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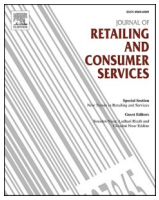

Exploring home delivery service attributes: Sustainability versus delivery expectations during the COVID-19 pandemic

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ABSTRACT

Many consumers expect e-commerce home delivery to be sustainable and fast. To better understand the dilemma behind these requirements, we analyzed e-commerce players' practices and assessed consumers' preferences for home delivery using a mixed-methods approach. We used exploratory structured interviews with logistics and e-commerce companies to reveal their home delivery options, and a discrete choice experiment (DCE) with 400 consumers to identify their home delivery preferences. Our study provides new insights into consumer expectations and preferences regarding home delivery solutions offered by e-commerce companies. Our findings provide empirical evidence of consumer expectations regarding individualization, innovation, and sustainable service alternatives for home delivery. Our results indicate that delivery speed is the most desired home delivery attribute, followed by delivery options, reusable packaging, and delivery by electric delivery vehicles.

1. Introduction

In January 2020, the COVID-19 pandemic was declared a public health emergency of international concern (PHEIC) by the World Health Organization (WHO); a status that ended in May 2023 (WHO, 2023). The COVID-19 pandemic changed business and daily life such that e-commerce's share of total global retail sales increased from about 7% in 2015 to about 14% in 2019, jumping through the COVID-19 pandemic to about 21% today (Statista, 2023). Consequently, the demand for last-mile logistics or home delivery services has also increased (Srinivas and Marathe, 2021; Pahwa and Jaller, 2023). The final leg of a business-to-consumer (B2C) package delivery service is known as last-mile logistics (Lim et al., 2018). In this regard, home deliveries include all supply chain-related distribution activities associated with shipments from distributor storage to private households (Boysen et al., 2021; Chopra, 2019). This process is considered the most expensive, least sustainable, and inefficient in a distribution network (Perboli et al., 2021). The COVID-19 pandemic temporarily made e-commerce the consumers' first choice to shop (Lv et al., 2020), increased customer demand and transportation volumes (Vakulenko et al., 2019), and highlighted last-mile-logistics or home delivery systems as an operational bottleneck (Srinivas and Marathe, 2021). Moreover, Grashuis et al. (2020) examined the dynamic relationship between the COVID-19 pandemic and grocery shopping behavior, revealing that the COVID-19 pandemic decreased the utility of in-store shopping and increased consumers' expectations for home-delivery services.

Regarding home delivery distribution networks, Chopra (2019) refers to the high shipping costs caused by single-customer shipments to individual locations. As a result, logistics and e-commerce companies are trying to consolidate shipments as much as possible, which Janjevic et al. (2019) say can result in significant cost savings. Retailers often charge their consumers delivery fees or impose minimum order sizes. Lim et al. (2018) pinpoint the complexity of configuring last-mile distribution networks as part of a more extensive omnichannel system, in which conventional distribution systems are expected to be inadequate.

Another negative impact of increased e-commerce and more home delivery volume relates to environmental problems, especially for urban logistics (Savelsbergh and Van Woensel, 2016; Bjerkan et al., 2020; Buldeo Rai and Dablanc, 2023), leading to increased traffic and emissions (Jaller et al., 2021). The emissions problem is primarily related to the use of diesel trucks to deliver products from warehouses to end customers (Pahwa and Jaller, 2022).

However, despite these problems, consumers use Internet shopping for convenience, including fast front-door deliveries, time-phased

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delivery dates, and convenient return options. Nevertheless, the share of environmentally conscious consumers is also increasing, and this group aims at both convenience and sustainability (Guo et al., 2019).

Thus, more e-commerce companies are facing an increasing consumer demand for sustainable solutions concerning products and the services offered (e.g., Kreye and van Donk, 2021). Logistics and retailing companies are aligning their service strategies and designing new services to satisfy consumers' increasing expectations (Tsai and Tiwasing, 2021).

The success of e-retailing is mainly influenced by multiple delivery options and the quality of the delivery services as perceived by online consumers (Joerss et al., 2016; Sorkun et al., 2020; Wang et al., 2022). This necessitates alternative home delivery solutions (Srinivas and Marathe, 2021). Hence, retailers offer delivery options comprising various alternatives of delivery attributes (Nguyen et al., 2019). Therefore, it would be necessary to present these options in a useable way, as the delivery system's efficiency also depends on the learnability of consumers when using the shopping site (see Kull et al., 2007; Pitchay et al., 2022; Jiao et al., 2023).

Existing studies reveal that speed, time slot, delivery date, and delivery fee are among the most significant decision-making criteria for consumers' preferences regarding home-delivery options (e.g., Garver et al., 2012; Nguyen et al., 2019). As a further factor, Kiba-Janiak et al. (2021) suggest satisfying consumer expectations regarding the environmental consequences of home deliveries. Considering home delivery services as demand-driven, the perceived quality of last-mile operations may positively influence consumer loyalty (see Wen et al., 2014; Jiang et al., 2020; Su et al., 2023; Chen et al., 2023).

Correspondingly, Buldeo Rai et al. (2019) found that the most important attribute was the delivery fee followed by return options. They also found that when delivery and returns were free, consumers were willing to collect their orders or wait longer for their parcels (Buldeo Rai et al., 2019). The increasing number of returns has a negative on the environment, so e-commerce companies are pursuing strategies to reduce environmental pollution, such as trying to convince consumers to use recyclable packaging boxes (Xu et al., 2020). However, the study by Eriksson and Machin (2020) shows that there is no consensus among consumers worldwide as to what constitutes sustainable packaging. Consequently, there is an issue of greenwashing that needs to be addressed. Another strategy to decrease environmental pollution is crowdsourced delivery or options, where citizens take over the delivery of goods along their way (Paloheimo et al., 2016; Buldeo Rai et al., 2018; Guo et al., 2019). The environmental impact depends on the offered services (Buldeo Rai et al., 2018; Pålsson et al., 2017).

In the past, service innovation has been driven by contextual shifts toward increased individualization, real-time solution development, and increased value in-use (Edvardsson et al., 2018). These developments can also be observed in the context of home delivery services, where Merkert et al. (2022) examined consumer preferences toward innovative last-mile parcel delivery. Thereby, Caspersen et al. (2022) that female consumers are willing to pay extra for environmentally friendly last-mile delivery. Additionally, consumers prefer more sustainable options when shown last-mile deliveries' environmental and social impacts (Ignat and Chankov, 2020). Another recent study by Luttermann et al. (2021) explored the online grocery consumer's preferences for last-mile delivery attributes, finding that the most preferred characteristics were the type of vehicle, packaging, and speed options. In addition to these, the demographic characteristics (e.g., gender) (Dias et al., 2021; Nogueira et al., 2021), importance of environmentally friendly delivery (Pinto et al., 2023), willingness to pay for environmentally friendly delivery (e.g., Engelhardt, 2023; Caspersen et al., 2022) and willingness to wait more for environmentally friendly delivery (e.g., Ignat and Chankov, 2020) influence consumer behavior in e-commerce.

Building on the above argumentation, we posit that existing studies on home deliveries tend to evaluate sustainability in a limited manner as sustainability concerns extended to additional variables (e.g., Kovács et al., 2020; Sarkis, 2020) for which empirical support is missing. This shortcoming refers mainly to the trade-off between the service that home delivery offers and the consequent environmental effects. There is scant literature on individualizing consumer preferences in home deliveries that combine logistics service with sustainability dimensions. To address these issues, we follow the call by Beckers et al. (2022), who call for more research to examine individual delivery preferences, and ask the following research question:

RQ: Based on existing sustainability practices, individualization, and innovation by e-commerce and logistics companies, which home delivery service attributes are mostly preferred/expected by the consumers?

