ISSN 1678-6971 • RAM. Rev. Adm. Mackenzie, São Paulo, *26*(1), eRAMR250005, 2025
Knowledge, Strategy and Innovation, https://doi.org/10.1590/1678-6971/eRAMR250005
Submitted: Feb. 15, 2023 | Approved: Mar. 8, 2024

Relevant attributes for pick-up points in last-mile logistics

Atributos relevantes para *pick-up points* na logística de última milha

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To cite this paper: Baia, B. de S., da Silva, A. M., & Filenga, D. (2025). Relevant attributes for pick-up points in last-mile logistics. *Revista de Administração Mackenzie*, *26*(1), 1–23. https://doi.org/10.1590/16786971/eRAMD250005

RAM does not have information about open data regarding this manuscript.
RAM does not have authorization from the authors or evaluators to publish this article's review.

Abstract

Purpose: To identify the relevance of attributes associated with pick-up points where consumers collect their orders from online purchases (e-commerce) in the metropolitan region of São Paulo.

Originality/value: A systematic search of the Web of Science and EBSCO databases and an initial literature review revealed that studies on e-commerce consumer preferences regarding attributes related to pick-up points are scarce despite the large volume of studies on last-mile logistics. Thus, this study presented the following research problem: *Which attribute associated with pick-up points is considered the most convenient for e-commerce consumers in São Paulo metropolitan region?*

Design/methodology/approach: A stated preference survey was applied to respondents, with different hypothetical scenarios associated with pick-up points. We developed a data collection instrument and applied it to a sample of 124 respondents, who were asked to make a compensatory analysis of the trade-offs of the attributes present in each alternative. A Conjoint Analysis model was developed from the questionnaire data collection, which generated a utility function, thus enabling to identify the relevance of the attributes associated with pick-up points.

Findings: The Security attribute was indicated by respondents as a priority, given the social, political, and economic circumstances of 2022. The accessibility and availability attributes were indicated next in relevance.

Keywords: e-commerce, logistics, pick-up point, stated preference, last mile

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https://doi.org/10.1590/1678-6971/eRAMR250005

Resumo

Objetivo: Identificar a relevância dos atributos associados aos locais onde os consumidores retiram suas encomendas (*pick-up points*) decorrentes das compras feitas pela internet (e-commerce) na região metropolitana de São Paulo.

Originalidade/valor: Buscas sistemáticas nas bases de dados Web of Science e Ebsco e uma revisão de literatura inicial revelaram que são escassos os estudos sobre as preferências dos consumidores de e-commerce quanto aos atributos relacionados aos locais em que retiram suas encomendas, apesar do grande volume de estudos sobre logística de última milha. Assim, este estudo formulou o seguinte problema de pesquisa: Qual atributo associado a *pick-up points* é considerado o mais conveniente para consumidores de e-commerce da região metropolitana de São Paulo?

Design/metodologia/abordagem: Uma pesquisa de preferência declarada foi aplicada com o intuito de apresentar aos entrevistados diferentes cenários hipotéticos associados a *pick-up points*. Desenvolveu-se um instrumento de coleta de dados que foi aplicada a uma amostra composta por 124 respondentes, os quais foram requisitados a realizar uma análise compensatória em relação ao *trade-off* dos atributos presentes em cada alternativa. Foi desenvolvido um modelo de Análise Conjunta a partir da coleta de dados do questionário, que gerou uma função utilidade, sendo possível identificar a importância dos atributos associados a *pick-up points*.

Resultados: Foi possível identificar que o atributo Segurança foi aquele indicado pelos respondentes como prioritário, dadas as circunstâncias sociais, políticas e econômicas no ano de 2022. Os atributos Acessibilidade e Disponibilidade, respectivamente, foram indicados na sequência.

Palavras-chave: comércio eletrônico, logística, ponto de retirada, preferência declarada, última milha

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https://doi.org/10.1590/1678-6971/eRAMR250005

INTRODUCTION

Logistics is a topic that has stood out in the retail market, mainly due to the growth of e-commerce in the 21st century (Alves et al., 2018). Consumer habits are changing fast, and buying online is becoming increasingly popular. As a result of this growth, logistics processes should be optimized accordingly (Oliveira et al., 2017).

