the profitability of the system or organization: 1) identification of the system constraint; 2) determination of how to exploit the system constraint; 3) subordination of all non-constraints to the constraint; 4) elevation of the system constraint; and 5) return to step 1 to identify any new constraints that may have arisen.

2.1 Identifying the system constraint

The application of the theory begins by examining the constraints imposed by the Market Place that hinder the delivery of parcels to addresses in *favelas*. To address the question of what needs to be changed, Cox III and Spencer (2002) suggest using a tool called the Current Reality Tree (CRT), which analyzes the causes and symptoms of the current situation. The symptoms are referred to as Undesirable Effects (UDEs). The purpose of CRTs is to illustrate the interconnections between all the symptoms and the root problem of the system. The problem is identified at the top of the tree, while the subsequent causes are represented as branches of the tree. Figure 2 depicts an example of the causes leading to a high customer service time issue in a convenience store chain.

Figure 2. Example of CRT.
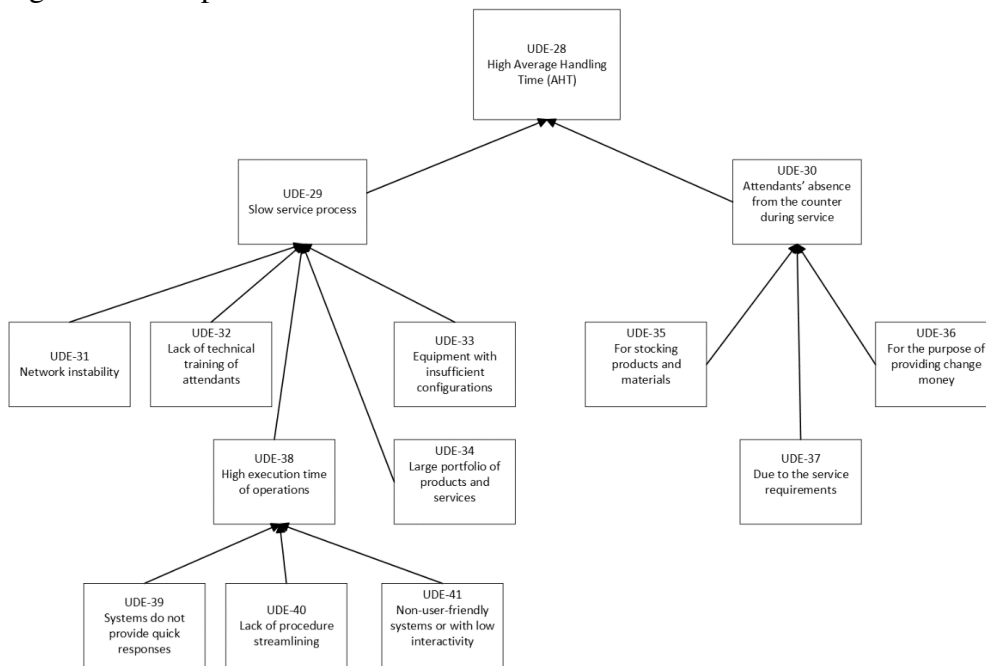
Source: Resende (2014).

In this step, it is crucial to list the key undesirable effects that are directly linked to the root problem, which aligns with the findings of Margonar and Regattieri (2018). It is essential for process experts to review whether the causes are clearly and concisely presented, demonstrating direct or indirect alignment with the root problem. To ensure the alignment of the CRT, one effective approach is to employ the "if-then" technique. This technique involves examining how "IF the cause occurs, THEN it will trigger the undesirable effect." Conversely, in reverse analysis, we explore the question of "WHY the undesirable effect occurs when the cause has not been addressed." By employing the if-then logic, this procedure is extended to all the connections between UDEs. Some effects may be the result of independent causes. The theory recommends incorporating a small number of impactful causes (<3) for each UDE.

2.2 Exploiting the system constraint

Once the system constraint has been identified through the undesirable effects, step 2 consists of exploiting the maximum capacity of the constraint; that is, the most intensive causes for the most powerful undesirable effect must be remedied so that the constraint produces the maximum possible value.

2.3 Subordinating to the system constraint

All processes must align themselves with the constraint, meaning that any improvements in other operations will not yield global gains until the constraint is addressed. Therefore, this step involves synchronizing all other resources to operate at the pace of the constraint. Subordination ensures that activity levels are maintained with minimal inventory, thereby reducing investment and operating expenses. To address the second question (what to change to), it is necessary to identify alternative resources that can replace the existing constraints. The tool recommended for this step is the Scatter Plot. This diagram is created by considering the opposite of the root problem. In the example shown in Figure 3, the potential issue of customer dissatisfaction is depicted. Proposed solutions are presented through two distinct paths, which include either the dismissal or retention of unproductive operators. This diagram facilitates the identification of trade-offs and their impact on the business system.