Our study addresses consumers' expectations of sustainability, innovation, individualization, and delivery, and we used a mixed-method approach with a sequential initiation approach to answer our question. This research design allows the first stage of the investigation to act as a guide for the second stage, which seeks to explore specific aspects of the phenomenon further (Golicic and Davis, 2012). In the first phase, we conducted semi-structured interviews with logistics and e-commerce companies to explore the research field. In the second phase, based on these results, a discrete choice experiment (DCE) was conducted with 400 consumers to reveal their home delivery preferred attributes, including convenience and sustainability choices.

The contributions of our results are threefold. First, from a theoretical perspective, we revealed the logistics utility and preferred service output levels of home deliveries. Second, empirical evidence was found for consumer expectations regarding individualized, innovative, and sustainable service alternatives in home deliveries that combine service with sustainability dimensions in a customized way. We show that the most desired attribute is delivery speed (same-next day delivery), followed by delivery option (home), packaging (reusable), and delivery vehicle (electric). Consumer demographics and Likert-type items (statements) revealed interaction effects, showing a willingness to pay more for an environmentally friendly delivery was significant for the choice of delivery vehicles. Finally, our empirical findings reveal mismatches between corporate practices and consumer expectations regarding sustainability. Consumers want more information, individualization, and progress towards sustainability. However, the companies studied do not offer many alternatives for customizing home delivery.

The remainder of the paper is as follows. First, we present the results of a literature review and a theoretical background regarding logistics utility in home deliveries and conceptualize sustainable home deliveries from a consumer perspective. Next, we present our methodology, describing the rationale behind the mixed-methods research design and providing details regarding the context, data, and analysis technique. We then present the analysis and results of the research. Finally, we discuss the theoretical and practical implications of the research and highlight opportunities for further studies.

2. Literature review and theoretical background

2.1. Logistics utility and service output level and design of home delivery

Last-mile distribution is a crucial driver for profitability, directly affecting cost and customer experience. When designing a distribution network, companies aim to fit their distribution structure with customer requirements, as customers select the distribution channel that offers them the highest utility (see Chopra, 2019). Mankiw and Taylor (2020) conceptualize utility as an alternative way of describing and optimizing consumer preferences as utility measures: the satisfaction a consumer receives from a bundle of goods or services. Authors have long recognized the value of logistics, Heskett et al. (1964), for example, pinpointed the utility that logistics creates, as it guarantees the satisfaction of specific customer demands in terms of the delivery locations and times expected by the customer (see also Murphy and Wood, 2008).

Home deliveries can be considered a specific supply chain distribution network (e.g., Chopra, 2019) or a form of a marketing channel (see Palmatier et al., 2019) that offers a particular service output to consumers, which describes the product distribution methods. The service output dimensions include typical logistical parameters such as bulk-breaking, spatial convenience, waiting and delivery time, and customer service. From a marketing channel perspective, it would be necessary to identify the service output demanded by the various customer groups. Similarly, Chopra (2019) recommends an approach of strategic fit, where it is essential to know the required quantities of products that consumers buy immediately, their willingness to wait for the order, and the required increase in customer service level. Following the notions of Bookbinder and Lynch (1997), the various home delivery set-ups can be addressed as utility functions that model consumer preferences regarding specific home delivery attributes. With changing environmental-related preferences, it is necessary to expand utility functions to include sustainability attributes (Luttermann et al., 2021) and the choice of individualized home delivery options.

2.2. Individualization, innovation, and sustainability issues in home deliveries

The COVID-19 pandemic disrupted the retail sector and accelerated e-commerce (Guthrie et al., 2021; Bhatti et al., 2020). In this new market environment, customer experience has become a source of competitive advantage (Vakulenko et al., 2019), and home deliveries significantly affect logistics and e-commerce companies because they involve numerous touchpoints (Suguna et al., 2021). Many logistics and e-commerce companies are redesigning their service offerings to satisfy consumers' higher demands and expectations (Tsai and Tiwasing, 2021) and improving their existing delivery options (Holdorf and Haasis, 2014). However, these companies are still facing the challenges of an inefficient execution of home delivery operations (see Trott et al., 2021).

In addition, Ternès et al. (2015) show that consumers are increasingly aware of environmental issues, which fosters a desire to make environmentally sustainable purchases. This inclination particularly extends to products where consumers seek greater transparency throughout the value chain (e.g., Nitsche et al., 2016). Building on this shift in consumer behavior, Luttermann et al. (2021), Trapp et al. (2021), and Freitag and Kotzab (2020) have extended this paradigm to include changes in logistics practices. Recent consumer research in Germany shows that a significant majority of German consumers would be willing to forego buying fruits and vegetables in supermarkets if they were transported by air (Rühle, 2023). To fulfill customers' expectations for flexible, fast, and low-cost (or free) deliveries (Mangiaracina et al., 2019), logistics and e-commerce companies are adopting new services and solutions such as same-day delivery (Muñoz-Villamizar et al., 2021), instant deliveries within 2 h (Dablanc et al., 2017), flexible delivery time slots (Wang et al., 2019), live tracking systems (Tiwapat et al., 2018) and other solutions, such as reception boxes, parcel lockers, pick-up points, crowdsourcing logistics, drones, trunk delivery, dynamic pricing, underground delivery and robots (Chen et al., 2021; Mangiaracina et al., 2019).

Wang et al. (2022) conceptualize the recent developments in the field of home delivery from a consumer logistics perspective (see e.g., Teller et al. 2012), where home delivery is viewed as an operator-dominated logistics service in a post-shopping last-mile context. They discuss a range of unconventional delivery and collection methods, including parcel lockers, delivery boxes, pick-up/collection points, micro-depots, and crowdsourced deliveries.

The COVID-19 pandemic has caused a rise in e-commerce across the globe due to the emergence of new shopping and consumption habits (Villa and Monzón, 2021), leading to a tremendous increase in the number of last-mile deliveries and the associated environmental implications (e.g., CO_2 emission) (Awwad et al., 2018; Yang et al., 2023). In this regard, several possible solutions and practices can provide significant opportunities to decrease the negative environmental impacts of this type of service.

Adopting low-emission vehicles is one of the main tools envisaged to mitigate adverse impacts (Roumboutsos et al., 2014). Using electric vehicles for last-mile deliveries could be a viable alternative to vehicles with internal combustion engines (ICE) (Ehrler et al., 2021). In addition, a significant role in reducing the carbon footprint of package deliveries can be played by commercial electric vehicles (Goeke and Schneider, 2015), electric-cargo bikes for inner-city deliveries (Gruber et al., 2014), and autonomous delivery technologies (Figliozzi, 2020). Likewise, drones can reduce energy consumption and greenhouse gas emissions (Chiang et al., 2019; Lemardelé et al., 2021). Other alternatives to increase the sustainability of urban logistics are parcel lockers and crowdsourcing (Oliveira et al., 2017). Parcel lockers can effectively reduce the number of deliveries, including failed deliveries. They help reduce CO_2 emissions (Iwan et al., 2016) and offer flexibility in collection hours, security, and savings corresponding to regular home delivery (Deutsch and Golany, 2018). Recently, Meng et al. (2023) presented the positive effects of drone-assisted truck deliveries, which help to reduce carbon emissions.