Within e-commerce, there is an important stage that sellers must pay attention to, which is the so-called 'last mile'. Also known as 'home delivery', it is the last step of the business-to-consumer (B2C) service when the order is delivered directly to the recipient (Mohammad et al., 2023). The last mile is the most expensive stage of the supply chain and can account for up to 41% of its total cost (Capgemini, 2019). More than a decade ago, previous studies indicated that the last mile in e-commerce could generate rework due to absent recipients, a significant number of kilometers traveled, and a low number of deliveries in isolated regions (Gevaers et al., 2009). Over the years, the problems have worsened rather than been solved.

In order to improve this process, pick-up points have emerged, making the last mile less troublesome for both the customer and the seller. Pick-up points allow people to make their purchases online, and instead of waiting for the package to arrive at home, pick it up at a physical store or other autonomous collection facility made available by the retailer (Silva, 2018). This alternative to home delivery is advantageous for couriers, as it reduces rework; for retailers, it offers a delivery service that suits the customer; and for consumers, it provides greater flexibility in schedule, security, and savings for receiving their orders.

Unlike in North America and Europe, alternative services to home delivery, such as pick-up points, are little explored in Brazil (Silva et al., 2019). However, Oliveira et al. (2017), Silva et al. (2019), and Silva (2018) observed that pick-up points have the potential to be adopted by Brazilian consumers but are not a priority alternative yet, thus requiring strategic planning for their implementation.

However, such planning should consider the differences between North American and European countries and Brazil. Obviously, the success of this service depends on consumers' conditions, and the context of this study addresses the country's social, political, and economic conditions in 2022. According to Marques and Couto (2020), more specifically, in the São Paulo metropolitan region, several obstacles exist, including the Cracolândia and its social problems. Therefore, this region is marked by a scenario of

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insecurity, reduced urban mobility, occupational deficit, and unemployment that result in numerous drug users and homeless people, among other aspects.

Based on these circumstances and a few studies about what consumers claim to be the most appropriate conditions for picking up their orders, we ask: which attribute associated with pick-up points is the most convenient for e-commerce consumers living in the São Paulo metropolitan region?

At first, we identified, through a literature review, that accessibility, availability, and security are the most relevant attributes for e-commerce consumers, who were then asked indirectly through the stated preference technique, which they considered the most convenient. The results were then modeled using RStudio software, and a utility function was generated, indicating that the security attribute was considered the most convenient for e-commerce consumers in that region.

The study helps to understand how pick-up points can be used in the Brazilian context in order to meet consumer preferences and, therefore, be used more by retailers. After this introduction, we present a brief literature review. Next, we detail the applied methodology of stated preference, followed by the results and discussion. At the end, we present the conclusions.

THEORETICAL FRAMEWORK

Last-mile

One of the stages in the e-commerce logistics process is what we know as the last mile. Yuen et al. (2018) and Marchioro et al. (2019) define it as the distance between the distribution center and the consumer's home. This service begins when the parcels leave the shipping company, which is considered the last stage of the delivery process.

Last-mile logistics has become increasingly important in several studies, and pick-up points have stood out, mainly because they affect the total logistics cost (Demir et al., 2022).

It is important to highlight that an efficient last-mile service has been increasingly demanded in recent years, which becomes an opportunity to seize, considering the competitive market provided by e-commerce. According to Morganti et al. (2014), delivery service companies offer a criterion for consumers to choose where to buy the product. Besides the benefits associated with the seller and the customer, Silva (2018) also emphasizes that "the urban distribution of goods is an essential activity in the process of development and sustainability of the economy in urban centers", which shows that

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the advantages of good last-mile logistics planning also affect those indirectly involved.

Bjerkan et al. (2020) investigated consumer behavior in e-commerce and identified a correlation between the volume transported and the preference between receiving the delivery at home or at a pick-up point. The latter practice was associated with low added-value deliveries.

In fact, the study shows a correlation between value-added deliveries and the current circumstances when the package is picked up. Hence, we can assume that picking up and transporting higher value-added parcels can lead to a feeling of insecurity, as these parcels could be the target of a robbery, depending on the location and surroundings of the pick-up point.