Figure 3. Example of a Scatter Plot
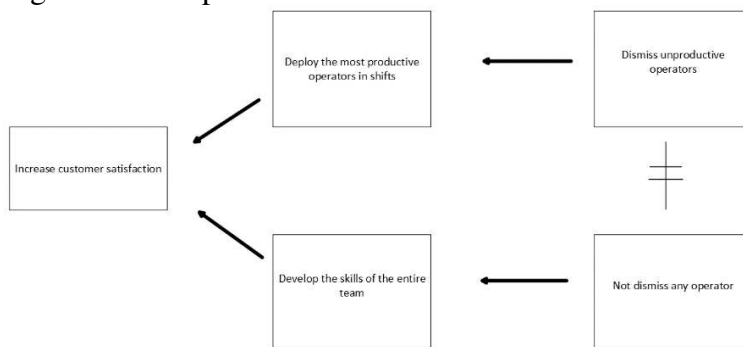
Source: Resende (2014).

The diagram illustrates the necessary conditions and corresponding requirements to attain the goal, aiming to alleviate the constraints until the initial bottleneck is eliminated. The new achievable state is identified using a tool known as the Future Reality Tree (FRT), which will be discussed in the subsequent section.

2.4 Elevating the constraint

After optimizing constraint utilization (exploitation), if capacity constraints still persist within the root problem, interventions can be implemented in the production process to overcome these limitations. For instance, one can decide to acquire new order distribution models and equipment, increase personnel, introduce additional work shifts, and so on. Breaking a constraint leads to the emergence of a new weaker "link" conceptually, which represents a new constraint at another point in the production chain. In this step, it is necessary to develop a Future Reality Tree (FRT), which involves mapping the constraints following the implementation of the solutions identified in the Scatter Plot. This stage assesses the effectiveness of constraint management. Figure 4 illustrates an example showcasing the newly constructed reality addressing a root problem of customer dissatisfaction after interventions targeting the causes of undesirable effects.

Figure 4. Example of a Future Reality Tree.
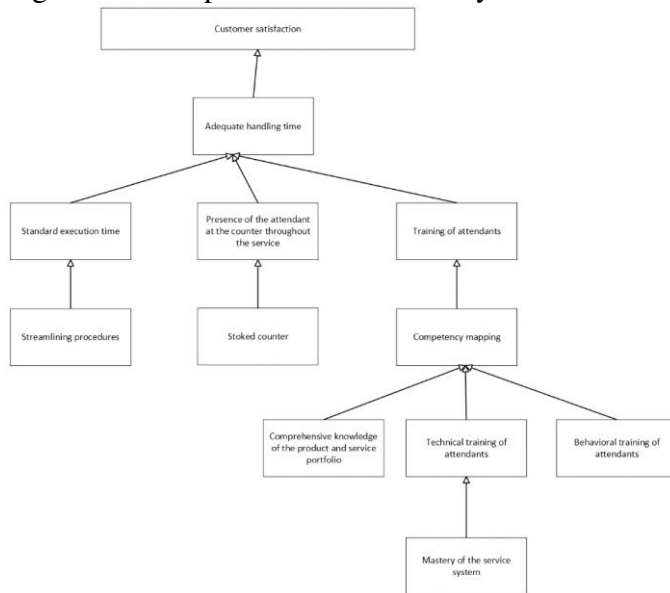
2.5 Return to Step 1

The fifth stage involves addressing the newly emerged constraint and returning to the first step to establish a continuous improvement process.

3. METHODOLOGY

According to Gil (2022), this research is descriptive in nature, as its objective is to present characteristics of the phenomenon of "lack of last-mile parcel delivery in *favelas*." The methodology can be classified as qualitative, and the collection of primary and secondary data took place between May and June 2023.

For primary data collection, interviews were conducted via email with seven specialists in last-mile delivery working with e-commerce customers. As for secondary data, reports from 21 customers who had not been served by marketplace companies' distribution services were gathered from Twitter. Additionally, articles on the complexities of last-mile delivery were sourced from the Scholar Google and Elsevier databases, as well as the non-indexed specialized journal Last Mile Express. The keywords used for the search included: "last mile delivery problems," "last mile delivery inefficiency," and "order delivery in restricted areas." In terms of analytical procedures, a content analysis of the collected data was performed following the principles outlined by Bardin (2016). The analysis was performed using the R software, which generated categories of causes and undesirable effects related to the phenomenon in accordance with the Theory of Constraints.