Recently Beckers et al. (2022) developed a forecasting model that examines the impact of online shopping on urban transport (in terms of household freight trips) and predicts consumers' preferred delivery locations. These are home delivery, work delivery, pick-up at a pick-up point, pick-up at a locker, and pick-up at a store.

Another burden on sustainability is package waste, which is growing significantly with last-mile delivery practices (Wang and Hu, 2016). E-commerce requires more packaging than traditional store retail, and the amount and type of packaging contribute negatively to climate change (Pålsson et al., 2017). To avoid negative consumer experiences with product damage, companies tend to over-package products (Lu et al., 2020), increasing packaging waste (Chen et al., 2018). Thus, developing environmentally friendly, reusable, and recyclable packaging reduces waste (Cohen, 2001).

2.3. Conceptualizing individual convenient as well as sustainable home deliveries based on consumer preferences

Based on the previous argumentation, we developed a conceptual framework that includes home delivery service attributes that provide choices for convenient/individual and sustainable solutions. These attributes relate to service outputs in terms of spatial convenience, waiting and delivery time and customer service and include: a) delivery options (= location of the home delivery); b) delivery speed (= rate or velocity at which the home delivery occurs); c) delivery vehicle (= means of transportation for home delivery); d) delivery time (= when delivery occurs); and e) packaging (materials for and methods of packaging for the home delivery), each of which is discussed in detail below.

2.3.1. Delivery options

Diversified and flexible delivery locations offer consumers a more individualized last-mile delivery experience (Mangiaracina et al., 2019). In addition to the traditional home delivery option, a more comprehensive delivery place selection includes parcel lockers, reception boxes, click-and-collect, or delivery to the neighbor (Boysen et al., 2021). An unattended delivery service is a service that removes the order from the service stream after delivery and does not require the consumer to be present at the point of delivery and is considered home delivery without the need for customer confirmation (Olsson et al., 2023). At the same time, the unattended home delivery options improve first-time delivery efficiency, save delivery time and reduce GHG emissions (Tiwapat et al., 2018).

2.3.2. Delivery speed

During the COVID-19 pandemic, customers began to demand faster, even same-day deliveries (Suguna et al., 2021), and major companies

started to offer same-day and instant deliveries. In addition to average delivery durations such as 2–3 days, a more comprehensive range of options for shorter delivery windows gives consumers an individualized last-mile delivery experience. However, this resulted in more complexity in planning routes and vehicles (Witten and Schmidt, 2019).

2.3.3. Delivery vehicle

Growing parcel volumes for home delivery increases the number of delivery vans in the city centers, contributing to congestion, pollution, and health problems (Boysen et al., 2021). One way to decrease the environmental impacts of home deliveries is to use electric vehicles (Oliveira et al., 2017). Replacing petrol and diesel vehicles with electric cargo bikes for inner-city courier shipments (Gruber et al., 2014) or cyclist/pedestrian deliveries also significantly reduces congestion and emissions in urban areas (van Lopik et al., 2020). Similarly, innovative practices such as crowdsourcing and autonomous delivery robots (Mangiaracina et al., 2019; Simoni et al., 2020) can also significantly reduce CO_2 emissions. Although the traditional van with an internal combustion engine remains the most used vehicle type in home deliveries (Bretzke, 2020), the use of cargo bikes and/or electric vehicles is increasingly common, particularly in city areas (Rudolph et al., 2022; Llorca and Moeckel, 2021; Saenz et al., 2016). Jaller et al. (2021) identified the effects of alternative truck technologies on parcel distribution and showed how speed affects energy efficiency ratios. Electric vehicles at lower speeds show better results than diesel-powered vehicles. Nevertheless, home delivery transportation should deal with complex inner-city structures (Trott et al., 2021).

2.3.4. Delivery time

Especially for those in paid employment, it may be necessary that the delivery time does not coincide with working hours, so individualization can play an essential role in reducing failed first-time delivery rates and thus preventing carbon emissions from a second-time delivery (Nguyen et al., 2019). Very often, the time windows offered do not fit working schedules; consequently, later-hour deliveries might become more critical in the future (Grant et al., 2014).

2.3.5. Packaging

The ability to choose different packaging formats and different packaging materials, such as reusable or disposable packaging and other materials, is a customizable option and, thus a form of individualization of home deliveries as consumers are allowed to choose from a variety of packaging types. The use of single-use packaging, according to Dey et al. (2021) or Dybka-Stępień et al. (2021), has led to billions of tons of waste, which pollutes the environment. Furthermore, packaging material types have a significant environmental impact (Dengale, 2022). Hence, reusable packaging can decrease the adverse effects of single-use packages (Coelho et al., 2020), and providing a choice of packaging material can further reduce waste and energy consumption. Saraiva et al. (2016) identified that recyclable packaging has a much lower environmental impact than non-recyclable packaging.

2.3.6. Critical reflection

Allowing consumers to tailor a specific set of home delivery options from the above attributes based on their needs and wants (Goldsmith, 1999) results in personalized home delivery options, consequently offering companies differentiation opportunities in line with the growing popularity of individualized products and services (Xiang et al., 2022). According to Goldsmith (1999), customers' satisfaction increases with choice over how they receive a product.

Furthermore, the better the companies categorize and target customers with intrinsic needs – e.g., for sustainability– the greater the likelihood of customer loyalty (Gummerus et al., 2004). However, individualization strategies for last-mile delivery services are poorly developed (Luttermann et al., 2021). Individualization strategies combining convenience and sustainability will likely lead to more environmentally friendly delivery options, e.g., deliveries with an electric vehicle, reusable packaging, and parcel locker delivery. However, a mismatch between individualization and expectations will increase costs rather than benefits (Eversheim and Schuh, 2003). Therefore, it is essential to understand consumer needs and to provide individualized services accordingly.

3. Methodology

3.1. Context of the study

We performed our study in Türkiye, where e-commerce has shown an increasing trend in the last decade (Yılmaz and Bayram, 2020). Between 2016 and 2020, e-commerce spending in Türkiye tripled in inflation-adjusted terms (TUSIAD, 2022). In 2019, the volume of e-commerce in Türkiye increased by 39% compared to the previous year (ETBIS, 2019). The momentum continued with an increase of 66% in 2020 (ETBIS, 2020) and 69% in 2021 (ETBIS, 2021), compared to the previous year. In 2022, the Turkish e-commerce market continued its growth with a remarkable increase of 109%, compared to the previous year, reaching approximately USD 40 billion. E-commerce activities in Türkiye account for 16.5% of total retail trade (Bloomberg, 2023). Especially with the COVID-19 pandemic, e-commerce sales in Türkiye have increased significantly; in the first five weeks, e-commerce sales in Türkiye grew by an average of more than 170 percent compared to the same period of the previous year (Erdoğan, 2020). The e-commerce sector in Türkiye witnessed significant growth over the past few years. According to the latest available data from ETBIS (2021), in the first six months of 2021, more than 320,000 businesses offered e-commerce activities in Türkiye, and the ratio of e-commerce to general trade was approximately eighteen percent, and the e-commerce volume was TRY (Turkish Lira) 161 billion (approx. USD 10 billion), a more than 75 percent increase compared to the first half-year of 2020. Likewise, orders increased by nearly 95 percent in the first half-year of 2021, from approximately 850 million to more than 1.6 billion TRY (ETBIS, 2021). In addition, an analysis of e-commerce expenditure to GDP per capita ratio shows that, according to 2020 figures, Türkiye is above the average and ranks 23rd among 94 countries (TUSIAD, 2022).