Although the last-mile process is important for successful logistics, doing it efficiently has not been a simple task. According to Ranieri et al. (2018), the growth of e-commerce has caused many problems in the last-mile process, including meeting environmental or sustainability demands. For Silva (2018), the last mile can represent from 13% to 75% of the total logistics cost. Marchioro et al. (2019) observe that when the service is intended for a region with delivery restrictions, an extra fee of up to 35% can be added to the freight value. This cost is also related to a recurring need for rework. The nature and route of deliveries, the amount, type of packaging, and energy efficiency of stores and distribution center operations contribute greatly to potential climate change and, therefore, imply higher costs (Van Loon et al., 2015).

Allen et al. (2018) argue that a business-to-consumer (B2C) service requires direct contact, expressed by collecting the signature as proof of delivery, and demands more training. For Chen et al. (2018), there are several small and time-consuming activities after arrival at the destination, such as waiting, identification, handling, and receipt protocol.

Pick-up points

The problematic home delivery is not the only option for those seeking to sell or buy online. According to Ranieri et al. (2018), several e-commerce companies are using the concept of collection and delivery points as an alternative to home delivery. Zenezini et al. (2018) mention that pick-up points and lockers are the most adopted collection and delivery points (CDPs).

For Morganti and Dablanc (2014), the development of pick-up points has proven efficient in reducing the risk of unsuccessful deliveries and the splitting of deliveries generated by e-commerce growth. Zenezini et al.

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(2018) strengthen the argument by claiming that when implementing a network of pick-up points, both consumers and couriers benefit since it tends to cheapen the service, optimize vehicle routing, and reduce delivery time, making the whole operation faster and safer. Silva (2018) also found that delivery to pick-up points reduces the mileage traveled by carriers, resulting in an operational cost of around 12.8% lower than home delivery.

Gevaers et al. (2014) investigated the effect of different factors on last-mile logistics costs. They found these relevant: level of customer service, type of delivery, geographical area, market den, the fleet, and the distribution environment.

Although new to Brazilians, pick-up points are common in countries like the United States, Germany, France, Belgium, and Spain (Silva, 2018). According to Deutsch and Golany (2017), lockers are currently used in more than 20 countries. Data collected by Lachapelle et al. (2018) show that in 2016, more than 1.4 million parcels were delivered through lockers in Australia.

What we see in countries that have already established the practice of pick-up points and their respective lockers is that a whole system permeates the circumstances of the country or surrounding region. Picking up parcels requires a series of factors intrinsic to consumers' routines. These include the cost of rent for setting up the pick-up points, the legal security for establishing a commercial point, a guarantor contracting system, current labor legislation regarding working conditions and employment links, complying with the safety standards required by the responsible municipal bodies, bureaucracy for opening a firm, accounting, and, finally, although not less important, public security.

In Brazil, mainly in São Paulo, there are frequent complaints about the countless small robberies by drug users who roam the city and gather in specific areas, such as the Cracolândia. This is a place in the central region of the city that brings together drug dealers and users who wander the neighborhoods in search of some money to support their addiction. Public security, conducted by the civil and military police, has very little power to act, given the out-of-control conditions of this scenario. Its impact on parcel pick-up logistics is predictable and decisive for its success (Amaral & Andreolla, 2020; Marques & Couto, 2020).

In order to establish and expand this alternative way of delivering goods, there are several companies providing pick-up point services. One successful example is the Swedish company PostNord, which in 2014 had around 5,000 points settled in countries like Sweden, Norway, Denmark, and Finland

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(Morganti et al., 2014). The safer, easier, and more convenient it is, the more likely this technique will be successful since it offers an excellent alternative for completing the e-commerce process. Still, it depends on social, political, and economic factors contributing to its implementation and adoption by more and more consumers.

Stated preference technique

Among consumer preferences that are determinants for satisfaction is delivery time. Dablanc et al. (2017) highlight the 'next day delivery,' which requires strong efforts upon batches and periods. Monday, for example, is considered the peak of the week. Therefore, modern approaches are needed to make deliveries flexible and scalable.