4. DATA ANALYSIS

The convergence of primary and secondary data revealed several key causes that contribute to the bottleneck in last-mile distribution within restricted delivery *favelas*. The primary issues identified include movement restrictions based on modality/method, limitations in scheduling, cargo theft incidents, and inadequate addressing. These findings align with the research conducted by Vieira, Carvalho, and Yoshizaki (2016) and reinforce the significance of these factors in impacting distribution. Figure 5 illustrates the diagram of the Current Reality Tree (CRT), which reflects the problems identified through a literature review, as well as

primary data collected from industry experts and secondary data obtained through the perception of unassisted consumers during the distribution stage. The CRT highlights the main causes of the undesirable effects observed in the last-mile delivery process.

Figure 5. Current Reality Tree of E-commerce Non-Distribution.
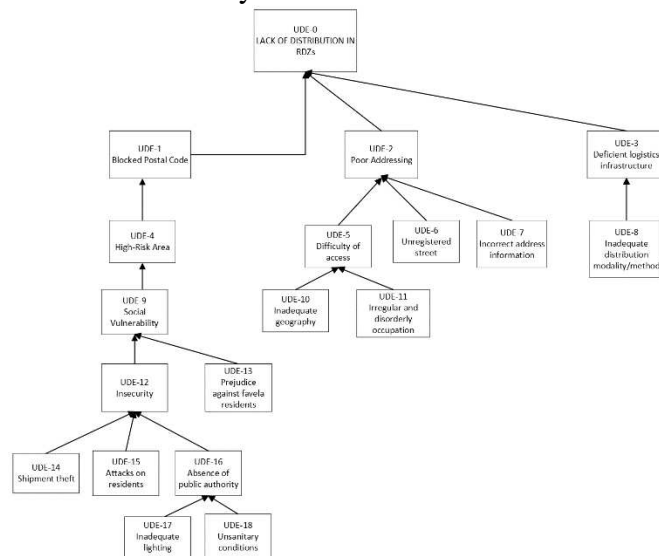
Source: Prepared by the authors based on research data.

A significant portion of parcels remains undelivered due to marketplaces implementing zone restrictions. This practice, commonly referred to as the "Mapping of Postal Codes from Hell" (Estadão, 2017), is often influenced by environmental factors resulting from the absence of state presence in these locations. In the CRT analysis, delivery restriction factors arising from distribution risk are associated with **Undesirable Effect No. 4** (High-Risk Area). On the other hand, factors related to poor addressing are sometimes linked to effects stemming from irregular occupation patterns and inadequate geography (**UDE10** and **UDE11**), while at other times, they can be attributed to the effects of insufficient distribution infrastructure (UDE3).

4.1 Secondary data analysis

The following accounts express the feelings of dissatisfaction of a sample of customers who are perceived as "invisible" to marketplace distribution. Most of the complaints are concentrated on (**UDE4**):

> "Situation: Restricted delivery zone. I already know that my parcel will not be delivered" (Customer 1) / "So, you buy a product over the Internet and wait anxiously for it to arrive. Then you go to track the order, and a message reads 'Restricted delivery zone'" (Customer 2).

> "[The company] refuses to deliver orders to my home because it's located in a high-risk area with restricted delivery. Instead, they require me to pick up the items from their unit, which is in a neighboring place that is also considered a high-risk zone. In the end, it's essentially the same situation" (UDE1, UDE4 – Client 3) / "[...] This zone has home delivery restrictions because of seven or eight thugs, so my delivery is going to be delayed. Do I deserve this?" (UDE1, UDE4 – Customer 4).

> "[...] I have recently found out that my neighborhood is considered a 'Restricted Delivery Zone' by (the company). So now, instead of getting the phone I bought in two days, it could take up to a week to be delivered" (UDE1, UDE4 – Customer 5) / "[...] And then, when I check my order, it says: 'Area with delivery restrictions subject to an extended deadline'" (EI1, EI4 – Customer 6).

"[...] I live in an area with delivery restrictions. It's really disheartening" (EI1, EI4 – Customer 7) / "[...] I visit (the company's) website and come across the warning 'Restricted Delivery Zone.' I mean, seriously?" (UDE1, UDE4 – Customer 8).