3.2. Mixed-method approach

Our study followed a two-stage mixed-method approach: 1) semi-structured interviews to explore the practices and perspective of e-commerce and logistics companies in terms of home delivery services; and 2) a discrete-choice experiment to identify relevant attributes for service output levels in home deliveries. This approach is based on the initiation design strategy, in which results from the first stage (interviews) are used to report the practices in home deliveries for the second stage, a discrete choice experiment design (Golicic and Davis, 2012). According to the WHO, the COVID-19 pandemic began in March 2020 and ended in May 2023 (WHO, 2023). Data collection for both methods was conducted during the official COVID-19 pandemic period between January and June 2021.

3.2.1. Stage 1: Semi-structured interviews

To determine the relative attributes of our DCE, we conducted eight semi-structured interviews with experts from different e-commerce and logistics companies to explore the last-mile activities that their companies offered in Türkiye. We used three inclusion criteria to identify and select our experts related to their years of experience, management level, and degree of connection to the phenomenon under study (Weber, 2021). The companies used were selected based on their market share in the Turkish e-commerce and logistics industries. As an exploratory approach, we contacted the leading players (based on their reputation, brand awareness and available market share information) with an e-mail invitation to participate; out of 12 invitations, eight experts from

the contacted companies volunteered for the study. We conducted the interviews in the participants' native tongue, and the transcripts were translated into English and subjected to a back translation to ensure linguistic equivalence, quality, and trustworthiness (Behling and Law, 2000). Online interviews were held between January 2021 and April 2021, and the interview lengths ranged from 20 min to 128 min. Table 1 presents the demographic characteristics of the sample.

The interview questions refer to information on recent advances in home delivery practices and the literature review (see Appendix 1). The interview guide includes questions to uncover the companies' last-mile practices in terms of sustainability, customization, and innovation. There are also questions about the companies' plans and strategies that are not publicly available on their websites due to competitive dynamics. One researcher recorded and transcribed all interviews, while two researchers independently analyzed the transcribed interviews with MAXQDA 2020 software. The outcomes of this analysis served as input for the next stage of the research. The results of the interviews are presented in section 4.1.

3.2.2. Stage 2: Discrete choice experiment

We designed a discrete choice experiment (DCE) after the interview analysis. DCE is a quantitative technique to determine the participant's preferences between two or more scenarios (Law et al., 2021). When a predefined set of attributes is given, DCE elicits the essential attributes and specifies the most preferred levels for each (Kessels et al., 2015). In the experiment, participants were presented with a set of choices, and each choice set was asked (see Appendix 2 for an example of a particular choice set) to select a preferred option among alternatives (Kim and Park, 2017). The approach is based on traditional microeconomic consumer behavior, where consumers select a bundle of goods based on the perceived value of the bundle (Louviere et al., 2000). Consumers try to maximize utility based on their preferences or utility. In this paper, we focused on consumers' expectations of home delivery service attributes.

We opted for DCE because it allows an approximation of utilities for the various options. Based on this, it is possible to present an optimal combination - here, individualized and sustainable delivery. In addition, DCE is recommended for decisions that reflect real-world situations (e.g., Luttermann et al., 2021).

The main problem – i.e., the decision about delivery options - must be separated into attributes and levels. Following the notions of Kjaer (2005), we used the findings of our expert interviews and the results of our literature review to develop the attributes and levels. The number of attributes and levels must be practicable to prevent overwhelming respondents in their decision-making and causing cognitive difficulties. Thus, we formed the following five attributes: "delivery vehicle", "delivery speed", "delivery option", "delivery time" and "packaging". Each attribute has two to three levels (see Table 2).

Based on the levels and attributes, we developed our choice sets, which include a total of 162 (3x3x3x3x2) possible combinations. For the specific design of the sets, we used JMP software with a Bayesian D-optimal design developed by Sándor and Wedel (2001). Bayesian D-optimal design methodology integrates the available information about the parameters of the choice model into the choice design (Kessels et al., 2011a). The design assumes a pre-distribution of possible parameter values and is optimized over this distribution. In this way, it associates uncertainty about the proposed parameters with the problem formulation (Kessels et al., 2011b). The design requires prior knowledge about the attributes. The pre-test was conducted with seven academics and students to ensure the clarity, content, and understandability of the survey. To maximize the possible combinations of attribute levels, four different surveys were designed using JMP software. The demographic and Likert-type items (statements) were the same in each survey, but the choice sets differed; there were 40 choice sets (10 different choice sets per survey). Each survey had ten choice sets, for a total of 400 valid respondents (with 100 valid responses per survey). Table 3 displays the demographic characteristics of the discrete choice respondents.

The DCE survey consisted of three sections. The first section collected the respondents' demographic characteristics and online shopping experience. The second section included the DCE, where each respondent was presented with ten pairs of choice sets of two scenarios. The third section contained three 5-point Likert-type items (statements) (see Fig. 3) to identify the respondent's willingness to pay and wait more and the significance of environmentally friendly delivery was measured with one Likert-type item for each statement. The statements are presented in Fig. 3. The necessary information on the attributes, levels and other parts are explained with short notes on the survey.

The results of the Likert-type items (statements) showed that almost all consumers attached importance to sustainable last-mile delivery (86.8%), and more than half were willing to wait longer for more environmentally friendly delivery (63.5%). However, compared to the

Table 2
DCE attributes and levels.

Attributes	Level 1	Level 2	Level 3
Delivery Option	Home	Pick-up (Parcel-locker/Esnaf*mom and pop type of store in Türkiye)*	Unattended (delivery to the neighbor/security)
Delivery Speed	3+ days	2–3 days	Same-next day
Delivery Vehicle	Bike/ Pedestrian	Electric Vehicle	Standard (Diesel/ petrol fueled)
Delivery Time	Morning	Afternoon	Evening
Packaging	Disposable	Reusable	–

Table 1
Demographic characteristics of the interviewees.

Type of the Company	Product Category	Position in the Company	Gender	Years of Experience	Meeting Type	Date	Duration
Company 1/Logistics	NA	Operations Director	Male	24 Years	Online	26.02.21	128 min.
Company 2/E-Commerce (Pure E-retailer)	Food & Non-Food	Chief Operations Officer	Male	22 Years	Online	22.01.21	20 min.
Company 3/E-Commerce (Pure E-retailer)	Food & Non-Food	Business Development Specialist	Female	5 Years	Online	20.01.21	28 min.
Company 4/E-Commerce (Omnichannel)	Food & Non-Food	E-Commerce Operational Specialist	Male	4 Years	Online	10.04.21	38 min.
Company 5/Logistics	NA	Delivery Operations Planning Manager	Male	11 Years	Online	16.03.21	40 min.
Company 6/Logistics	NA	Operational Project Group Manager	Male	19 Years	Online	12.04.21	56 min.
Company 7/Logistics	NA	General Manager	Male	19 Years	Online	15.04.21	60 min.
Company 8/E-Commerce (Pure E-retailer)	Food & Non-Food	Logistics Manager	Male	16 Years	Online	10.03.21	36 min.

NA: Not applicable.

Table 3
Demographic characteristics of the survey sample.