The consumer may not be fully aware of marketing strategies, but establishing a subjective value scale aims to achieve those perceived values or attributes. The perception of attributes is one of the ways by which marketing develops or reaches consumer preference in the shopping process (Balen et al., 2022). Therefore, to understand how a person reacts when deciding what to consume, economic theories on consumer behavior estimate econometric models for making predictions when faced with alternatives (Brandli & Heineck, 2005).

A technique that can help to know consumers' choices is stated preference. It studies consumer priorities within an imaginary context, where the preference must be declared. Gökçe and Durmuş (2019) suggest two essential elements for stated preference. First, the cost of transportation should be the main concern of those involved in the transport and delivery process since, in all cases, the cost factor is the most important. Second, transportation time and reliability play a significant role in decision-making. Still, their specific importance varies according to transportation characteristics and from one branch of activity to another.

To apply the stated preference technique, it is necessary to survey individual declarations on their preferences from a set of predetermined alternatives for estimating utility functions (Kroes & Sheldon, 1988; Larranaga et al., 2021).

The utility function is a model proposed by classical economic theory to measure consumer preferences regarding a set of available choices (Silva et al., 2010). According to Falleiro et al. (2018), the utility function stems from the Expected Utility Theory (EUT), which, in turn, has been established as "the best model for normative analysis on decision-making in a context of risk or uncertainty".

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The authors also show a limitation of the technique. There are sufficient studies to claim that EUT "does not provide an appropriate description of the decision-making process when it is analyzed descriptively" (Tversky & Kahneman, 1992).

The development and improvement of EUT resulted in other techniques – Prospect Theory [PT] (Kahneman & Tversky, 1979) and cumulative prospect theory (Tversky & Kahneman, 1992). These techniques seek to explain how people (consumers) make decisions when faced with their questions, that is, in a situation of uncertainty (Falleiro et al., 2018).

Finally, when describing the process that represents the evolution of the concept of the Utility Function, Falleiro et al. (2018) observe a change in its essence by adding the probability weighting function. Therefore, "the utility function in PT has a concave shape for gains and a convex shape for losses, with the shape of an 'S', where losses are steeper than gains due to loss aversion". In their study, they assumed shapes for the utility function and the probability weighting function; therefore, they estimated parameters that allow checking the shape of these functions, both at the individual and aggregate levels, which is relevant for our study for comparing methods and results.

According to Baidya et al. (2014), the term utility is used to measure consumer satisfaction when buying a good or service. By analyzing the level of utility, we notice if one product is preferable to another. Therefore, an analysis using the utility function, even in econometric models, is an excellent option for researchers who want to establish a criterion of importance or decision among a wide choice of scenarios, as is the case of this study on preferences related to pick-up points.

The combination of utility and stated preference research techniques enables considering that each alternative represents a different combination of relevant attributes of the same product or service (Gökçe & Durmuş, 2019). Using the trade-off technique, it is possible to compare the alternatives, where different levels are assigned to each attribute, thus requiring interviewees to make a compensatory analysis of the alternatives (Bastos, 1994). The survey result generates the utility function, which allows identifying the degree of relevance of each attribute for individuals, so that the product or service can be modulated, emphasizing the attributes that are most useful.

Therefore, the perceived utility can be treated as revealed and included in several other data collection instruments, all seeking to analyze consumer perception regarding the study object. Take, for example, the TAM Model

ISSN 1678-6971 • RAM. Rev. Adm. Mackenzie, São Paulo, *26*(1), eRAMR250005, 2025
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(Technology Acceptance Model) by Davis (1989) and the TTF Model (Task Technology Model). The TAM model gathers a set of variables to investigate technology acceptance, that is, analyzing potential resistance to adopting and using information technology. The TTF model, a task-technology fit model, results from seminal studies by Goodhue and Thompson (1995). It is the combination of two research flows: use and task technology. One is related to the performance or impact on the performance of each agent when using a certain computer program. At the same time, the other analyzes the suitability or adjustment during a given activity.