"[...] Rio de Janeiro is filled with areas with delivery restrictions. After all, it feels more like a war zone than a regular city. Sadly, this has become the norm" (UDE12 – Customer 9) / "[...] Restricted delivery zones are those where (the company's) vehicles are most frequently attacked or at risk of being robbed" (UDE14 – Customer 10).

"[...] I just wanted to order a meal from McDonald's to find some comfort in food, but (the company) claims there are delivery restrictions in place" (UDE1 – Customer 11) / "[...] (The company) refers to this as an area with provisionary restrictions. They argue that it's due to security concerns, but that's a lie because they make deliveries in far worse places. The truth is that their distribution center is poorly maintained and lacks the necessary infrastructure for efficient deliveries" (UDE13, UDE1, UDE8, UDE12 – Customer 13).

"[...] In the neighborhood near my college, I see (the company's) vans driving by every day, delivering to the privileged class, while I must suffer the consequences of living in an 'Area with distribution subject to different deadlines and temporary restrictions on home delivery'" (UDE1, UDE13 – Customer 14) / "[...] I reside in a fully urbanized area, just a few meters away from a police station and a military police battalion here in Itaquera. Yet, they insist that I pick up my package from their facility, claiming it's a high-risk area..." (UDE4 – Customer 15).

"[...] I hate being poor and being forced to live in this goddamned place simply because I can't afford to live somewhere else. I hate the fact that I can't wear nice clothes without sweating. It pisses me off having to pick up a parcel beneath the scorching sun just because they refuse to deliver to my location, labeling it as a 'High-Risk Area'" (UDE4, UDE1, UDE13 – Customer 16) / "[The company] humiliated me. I had to leave my house and walk almost to the end of my street to pick up the parcel because the delivery guy refused to come inside. The app kept claiming it was a high-risk area. I mean, there's nothing going on here; it's just like anywhere else. This is just because of the shootings that get shown on TV now and then, but it's not a big deal" (UDE4, UDE1, UDE13 – Customer 17).

"[The company] left my parcel at Leo's Bar instead of bringing it to my home. So I asked him, 'Geez! Why didn't they have it delivered to my house? Everyone else does.' To which he replied, 'Because it's a high-risk area.' I said, 'Your bar is riskier. It's been robbed before!' Give me a break!" (UDE4 – Customer 18) / "[...] I used to work in deliveries when I was younger. If I saw an address in a dangerous place, I would simply write down 'High-Risk Area' and not bother at all. I wouldn't risk my motorcycle or my life going up a hill controlled by drug dealers and thugs. And when I saw the [the address] on the invoice, that was the end of the rope. The customers were left without their parcels. It's not my problem" (UDE4, UDE12, UDE13 – Customer 19).

"One of the most satisfying aspects of moving to a neighborhood with better access and infrastructure is being able to receive any (company) order at my HOME without being considered a high-risk area. I swear!" (UDE4 – Customer 20) / "[...] "I'm still waiting for a parcel that I'll have to pick up halfway because the carrier partner considers my house a high-risk area. The poor never have a moment of peace!" (UDE4 – Customer 21).

4.2 Primary data analysis

In this section, we move on to arranging the analysis categories based on the insights provided by the distribution specialists working with marketplaces. Regarding the issue of shipment and goods theft, the data from the interviews revealed a convergence in the perspectives of carriers in São Paulo and Rio de Janeiro, as presented below:

"[...] The major issue revolves around **shipment theft**. The high rate of robberies in certain areas is the primary reason why those regions are designated as Restricted Delivery Zones (RDZ)" (**Respondent 2**, Rio de Janeiro).

"[...] We steer clear of these areas due to the detrimental effects of theft, which not only involve compensating customers but also ensuring the safety and well-being of our delivery personnel" (**Respondent 1**, São Paulo).

As for the constraints of the distribution modalities, the respondents confirm the undesirable effects on the last mile:

"[...] Another issue arises from the inability to access certain areas due to the absence of roads where vehicles can pass or physical blockages imposed by drug traffickers" (**Respondent 1**, São Paulo).

The issues highlighted in the CRT regarding the undesirable effects stemming from disorderly and irregular occupation were also corroborated by the data collected:

"[...] An additional problem is the disorderly occupation of certain locations, making it extremely challenging to identify delivery destinations due to the absence of street names and numbering" (**Respondent 2**, Rio de Janeiro).