Demographic category		# of Respondents	Component Ratio (%)	# of citizens (Türkiye) [b])	Component Ratio (%) Türkiye
Gender	Female	248	62	42,575,441.00	49.92
	Male	147	36.8	42,704,112.00	50.08
	Other/Diverse	5	1.3	0	0
	No Response	0	0	0	0
	Total	400	100	85,279,553.00	100
Age	20–30	279	69.8	12,298,697.00	14.42
	31–40	34	8.5	12,751,523.00	14.95
	41–50	50	12.5	13,187,877.00	15.46
	51–60	33	8.3	12,681,788.00	14.87
	61–70	4	1	12,369,563.00	14.50
	No Response	0	0	9,681,765.00	11.35
	Total	400	100	7,041,960.00	8.26
Marital Status	Single/Divorced	306	76.5	25,772,025.00	38.73
	Married	94	23.5	40,772,417.00	61.27
	No Response	0	0	0	0.00
	Total	400	100	66,544,442.00	100.00
Job Status	Student	178	44.5		
	Full-time employed	161	40.3		
	Retired	21	5.3		
	Unemployed	39	9.8		
	No Response	1	0.3		
	Total	400	100		
Income	<2500 TL[a]	10	2.5		
	2.500–5.000 TL	69	17.3		
	5.001–7.500 TL	35	8.8		
	7.501–10.000 TL	57	14.3		
	10.001–12.500 TL	5	1.3		
	12.501–15.000 TL	23	5.8		
	15.001 TL>	14	3.5		
	No Response	187	46.8		
	Total	400	100		

[a] 1 USD ~ 8.8 TL (Turkish Lira at the time the data was collected).
[b]) data from 2022.

willingness to wait, the willingness to pay for a more sustainable delivery was relatively low (38.8%).

For DCE analysis, we applied - based on the notions of McFadden (1973) - a multinominal logit choice model (MNL), which replicates the human decision-making process in a streamlined manner. The basis of the MNL model is Random Utility Theory (RUT), which has been developed to explain choice behavior. A choice situation with multiple alternatives adopts the principle that individuals prefer the alternatives providing the highest utility (Rose and Bliemer, 2013). In addition to analyzing the main effects with five attributes (to identify whether the individuals' characteristics influence the preferences for last-mile delivery attributes), two other aspects were entered into the model analysis through interactions with the main effects: the respondents' sustainability awareness (Likert-type items-statements) and gender variables.

We collected our data for the DCE between 1 June - 15 June 2021 and had to screen questions to participate in the survey: the age of the respondent (being older than 18 was required) and having previous online shopping experience. The survey was automatically terminated if a respondent did not meet one of the eligibility criteria. The respondents were reached through researchers' contacts and online platforms (e.g., LinkedIn accounts, social media pages, and department websites) by using a Google Forms link and a QR Code. The answered questionnaires were collected on a url link, and there were 487 responses. Our respondents came from 25 out of the total 81 provinces in Türkiye. In these 25 provinces, we had respondents from 19 metropolitan cities out of 30 metropolitan cities in Türkiye (Ministry of Interior Republic of Türkiye, 2022).

Of the 487 responses, there were 400 valid responses: 248 were female, 147 were male, and five did not specify gender. Most respondents were between 20 and 30 years old (69.8%). There were four categories of employment status: university students (44.5%), full-time workers (40.3%), retired (5.3%) and unemployed (9.8%). In addition, 81% of the respondents indicated that they had increased their online shopping frequency during the COVID-19 pandemic.

When analyzing the demographic characteristics of our sample in comparison to the broader Turkish population (TUIK, 2022a, 2022b, 2022c), there are differences in age, gender distribution, and marital status, as shown in Table 3. These differences are primarily due to our purposive sampling approach, which focused on a specific shopping behavior - the use of e-commerce. Consequently, the relevant population for our study consists of e-commerce users in Turkey. In line with this focus, data from the Statista Digital Market Insights survey (Statista, 2023) indicates that the predominant segment of e-commerce users in Turkey in 2021 will be in the 18–44 age group, accounting for 76% of the total. In contrast to this demographic distribution, our sample shows a slight overrepresentation in terms of age and a marginal deviation in the gender category. In addition, our sample differs from the composition of users of online marketplaces, with a notable overrepresentation of female participants (62% compared to 43% according to ETBIS, 2020). It is imperative to interpret these differences in light of our study's specific focus on e-commerce users while acknowledging that deviations in demographic characteristics are inherent to our targeted sampling strategy.

4. Data analysis and results

4.1. Semi-structured interviews

In analyzing the qualitative data after the transcription of the interviews, we obtained 54 codes and classified them into two main categories (Sustainability and Individualization & Innovation) and subcategories (for a detailed description of each sub-category, the main codes, coding rules, and anchor samples, see Table 4 and Table 5). Table 6 contains the coding statistics.

Our respondents indicated that their companies were taking many steps in customer individualization, particularly to increase the variety

Table 4
Anchor sample of sustainability category.

Category	Sub-category	Definition	Coding Rules	Anchor Sample
Sustainability	Electric Vehicle	Electronically operated vehicles. All types of electrically powered delivery vehicles, such as scooters, electric-cargo bikes, commercial electric vehicles, and autonomous delivery robots	Companies that make or are in the research phase to offer deliveries with pedestrian couriers	*"We focused on using electric vehicles. There are goals such as reducing fuel consumption and reducing the costs of fuel-consuming vehicles. However, we are faced with a handicap there, as some regions are topographically not suitable for using electric vehicles."*
Sustainability	Environment-friendly/Reusable packages	Packaging that can be reused several times or packaging with renewable/recycled materials	Companies that make or are in the research phase to offer environment-friendly/ Reusable packages	*"The issue of sustainability is on our agenda. We attach importance to the development of e-commerce in an environmentally friendly manner. In the fields of operation and delivery, we basically focus on two points, environmentally friendly packaging and electric vehicles. The packaging should be made from environmentally friendly materials and recycled materials as much as possible and that this packaging should not carry air and should be made in accordance with the product shape, and the material used should be reduced. "*

Table 5
Anchor sample of individualization & innovation category.

Category	Sub-category	Sub-Subcategory	Definition	Coding Rule	Anchor Sample
Individualization & Innovation	Delivery Place Selection	Parcel-lockers	Delivery is made to a self-service delivery locker	Companies that offer collection from the parcel locker option	*"We also added another mission to this closet. We decided that this locker should not be just a delivery locker, and added an earthquake preparedness kit. The cabinets we use generate electricity with the solar panel above them and provide 24/7 camera surveillance"*
		Collection from the store	Delivery is made to a store (click and collect)	Companies that offer click-and-collect service	*"We also offer a delivery location option, and customers can come and pick up the products they ordered from the stores, if they wish."*
		Esnaf	Delivery is made to nearby local businesses such as stationaries, hairdressers etc.	Companies that offer Esnaf modal	*"To be able to provide service from points close to the customer, where they can receive delivery, rather than delivery to the customer's home, which we describe as out-of-home deliveries. It's a project we are running with local businesses."*
Individualization & Innovation	Option to change the place of delivery		Ability to change the delivery location after the order is placed	Companies that offer an option to change the place of delivery	*"First, calling the customer by telephone, we ask "Are you at home?"* *then we ask, "who should we leave the package to if you are not at home?* *We can say that this service increases the first-time delivery rate"*
Individualization & Innovation	Time Slots	Ability to select delivery time out of a set of fixed time windows	Companies that offer delivery time slot option	*"There is a certain time slot, and the customer can order any product he can find in the market by choosing the desired delivery time according to the availability there. Delivery is made by commercial vehicles at the selected time"*	

of delivery speed options (see Fig. 1). The companies are aware of the need for individualization, but the stated practices are not enough to meet customer requirements.