In common, they are models for investigating technology users but serve as research modeling for different objects of study, as both include alternatives for researchers to study perceived utility and its consequences. All approaches refer to the flow of use, seeking to examine the attitudes and beliefs of users or consumers in order to predict the use of information systems or another dependent variable, which, in the present study, relates to stated preferences for choice and use of pick-up points.

METHODOLOGY

Through the stated preference technique, this research aims to identify which attributes associated with pick-up points are considered most convenient for e-commerce consumers in the São Paulo metropolitan region. According to Bastos (1994), user preference is an important factor in solving location problems, and we found it appropriate to meet our goal.

Regarding the autonomous delivery system, the consumer must not be present when the package is delivered, allowing the courier to deliver the products at a location other than the customer's home so they can pick it up at an appropriate time (Allen et al., 2007). There are different autonomous delivery systems, but this study emphasizes pick-up points and lockers.

This study used a quantitative approach through the stated preference technique. The research is exploratory and was carried out using the inductive method. We used a sample of 124 respondents, which was considered appropriate, built by convenience sampling, and because conjoint analysis is a technique with few statistical assumptions (Hair et al., 2009). This sample size does not differ from other studies that used the same technique nationally, such as Silva et al. (2015), with 93 respondents, and Graebin (2018), with 120.

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Definition of attributes

To survey stated preference, defining the attributes associated with pick-up points is first necessary. These attributes were collected through a literature review on the subject, which included national and foreign articles seeking to understand the behavior and motivation of e-commerce consumers when using pick-up points or to analyze success factors of the service in other regions such as China, the United States, and Europe.

One of the attributes of pick-up points, which should be considered when planning their installation, is the ease of access for consumers since its target audience has little free time in their daily lives. For McKinnon and Tallam (2003), it is possible to circumvent this barrier if they are located along people's daily routes, back and forth to work, college, the gym, etc.

According to Yuen et al. (2018), the proximity of pick-up points to places that are part of consumers' daily routine contributes to attending to their needs. This argument is reinforced by Silva (2018), who concluded that consumers will be less willing to use pick-up points if they have to make an extra shift outside their daily routine.

Given the relevance of pick-up points' accessibility for consumer satisfaction, the first attribute was defined as:

1st Attribute: Accessibility.

Most pick-up points in Changsha, China, are located in supermarkets, convenience stores, fast-food restaurants, etc. (Shuyan *et al.*, 2019). Therefore, it is common sense to deduct that most of them would only be available for parcel pick-up during business hours (8 am to 6 pm). However, this detail can be a barrier to consumers, as this is precisely the period when they would be unavailable.

For Oliveira (2017), schedule flexibility for collecting orders is a positive feature that increases the likelihood of consumers adhering to pick-up points. Iwan et al. (2016) found that 23% of consumers believe that 24-hour availability of pick-up points is the most important reason for using the service. Hence, we defined the second attribute of the survey as:

2nd Attribute: Availability.

Another recurring aspect highlighted by Silva (2018) is that pick-up points should be located in places that provide a sense of security for consumers to pick up their parcels, such as those with lighting and a large flow of people or other businesses.

According to Oliveira et al. (2017), the identification of security features is of paramount importance when planning the installation of lockers since

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the lack of them can attract the attention of thieves and become potential robbery points. In their survey, 54% of respondents considered security issues at pick-up points very important, and 45% referred to the need for some resources that provide a secure environment.

Given the relevance of the feeling of security provided by pick-up points to both customer and seller, we defined the third research attribute as:

3rd Attribute: Security.

To simplify the research and follow Morikawa's (1989) recommendations, we decided to limit it to three attributes, with two opposite levels for each. Table 1 summarizes the attributes considered in the research and their respective levels.

Table 1

Definition of attributes and their levels applied in the research

Attribute	Description	Level	Description by level
Accessibility	Location of the drop-off and pick-up point, regarding the path of the consumer's daily routine (home, work, college, gym, etc.)	0	An additional journey of at least 2km from your daily routine is required to reach the nearest drop-off and pick-up point.
		1	The drop-off and pick-up point is located on the daily route; no additional journey is required.
Availability	The period during which the drop-off and pick-up point is available for the delivery and pick-up of parcels.	0	The drop-off and pick-up point is only available on working days, during business hours (8 am to 6 pm).
		1	The drop-off and pick-up point is available 24 hours a day, 7 days a week.
Security	Sense of security regarding robberies and thefts that the drop-off and pick-up point provides to consumers.	0	The drop-off and pick-up point does not have cameras and alarms, and there is a small flow of people in that region.
		1	The drop-off and pick-up point has cameras and alarms, and there is a large flow of people in that region.