"[...] Difficulties arise in areas that lack regularization or are known to be unsafe. These places share similar conditions with squatter areas, featuring narrow streets and inadequate infrastructure, which restricts access" (**Respondent 5**, Federal District).

"Miscommunication can result in misunderstandings, lack of cooperation, and even conflicts during the delivery process" (**Respondent 6**, Rio de Janeiro).

"[...] Apart from the safety issues and narrow streets, which sometimes lack proper pavement in certain sections, the lack of standardized addresses poses a significant challenge in delivering to the intended destinations. The absence of formal or standardized addressing systems makes it difficult to precisely locate residential or commercial establishments. This can lead to delays, errors in package delivery, and even failed attempts, which incur additional costs for logistics companies when they need to make subsequent delivery attempts" (**Respondent 5**, Federal District).

"Transportation and logistics companies face numerous challenges when conducting last-mile parcel distribution in restricted delivery areas such as *favelas*, slums, or complexes. As an entrepreneur in this industry, I have faced significant difficulties. One of them is the absence of standardized addressing systems. In the areas where I operate, which have delivery restrictions, there is often a lack of standardized addressing, including postal codes, street numbers, and signage. This makes it challenging to accurately locate delivery destinations, leading to delays or incorrect deliveries" (**Respondent 6**, Rio de Janeiro).

The insufficient infrastructure and environmental factors resulting from the absence of government support were identified as significant factors contributing to the limitations of last-mile delivery, as reported below:

"The primary issues are related to infrastructure, including poorly identified and irregularly numbered streets, as well as potholed roads, which contribute to a high crime rate" (**Respondent 1**, São Paulo).

"[...] I understand that the major challenge with deliveries in Restricted Delivery Zones (RDZs) is the security aspect. As a result, there is a need for escorts to ensure deliveries can be made with a minimum level of security for the delivery personnel. This directly affects the population living in these regions, as they are often excluded from basic rights such as receiving parcels, medication, or even meals at their residences. Also, many of these areas, due to their irregular locations, lack access to other essential public services. Similarly, regular residences, which pay their taxes, are also deprived of these basic rights due to security concerns" (**Respondent 3**, São Paulo).

"[...] The main difficulty lies in the increased cost associated with the need for escorted delivery" (**Respondent 4**, São Paulo).

"[...] Limited access and poor infrastructure: The restricted delivery zones I serve have narrow streets, winding alleys, and inadequate access for delivery vehicles. These conditions make it challenging for my team to efficiently reach the recipients, leading to potential delays, damage to goods, or even the inability to make the delivery at all" (**Respondent 6**, Rio de Janeiro).

"[...] Safety issues: another significant challenge we encounter in these areas is security. In certain regions, there are instances of violence, crime, or access restrictions, which pose obstacles to our delivery teams' safe operations. Unfamiliarity with the local environment can result in delivery errors, navigation difficulties, and behaviors that may negatively impact my company's reputation" (**Respondent 6**, Rio de Janeiro).

Certain measures have been implemented by e-commerce companies and their distribution partners to address the adverse consequences arising from the absence of last-mile delivery in *favelas*, as outlined below:

"[...] Interaction with residents and community leaders: establishing effective communication with residents and community leaders is crucial for gaining insights into the unique needs and challenges of the region where I operate" (**Respondent 6**, Rio de Janeiro).

"[...] To overcome these difficulties, I have implemented strategies tailored specifically to areas with delivery restrictions. These strategies include leveraging advanced mapping and routing technologies, forming partnerships with local companies that possess knowledge of the area, providing continuous training to my delivery team on cultural issues and safety protocols, and engaging in open dialogue with residents and community leaders to better understand their needs and collaborate on finding solutions. Despite the challenges, we remain committed to finding effective solutions to ensure reliable and secure delivery in areas with delivery restrictions" (**Respondent 6**, Rio de Janeiro).

Content analysis results were obtained following Bardin's (2016) methodology using the R and SPACY software. Using SPACY, a TRIGAMMA diagram was generated to analyze the frequency and proximity of word triads related to last-mile problems. The most prominent triads identified were {('delivery,' 'with,' 'restrictions')} and {('zones,' 'with,' 'restrictions')}.