Regarding delivery methods, all companies offer the same-next-day delivery option and contactless or no-ringing-the-bell options during the COVID-19 pandemic. Three companies provide instant delivery options and several delivery place options, such as parcel-locker, Esnaf* *(mom-and-pop type of store in Türkiye),* and collection from the store. The managers reported attaching particular importance to parcel lockers and aim to increase the number nationwide gradually. To achieve this goal, companies offer discounts that can be applied immediately to the total order amount (if the parcel locker is selected as the delivery location) to encourage the choice of parcel lockers. Five out of eight companies use electric vehicles for deliveries; one is in the research phase for cargo bike deliveries, and one is in the research phase for pedestrian courier deliveries. 4 out of 8 companies use environmentally friendly/reusable packaging. However, we observed that no company currently offered the delivery vehicle and packaging type selection, which could provide an opportunity to increase sustainability in last-mile delivery. In addition to these, the choice of the delivery time slot is only offered by four companies. The semi-structured interviews allowed us to identify the key attributes of home delivery: delivery options, delivery speed, delivery vehicle, delivery time and packaging.

4.2. Discrete choice experiment

We estimated the relative importance of our five attributes with likelihood ratio (LR test) and the interaction effects between the individual characteristics in the first model (MNL-2). The second model (MNL-2) examined the preferences for last-mile delivery attributes. We used a maximum likelihood approach to identify the most expected attribute, and attribute levels and multinomial logit modeling enabled the estimation of the marginal utility for each attribute level (Mo et al., 2019). Table 7 shows the results of this approach.

In the basic model (without interaction effects, MNL-1), delivery speed (87.324) was the most important attribute, followed by delivery option (78.158), packaging (40.091), and delivery vehicle (30.600). The only insignificant attribute was the delivery time slot (0.494). Regarding

Table 6
Coding statistics.

Category	Sub-Category	Sub-Subcategory	Coding Results	Coding Results %
Sustainability	Pedestrian Courier (Research Phase)		1	2
Sustainability	Electric Vehicle		1	2
Sustainability	Electric Vehicle (Research Phase)		5	9
Sustainability	Environmentally friendly/ Reusable Package		1	2
Individualization & Innovation	Real Time Tracking (Research Phase)		2	4
Individualization & Innovation	Real Time Tracking		3	6
Individualization & Innovation	Crowdsourcing		4	7
Individualization & Innovation	Option to Change Place of Delivery		3	6
Individualization & Innovation	Delivery Method Option		8	15
Individualization & Innovation	Preference/Selection of Delivery Time Slots		4	7
Individualization & Innovation	Delivery Vehicle Selection		0	0
Individualization & Innovation	Delivery Place Selection	Collection from Store	1	2
Individualization & Innovation		Esnaf	2	4
Individualization & Innovation		Parcel-Locker	5	9
Individualization & Innovation	Instant Delivery		2	4
Individualization & Innovation	Same-Next Day Delivery		8	15

delivery speed, same-next-day delivery was the most preferred option, followed by delivery in two to three days. However, this difference represents only a modest increase in value and still has positive marginal utility, while delivery in more than three days provides a clear negative benefit to consumers. Regarding delivery options, only home delivery is preferred, and a clear negative perception applies to other options, especially parcel-lockers, Esnaf* *(mom-and-pop type of store in Türkiye),* and unattended delivery place options. Reusable packaging offers a positive benefit, while disposable packaging provides a disadvantage. Also, consumers prefer only the electric vehicle option regarding delivery vehicle selection.

In the second model (with interaction effects, MNL-2), the interaction effect results show that the preference for the delivery vehicle is only influenced by the respondents' consumer characteristics. The interaction between the importance of environmentally friendly delivery (bike/pedestrian) is significant. Moreover, the interaction between sustainable delivery (bike/pedestrian) and willingness to pay (for sustainable delivery) is also substantial.

Moreover, gender does not influence delivery preferences, as there was no significant interaction effect between gender and attributes. Similarly, the willingness to wait for more sustainable delivery does not influence the preferences for last-mile delivery attributes.

5. Discussion and conclusion

5.1. Research implications

Interest in home deliveries has increased during the COVID-19 pandemic, but published research in the field is still limited, and therefore, this study contributes theoretically and practically to our understanding. As discussed in the theoretical background section, the service output dimensions include typical logistical attributes, such as bulk-breaking, spatial convenience, waiting and delivery time, and customer service, for which consumers always prefer the output dimensions giving the highest value. On the one hand, the study has revealed customers' expectations regarding the following key output attributes: spatial convenience (home delivery), waiting and delivery time (same/next day delivery), and customer service (delivery vehicle selection-electric vehicle and reusable packaging).

On the other hand, delivery time slots were not significant, unlike Nguyen et al. (2019), whose study showed the opposite. A possible reason is that during the COVID-19 pandemic, many were working from home, and it was likely that one household member would be available for the delivery slots.

Our findings confirm previous studies while highlighting the nuances in our research context. We reveal that over one-third of consumers are willing to pay for sustainable delivery vehicles, in line with Caspersen

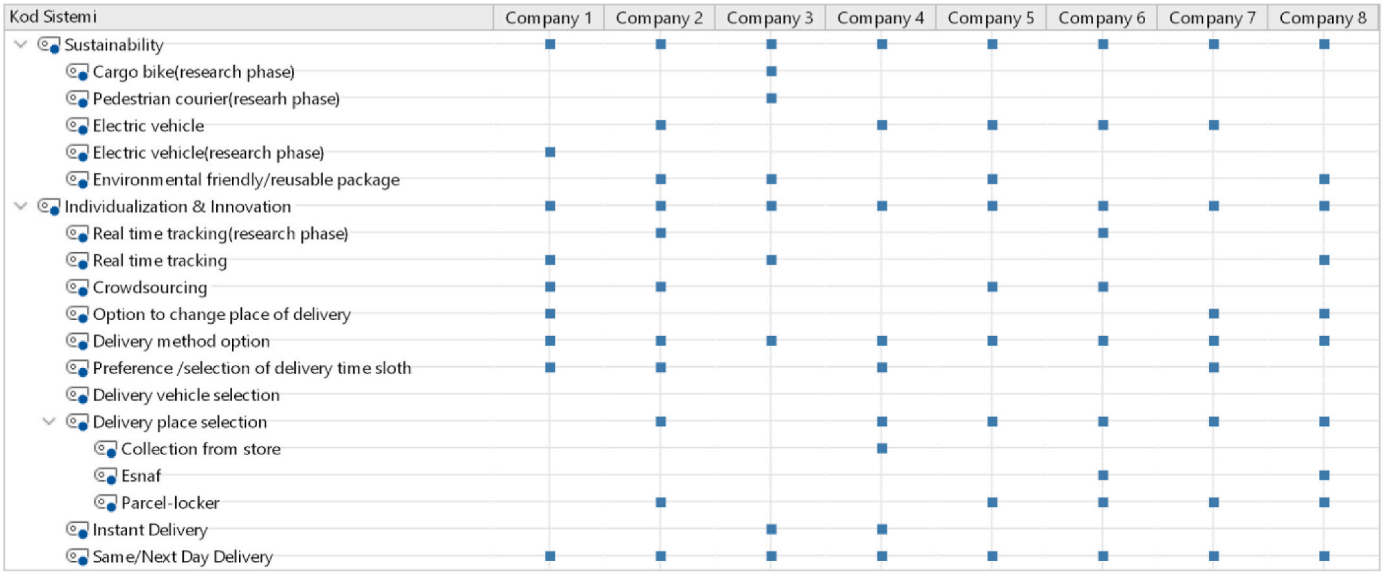

Fig. 1. Comparative analysis of the interviews.