Therefore, the generated utility function follows the model presented by Equation 1:

$$U_{(x)} = \beta_0 + \beta_1(Acb) + \beta_2(Disp) + \beta_3(Seg) \quad (1)$$

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Where: $U_{(x)}$ is the utility value regarding consumers' preference; Acb is the accessibility attribute; Disp is the availability attribute; Seg is the security attribute; β_0 is the independent constant of the utility function, and β_1, β_2, and β_3 are the attributes' coefficients to be determined.

Preparing the statistical project

After defining all attributes and their respective levels, we began preparing the statistical project, seeking to know the maximum number of scenarios that the combination of attributes' levels could provide.

For this study, we recalled Souza's (1999) preliminary ideas: for the development of a stated preference survey, which makes quick interviews with random people, the recommendation is that the number of alternatives should be seven at most. Using RStudio software, we calculated the full factorial, resulting in eight different combinations of attributes. By eliminating the alternatives considered dominant and dominated, the final survey remained with a set of six alternatives identified by colors. Table 2 shows how the attributes were distributed, where variable 1 indicates the attribute in a favorable condition, and variable 0 indicates the attribute in an unfavorable condition.

Table 2

Set of alternatives

Alternative	Accessibility	Availability	Security
Green	0	1	1
Blue	1	0	1
Yellow	0	0	1
Red	1	1	0
Orange	0	1	0
Black	1	0	0

Once the alternatives were set, it was necessary to define how interviewees would choose between the available options. There are several different ways for participants to register two answers in a stated preference survey, which are classified as metric (rating) or non-metric (choice and ranking) (Bastos, 1994).

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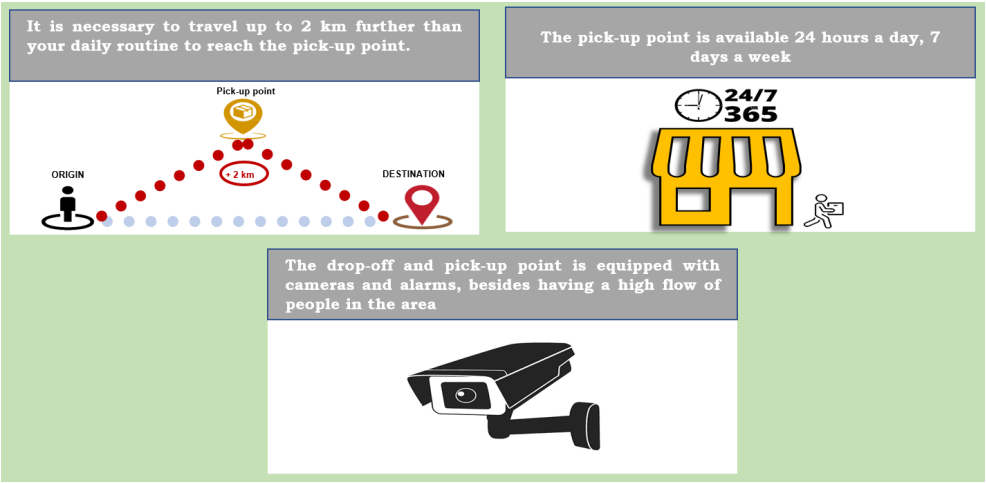
In a rating process, individuals analyze and assign a "grade" to the alternatives, according to their degree of attractiveness; in the choice method, interviewees analyze all the alternatives and choose the one they think most attractive to them; in the ranking method, the respondents sort in descending order the alternatives they consider most convenient (Souza, 1999). We adopted the ranking method for this research; this model is appropriate since people find it easier to sort a set of alternatives than to evaluate them one by one (Dutra et al., 2002).