Figure 6. Similarity analysis.
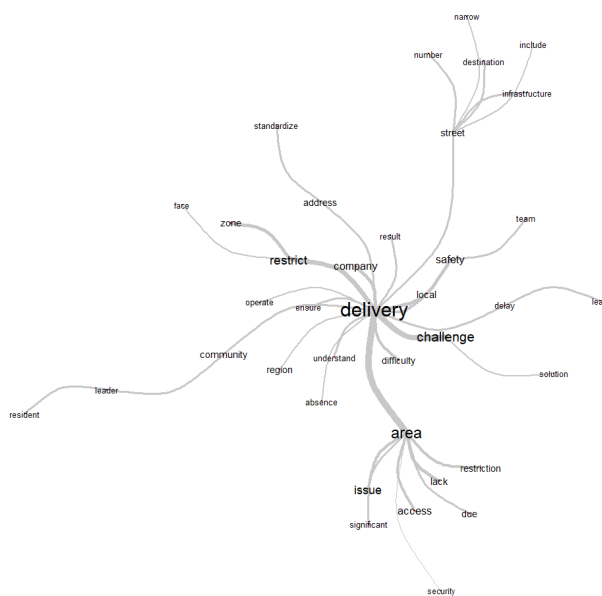
Source: Prepared by the authors based on the interview corpus.

With the aid of the R software, a similarity analysis (Figure 6) was performed on the same sample using graph theory. This analysis allowed for the identification of simultaneous occurrences between words, revealing connections and aiding in the understanding of the text corpus structure. It also facilitated the differentiation of common elements and specificities based on the variables, in line with the findings of Marchand and Ratinaud (2012). Furthermore, a word cloud representing the text corpus was created to visually display the expressions of last-mile problems.

The three outputs generated using different tools reveal a connection between the terms and their frequencies in the presented results, particularly highlighting the terms "restriction," "delivery," "safety," and "zone."

5. RESULTS

Based on the aforementioned scenario and considering that a constraint refers to any factor that hinders a system from achieving improved performance in relation to its goal (Goldratt & Cox, 2002), this study aimed to identify constraints that impede the e-commerce value chain from effectively distributing purchased items in *favelas* and slums.

The research proposes three solutions to address the primary problems identified through the analysis of primary and secondary data. These solutions include 1) the adoption of new distribution modalities/methods; 2) the implementation of digital addressing systems; and 3) the co-creation of a project for social transformation. These solutions are illustrated in Figure 7, which presents the Future Reality Tree (FRT), depicting the proposed strategies for improving last-mile distribution.

Figure 7. Future Reality Tree illustrating proposed solutions for last mile distribution.
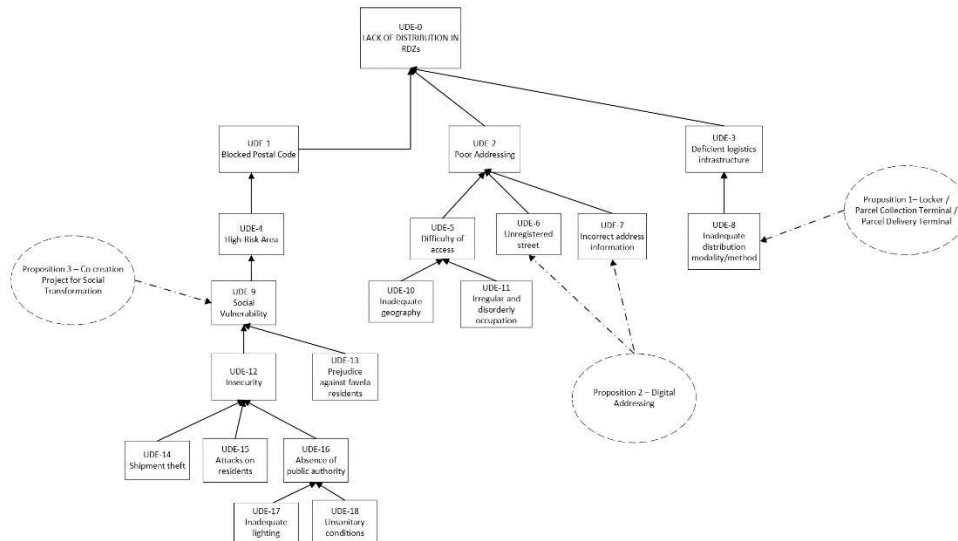
Source: Prepared by the authors.

According to Risberg and Jafari (2022), implementing real-time information systems, ensuring consistent delivery schedules, and exploring alternative modes of parcel distribution are effective practices in last-mile logistics, aligning with the propositions put forth in the FRT. The following section presents these three propositions in detail:

Proposition 1 – New Distribution Modalities

The first proposed solution entails delivering items from senders located outside of high-risk areas. Out of Home Delivery involves making the customer's order available at a

commercial establishment or a self-service terminal, allowing the user to conveniently retrieve it at a suitable time according to their daily routine (Out of Home Delivery in Europe, 2023). Modalities such as lockers or pick-up/drop-off points address the undesirable effects identified in the CRT, taking into consideration the consumer's perspective by considering high-traffic locations and their customer journey. This trend has been successfully implemented in Asian, European, and North American countries.