Table 7
Effect summary.

	MNL1				MNL2			
	Parameter Estimate	L-R ChiSquare	DF	p-value	Parameter Estimate	L-R ChiSquare	DF	p-value
Delivery Speed		87.324	2	<.0001*		2.586	2	0.2744
Same-Next Day	0.418				0.446			
2–3 Days	0.033				0.023			
3+ Days	−0.451				−0.469			
Delivery Option		78.158	2	<.0001*		12.057	2	0.0024*
Home	0.288				0.302			
Pick-up	−0.252				−0.262			
Unattended	−0.036				−0.040			
Packaging		40.091	1	<.0001*		1.251	1	0.2634
Reusable	0.103				0.107			
Disposable	−0.103				−0.107			
Delivery Vehicle		30.600	2	<.0001*		10.019	2	0.0067*
Standard	−0.122				−0.131			
Bike/Pedestrian	−0.060				−0.052			
Electric Vehicle	0.182				0.183			
Delivery Time		0.494	2	0.7813		0.604	2	0.7394
Morning	−0.014				−0.005			
Evening	0.018				0.012			
Afternoon	−0.004				−0.008			
Interaction effects								
Willingness to pay*Delivery Speed						5.013	2	0.0816
Willingness to pay*Delivery Speed[Same-Next Day]					−0.105			
Willingness to pay*Delivery Speed[2–3 Days]					0.037			
Willingness to pay*Packaging						0.39	1	0.5322
Willingness to pay*Packaging[Reusable]					0.009			
Willingness to pay*Delivery Time						1.823	2	0.4019
Willingness to pay*Delivery Time[Morning]					−0.032			
Willingness to pay*Delivery Time[Evening]					0.026			
Willingness to pay*Delivery Vehicle						6.385	2	0.0411*
Willingness to pay*Delivery Vehicle[Standard]					−0.068			
Willingness to pay*Delivery Vehicle[Bike/Pedestrian]					0.043			
Willingness to pay*Delivery Option						1.074	2	0.5844
Willingness to pay*Delivery Option[Home]					−0.026			
Willingness to pay*Delivery Option[Pick-up]					0.029			
Willingness to wait*Delivery Speed						5.703	2	0.0578
Willingness to wait*Delivery Speed[Same-Next Day]					−0.130			
Willingness to wait*Delivery Speed[2–3 Days]					−0.002			
Willingness to wait*Packaging						0.089	1	0.7657
Willingness to wait*Packaging[Reusable]					−0.005			
Willingness to wait*Delivery Time						2.37	2	0.3058
Willingness to wait*Delivery Time[Morning]					−0.049			
Willingness to wait*Delivery Time[Evening]					0.013			
Willingness to wait*Delivery Vehicle						3.347	2	0.1875
Willingness to wait*Delivery Vehicle[Standard]					0.060			
Willingness to wait*Delivery Vehicle[Bike/Pedestrian]					−0.036			
Willingness to wait*Delivery Option						0.283	2	0.868
Willingness to wait*Delivery Option[Home]					−0.015			
Willingness to wait*Delivery Option[Pick-up]					−0.001			
Significance of environmentally friendly delivery*Delivery Speed						4.931	2	0.085
Significance of environmentally friendly delivery*Delivery Speed[Same-Next Day]					0.160			
Significance of environmentally friendly delivery*Delivery Speed[2–3 Days]					−0.002			
Significance of environmentally friendly delivery*Packaging						2.494	1	0.1143
Significance of environmentally friendly delivery*Packaging[Reusable]					0.036			
Significance of environmentally friendly delivery*Delivery Time						2.903	2	0.2342
Significance of environmentally friendly delivery*Delivery Time[Morning]					0.061			
Significance of environmentally friendly delivery*Delivery Time[Evening]					−0.052			
Significance of environmentally friendly delivery*Delivery Vehicle						7.258	2	0.0265*
Significance of environmentally friendly delivery*Delivery Vehicle[Standard]					−0.102			
Significance of environmentally friendly delivery*Delivery Vehicle[Bike/Pedestrian]					0.073			
Significance of environmentally friendly delivery*Delivery Option						4.851	2	0.0884
Significance of environmentally friendly delivery*Delivery Option[Home]					0.001			
Significance of environmentally friendly delivery*Delivery Option[Pick-up]					0.071			
Gender*Delivery Speed						1.217	2	0.5441
Gender*Delivery Speed[Same-Next Day]					0.066			
Gender*Delivery Speed[2–3 Days]					0.027			
Gender*Packaging						3.149	1	0.076
Gender*Packaging[Reusable]					0.061			
Gender*Delivery Time						1.327	2	0.515
Gender*Delivery Time[Morning]					0.032			
Gender*Delivery Time[Evening]					0.032			
Gender*Delivery Vehicle						1.062	2	0.5881
Gender*Delivery Vehicle[Standard]					−0.010			

(*continued on next page*)

Table 7 (*continued*)

	MNL1				MNL2			
	Parameter Estimate	L-R ChiSquare	DF	p-value	Parameter Estimate	L-R ChiSquare	DF	p-value
Gender*Delivery Vehicle[Bike/Pedestrian]					0.052			
Gender*Delivery Option						4.831	2	0.0893
Gender*Delivery Option[Home]					0.126			
Gender*Delivery Option[Pick-up]					−0.147			

et al.'s (2022) finding that consumers were willing to pay for 'climate-friendly' deliveries. Nearly 90% of our respondents rate environmentally friendly delivery as important, and more than 60% of them state that they are willing to wait for their delivery if environmental transport is used. Moreover, about 40% of the respondents indicate they are willing to pay more for delivery by environmental transport means. This significant proportion of consumers favoring sustainability options in the context of a developing economy is a novel research finding.

Our research also confirms delivery speed as an important consumer factor, which is consistent with Caspersen et al. (2022). We also found that home delivery is the most expected service level attribute, which aligns and provides different insights with Merkert et al. (2022), who compared innovative delivery services (e.g., drone delivery) with traditional postal delivery services and parcel lockers and found the latter is still the most preferred among e-commerce consumers if drones are not able to deliver faster and cheaper than postal services.

Our study shows that consumers tend to choose the more sustainable options when informed about the environmental impacts of last-mile deliveries, partially consistent with Ignat and Chankov's (2020) work. Additionally, our results indicate that home delivery is the most critical service output, which aligns with the findings of Grashuis et al. (2020) that the COVID-19 pandemic decreased the utility of physical stores as consumers switched preferences to home delivery. Moreover, our findings regarding the vital role of different service offerings and emphasizing the individualization of the services are consistent with those of Vakulenko et al. (2022).

Finally, our research revealed that consumers were unwilling to wait for sustainable delivery options (e.g., pick-up). This result is at odds with the extant literature; for instance, Buldeo Rai et al. (2019) asserted that the consumers were happy to wait to collect their deliveries in case a sustainable delivery option was provided; similarly, research in Germany by Luttermann et al. (2021) found that was the most important attribute was delivery vehicle selection, followed by packaging and delivery speed. Here we speculate that the impact of the COVID-19 pandemic has heightened consumer preferences for delivery speed concerning sustainable delivery options. This means that organizations need to be adaptable to contextual changes possibly affecting consumer preferences relating to e-commerce deliveries. Research on the post-COVID-19 is still limited. The current literature on this topic highlights the need to examine the lessons learned from the COVID-19 pandemic and its long-term implications as future research (e.g., Gupta et al., 2023).