Questionnaire development

The alternatives were shown to interviewees as illustrated cards, where each attribute (whether in favorable conditions or not) was depicted in a frame. Each card had the background color associated with the alternative to facilitate its identification. Figure 1 shows an example of a card representing the green alternative.

Figure 1

Green alternative



The questionnaire began with a brief introduction to the topic and the stated preference survey itself, where the six cards were presented, and interviewees were asked to rank them in descending order, according to their preference. Respondents were also asked to answer a few questions about their e-commerce experience and socio-economic profile.

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The questionnaire was developed using the Google Forms application and spread through social networks (WhatsApp, Facebook, Instagram, etc.). To meet the study's objective, the scope of the questionnaire was limited to residents of the São Paulo metropolitan region. It was opened online on 12/14/2021 and closed on 03/06/2022. We received 169 responses but discarded 45 from non-residents in the São Paulo metropolitan region. Thus, we got 124 questionnaires with valid answers.

RESULTS

Of those interviewed, only one said they had never bought online. The questionnaire also showed that the majority of respondents (47.15%) make one purchase a month on e-commerce. Among the most popular products, the highest part (73.17%) was in clothes and accessories. When asked if they had ever had a frustrating experience with home delivery, 61.79% said yes. Although pick-up points are not very popular in Brazil, 73.98% said they were already familiar with the concept.

Of the 124 respondents, 62.1% were female and 37.9% male. Among them, 46.67% earn up to two minimum wages, and 35.83% between 2 and 4 minimum wages. The majority of those interviewed (63.41%) have an undergraduate degree, and almost half of the total (48.39%) are between 24 and 30 years old. Although the survey covered the whole metropolitan region of São Paulo, it reached more residents in the capital (50.44%). Still, we also received answers from residents in other areas, such as Mogi das Cruzes (13.27%), Ferraz de Vasconcelos (12.39%), and Itaquaquecetuba (7.08%).

Regarding the stated preference survey results, we showed six scenarios (represented by colors) to interviewees, each with at least one negative feature and one positive feature of the attributes under analysis. Each person should make a trade-off analysis and rank the preferred scenario from 1 to 6. Table 3 summarizes the chosen scenarios for each available option.

Table 3

Cross-tabulation of research results for stated preference

Alternative	1st	2nd	3rd	4th	5th	6th
Green	24	55	14	20	9	2
Blue	78	23	13	4	3	3

(continues)

ISSN 1678-6971 • RAM. Rev. Adm. Mackenzie, São Paulo, *26*(1), eRAMR250005, 2025
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Table 3 (conclusion)

Cross-tabulation of research results for stated preference

Alternative	1st	2nd	3rd	4th	5th	6th
Yellow	6	14	53	14	16	21
Red	12	21	16	60	13	2
Orange	2	2	8	15	35	62
Black	2	9	20	11	48	34

We can conclude that the blue card was considered the best by most of the interviewees, as it was chosen more often as the first option. Different from what we imagined, the red card (made up of two positive attributes) was out of the "top 3", being only the fourth option, and the yellow card ended up as the third choice.

From these initial observations, we inferred that the security attribute was much considered, as it was present in favorable conditions in the first three positions. On the other hand, the availability attribute drew attention to being in unfavorable conditions in the scenarios of the first and third options and in favorable conditions in the orange card, where it was preferred as the sixth and last option.

To generate the utility function, we manually inserted the field survey results into a Microsoft Excel spreadsheet. Then, we loaded them into the RStudio software, which, in turn, was already set up with the conjoint package.

After the calculation by RStudio, it was possible to define the numerical value of each coefficient associated with the attributes under study. From here on, we recall equation 1 and assemble the utility function with the coefficients stipulated by the software.

$$U_{(x)} = 4.5 + 1.086(\text{Acb}) + 0.739(\text{Disp}) + 1.524(\text{Seg})$$

As shown in Table 4, all the calculated coefficients got a p-value below 0.05; therefore, it is possible to determine, with a significance level of 5%, that all attributes are significant for the function and should be kept in the equation.