Lockers or Self-Service Parcel Terminals are devices utilized by marketplaces or logistics carriers for order collection or distribution (AMAZON, 2023). Typically located in malls, bus terminals, or shopping centers with high footfall, these lockers offer convenience to customers. The consumer can select the most convenient day and time to pick up their parcels at the lockers (Tsai, 2021). Recipients receive an email with instructions and a code to present when retrieving their package from the locker at their chosen terminal.

These distribution modalities can be strategically placed near areas classified as high-risk, providing a practical and convenient alternative for residents. This aligns with the findings of Market, Bliemer, and Fayyaz (2022), who suggest that lockers are particularly beneficial for high-value parcels. By implementing these measures, Undesirable Effects 4 (High-Risk Area) and 8 (Inadequate Distribution Modality) can be mitigated.

A Twitter post from a user highlights the effectiveness of this solution: "[...] Let me tell you something cool: (The company) now offers locker service. It's easy to use. You just [have to] find the locker closest to your home, jot down the address and postal code, and enter it during the purchase process. It's extremely useful for those residing in areas with delivery restrictions" (Customer 12).

Proposition 2 – Digital Addressing

Undesirable Effects 6 and 7, labeled as "Unregistered Address" and "Incorrect Address Information," respectively, contribute to the overall problem of "Poor Addressing" highlighted at the top of the CRT. This issue severely hampers the effectiveness of distribution logistics in slum areas, rendering it impossible to deliver parcels directly to residents' homes. Consequently, inconvenience, discomfort, and limited convenience arise as customers are compelled to travel to retrieve their shipments.

To address these undesired effects, we propose the implementation of digital addressing by utilizing georeferencing tools to identify and code locations within these communities. By digitizing addresses, residents of *favelas* and slums can have their residences accurately identified on shopping platforms, thereby facilitating the logistics of parcel delivery through the availability of postal codes and digitized locations. This solution, coupled with a deeper understanding of the region, contributes to the empowerment of slum residents, enabling their recognition by the government and fostering access to essential services.

During the primary data collection, one of the experts emphasized the carrier's need to develop territorial intelligence, stating:

"[...] Local and cultural knowledge: To effectively operate in these delivery-restricted areas, it is crucial to have a comprehensive understanding of the local geography, customs, and community peculiarities" (**Respondent 6**, Rio de Janeiro).

According to UOL (2023), marketplaces and logistics operators, in collaboration with Google, have initiated a project to digitize addresses in slum areas. These addresses are based on latitude and longitude coordinates and are represented in numerical and alphabetical formats.

Proposition 3 – Co-creation Project for Social Transformation

The paper also puts forth a proposition aimed at transforming the social landscape concerning last-mile delivery in *favelas*. This proposition focuses on overcoming the restrictions imposed by the social structure of these communities through a collaborative project. The proposed model involves the formation of a study group that includes stakeholders from both the community and the market players, as they share a common interest in ensuring that e-commerce purchases reach residents of the *favelas*.

The proposed model outlines ten steps for the implementation of a co-creation project aimed at addressing the identified problem. Co-creation acknowledges the significance of involving diverse stakeholders in problem-solving processes, particularly when multiple parties are affected. Regarding the specific issue under investigation, Flores and Silva (2017) recommend the establishment of partnerships with local entities. Cultivating strong alliances with *favela* and community leaders empowers companies to mitigate theft-related challenges and foster the development of optimized delivery strategies. Through active engagement with *favela* residents and leaders, companies can also contribute to reducing the incidence of thefts (Flores & Silva, 2017).

Activity 1: Understanding the problem
The primary project coordinator will evaluate the core problem that needs to be addressed. In the context under examination, the issue is the fact that "e-commerce won't go up the hill!" which means that e-commerce deliveries are unable to reach the residents of *favelas* and slums due to societal restrictions. To address this problem, one approach would be to engage in a collaborative effort involving various stakeholders, such as logistics companies, *favelas*, government entities, NGOs, and other relevant parties.

Activity 2: Formulating a process plan.
Before initiating the co-creation process, it is crucial to plan the entire project. The project coordinator can utilize the 5W2H model to formulate the work plan: a) Why will the study be conducted? (To address the need for delivering goods to the *favelas*); b) What will be accomplished? (Development of a delivery logistics model for the *favelas*); c) Who will participate in the project? (Community members, government representatives, logistics companies, and other relevant stakeholders); d) Where will the project take place? e) When will the project be implemented? f) How will the project be executed? (Study group engaging in co-creation activities); g) What will be the estimated cost of the project?

Activity 3: Meeting with stakeholders.
Once the stakeholders have been identified, the coordinator should arrange a meeting with all involved parties to present the problem and discuss the project. During the meeting, the group should further refine the project scope by addressing the outstanding items in the 5W2H framework.

Activity 4: Identifying the expert actors of the process.
During the meeting, the stakeholders should identify and nominate experts who can contribute to the project's solution. It is crucial to involve community leaders, government officials, and logistics company representatives in the study group.

Activity 5: Meeting with the experts.
After the study group is formed, the coordinator should prepare a presentation and schedule a meeting with the selected experts. During this meeting, the coordinator must clearly communicate the problem, objectives, and rationale behind each expert's inclusion in the group.

Activity 6: Designing the project.

Following the presentation of the problem and objectives, the group should collaboratively design a project plan, including an action plan and a timeline for execution, highlighting the roles and responsibilities of each group member. The project plan should define specific activities, encompassing the process flow and critical success factors. It may also require the establishment of working subgroups. In the case of the issue addressed here, the project should assess delivery logistics, the creation of a postal code system, and the establishment of service centers, distribution points, and collection units, among other factors relevant to solving the problem.

Activity 7: Defining the roles of each stakeholder.

Once the work scope is defined, the group must assign specific roles to each stakeholder involved. This includes identifying the individual responsible for each activity, the overall work coordinator, the controller, and the leaders of each team or work activity.

Activity 8: Creating subgroups to study each process.

One may need to create study subgroups to develop parts of the work process. For example, one group may evaluate the logistical process, another group may evaluate the security process, and another group may evaluate the work administrative process. In this case, it is necessary to create subgroups in which each subgroup will have a coordinator who must organize the development of its process and elaborate an action plan, schedule, and resources needed for the initiative in question.

Activity 9: Conducting focus groups.

Each sub-group should hold periodic meetings to update the actions and next steps. The focus group work will help in the discussions about important topics such as the creation of delivery units, the creation of delivery logistics, the creation of postal codes, risk analysis, the need to create a company, the employability of the community, the benefits for all stakeholders, among others.

Activity 10: Presenting results.

The group and the subgroups should hold periodic meetings to present the results for course corrections, if necessary, and to discuss the next steps. In the end, the general coordinator should present the final result of the project.

6. CONCLUSION

This article has provided a comprehensive analysis of the undesirable effects and underlying causes of the critical issue of non-delivery of e-commerce products in *favelas* and similar communities. It has also proposed a set of solutions aimed at bridging the gap between customer expectations and the reality of distribution platforms. The findings of this study are supported by the testimony of Specialist 7, who highlights the challenges faced in these areas, including delivery refusal due to safety concerns and higher delivery costs compared to other regions. "[...] There are two problems in such communities: the first one is the delivery person refusing to enter them due to safety concerns, and the second one is the cost of delivery, which usually does not align with the GMV (Gross Merchandise Volume)." Purchases in these zones tend to have a lower GMV, and delivery costs are up to three times higher than in other areas.

Both primary and secondary data indicate a strained relationship between businesses and consumers. The B2C sector has highlighted the vulnerabilities in the country's logistics

infrastructure, shedding light on not-so-invisible social "ills." However, several companies, such as Carteiro Amigo Express, Na Porta, Favela Express, Favela Log, and TrazFavela, have emerged as local solutions to address these issues. By employing innovative approaches like digitizing deliveries, utilizing mobile apps, and collaborating with community leaders, these companies have facilitated access to delivery services for residents of *favelas* and slum communities. Moreover, they have contributed to local economic growth by creating employment and income opportunities for the community. These initiatives play a vital role in reducing inequality and promoting social inclusion, demonstrating the transformative potential of local entrepreneurship (Startups, 2022).

Customers have become increasingly demanding in their expectations for shipment receipt, seeking transparency in tracking, flexibility, and engagement throughout the last-mile logistics process. They value marketplaces that offer delivery alternatives and contribute to overall satisfaction and shopping experiences, which, in turn, lead to repeat purchases and consumer loyalty (Last Mile Experts, 2023).

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