ISSN 1678-6971 • RAM. Rev. Adm. Mackenzie, São Paulo, *26*(1), eRAMR250005, 2025
https://doi.org/10.1590/1678-6971/eRAMR250005

Table 4

Parameter estimates by RStudio

Parameter	Coefficient	Std. Deviation	T-test	p-value
Intercept	4.5	0.03496	128.74	< 2e-16
Accessibility (Acb)	1.08266	0.03496	30.97	< 2e-16
Availability (Disp)	0.73992	0.03496	21.17	< 2e-16
Security (Seg)	1.52419	0.03496	43.6	< 2e-16

Notes. No. of observations = 124; R^2 adjusted = 0.7694; F-Statistics = 1,103, p-value < 2e-16.

The adjusted R^2 had a result of 0.769, so we could determine that the variation of the variables under study explains around 76.94% of the variation of the utility of the pick-up point. Regarding the F-statistics, its p-value was also below 0.05, thus rejecting the null hypothesis that all coefficients are equal to zero; hence, we can say that at least one of the independent variables is different from zero and thus influences the response variable.

DISCUSSION

With a value of 1.524 for the security coefficient, 1.082 for the accessibility coefficient, and 0.739 for the availability coefficient, we can say that the security attribute is the most convenient for e-commerce consumers living in São Paulo metropolitan region, followed by the accessibility attribute, and finally by the availability attribute, which is considered the least relevant in a pick-up point.

As stated by Baidya et al. (2014), the level of utility should be treated as ordinal. In other words, this concept aims not to define quantitatively how attractive each attribute is for the consumer but to analyze the ranking of utility levels for preference ordering.

Therefore, the calculated coefficients can be used to measure the share of attention or investment that should be received when planning the implementation of a pick-up point in the São Paulo metropolitan region, where the investment can be divided into 45.54% for security, 32.35% for accessibility, and 22.11% for availability.

The survey results show that among the attributes associated with pick-up points (accessibility, availability, and security), the security feature is the most convenient for e-commerce consumers in that region.

ISSN 1678-6971 • RAM. Rev. Adm. Mackenzie, São Paulo, *26*(1), eRAMR250005, 2025
https://doi.org/10.1590/1678-6971/eRAMR250005

CONCLUSIONS

In order to ensure that consumers enjoy the benefits that e-commerce can provide without being affected by inconveniences related to the delivery of goods, such as absent recipients, high freight charges, etc., it is of great value that successful applications be implemented to eliminate or minimize the obstacles that may reduce the added value of the last-mile service in e-commerce.

The study on pick-up points, an alternative to home delivery that is widely used in other countries but little adopted in Brazil, draws attention to the fact that it has the potential to be accepted by Brazilian e-commerce consumers but is still not considered a priority option when compared to home delivery.

To understand this, the study sought to identify which elements could be improved so that online consumers would be more inclined to adopt this type of delivery.

The stated preference technique, the methodology applied in this study, showed that the security attribute is the most convenient for consumers. Therefore, when buying a product online and choosing to receive it at a pick-up point, e-consumers tend to choose facilities located at places with a high flow of people in their immediate vicinity, in addition to having cameras and alarms, in order to provide a sense of security toward robberies and thefts that may occur before, after, or during package pick-up.

The study also analyzed the relevance of two other attributes – accessibility and availability. Both showed significant results but were not as valuable as security. This does not mean that these characteristics should be neglected when planning the implementation of a pick-up point; on the contrary, they need to be analyzed together with the security attribute, thus making an investment proportional to the relevance of each attribute.

As the name implies, the stated preference survey uses interviewees' statements to find out which situation they would be more likely to accept when faced with different available options. Based on the results, investments can be better targeted and applied with more certainty. However, it is important to continue this research by using an experiment to check in practice if the attributes of security, accessibility, and availability have a certain relevance, according to the interviewees' declarations.

E-commerce is constantly growing, and by joining this mode, many companies search for the best way to satisfy consumers and ensure their loyalty. Therefore, finding ways to provide an efficient service that meets customers' needs and well-being is of the utmost importance.

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The contribution of this study to the theory lies in the fact that identifying and handling stated preferences is essential for the success of ventures and requires, in addition to accumulated knowledge, different attributes that involve consumers, the conditions of society, and selling agents, thus directing efforts and investments for improving the process.

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