5.2. Managerial implications

Our findings have important implications for e-commerce, logistics, and home delivery stakeholders. With respect to sustainability concerns, we examined two concepts that have not been previously studied in the context of e-commerce deliveries: packaging choices and delivery vehicles. Specifically, our study found that packaging is an important issue for home delivery options. This suggests that e-commerce firms should strive to offer different packaging alternatives (disposable versus reusable). Moreover, when analyzing the interaction effects, the attributes of delivery options and delivery vehicles become significant, indicating a more complex consumer decision process.

The research reveals that consumers appear to have dilemmas regarding packaging type, willingness to pay extra, willingness to wait, and the significance of environmentally friendly delivery. Respondents expressed interest in these issues, but their decision appears to be negatively affected when examining the interaction effects. The situation is similar for the interaction effects between willingness to wait and the significant home delivery attributes revealed (delivery speed, delivery option, packaging, delivery vehicle). Among the interactions, only the respondents who give importance (and are willing to pay) for environmentally friendly delivery prioritize the delivery vehicle used and seek sustainable delivery vehicles. This means that companies should be able to cater to these environmentally focused customers while also offering alternatives for customers who do not prioritize environmental impact. To do so, e-retailers should take advantage of the large datasets they have about consumers to investigate the complex factors and interactions that influence purchasing decisions.

The research also reveals that consumers' preferences appear to be inconsistent with their statements and the expected service outputs. When the attributes are individually assessed (MNL1-see Fig. 2), the findings differ, revealing the complex nature of consumer behavior. This implies that companies need to understand not only what customers say but also what they do. This opens opportunities for using analytic techniques to understand patterns of behavior to evaluate the types of delivery options that should be offered.

Additionally, there were no interaction effects with gender, possibly because the COVID-19 pandemic has produced a more uniform type of consumer with similar expectations. To summarize, e-commerce companies need to diversify logistics service outputs regarding individualization, sustainability, and innovation. Moreover, they should use analytical approaches to decide what to offer to different types of customers.

5.3. Limitations and further research

Practices in home delivery are rapidly transforming due to changing consumer behaviors. Consumers are less satisfied with the "one option" alternative and appreciate multiple choices and sustainable solutions. However, their market behavior has not yet been widely measured or tested. Therefore, qualitative studies with consumers can provide more comprehensive insights for further research. However, there is also a need for real-life observations with companies where online experiments can be conducted. Based on the findings of this study, a longitudinal approach would allow a comparison of differences in expected attributes from home delivery service outputs and shed light on the changing dynamics of consumer behavior during and after the COVID-19 pandemic.

As in all research, there are also limitations. Although the mixed-method approach provides insights for exploring and identifying the drivers, other research methods such as simulations, experiments, and focus groups could also contribute to extending the knowledge in the field. Another limitation is that the data was collected during the COVID-19 pandemic, which can impact the importance of expected attributes and levels (e.g., delivery speed-same day/next day delivery, delivery option-home delivery). Another study to compare the results after the pandemic would provide more insights. Logistics and e-commerce companies should offer more sustainable, individualized, and innovative solutions.

In addition, the characteristics of the sample pose limitations on the external validity of our findings, as the sample composition shows slight

Marginal Probability	Marginal Utility	Delivery Option
0.4335	0.28756	Home
0.2529	-0.25152	Pick-up
0.3137	-0.03604	Unattended

Marginal Probability	Marginal Utility	Delivery Vehicle
0.3111	-0.06034	Bike/Pedestrian
0.3964	0.18212	Electric Vehicle
0.2925	-0.12179	Standard

Marginal Probability	Marginal Utility	Delivery Speed
0.3242	0.03341	2-3 Days
0.1996	-0.45133	3+ Days
0.4762	0.41792	Same-Next Day

Marginal Probability	Marginal Utility	Packaging
0.4487	-0.10298	Disposable
0.5513	0.10298	Reusable

Marginal Probability	Marginal Utility	Delivery Time
0.3319	-0.00428	Afternoon
0.3393	0.01782	Evening
0.3288	-0.01354	Morning

Fig. 2. Marginal utilities MNL-1.

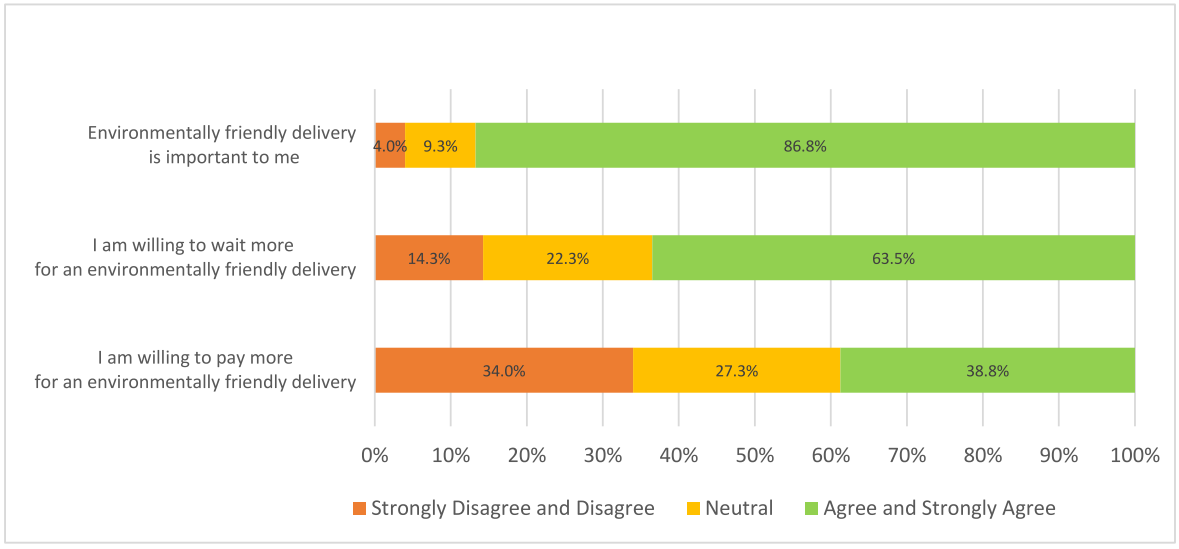

Fig. 3. Likert type items (statements).

deviations from the Turkish e-commerce user population. Future studies should consider these factors and seek to expand the generalizability of this research.

Lastly, the limitation of the context, in this case, a developing country, can be viewed as a further research opportunity for comparison with the dynamics in a developed country. Furthermore, we only examined the forward flow of home deliveries and therefore suggest integrating the possibilities for individualizing return flows of home deliveries, which, in some e-commerce segments, play a significant role (e.g., Frei et al., 2020).

CRediT authorship contribution statement

Herbert Kotzab: Conceptualization, Investigation, Methodology, Validation, Visualization, Writing – original draft, Writing – review & editing. **Işık Özge Yumurtacı Hüseyinoğlu:** Conceptualization, Data

curation, Formal analysis, Investigation, Methodology, Project administration, Software, Supervision, Validation, Writing – original draft, Writing – review & editing. **Irmak Şen:** Data curation, Formal analysis, Validation, Writing – original draft. **Carlos Mena:** Investigation, Methodology, Validation, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Acknowledgement

To the cherished memory of Mehmet Ali Uzuner, my grandfather who held a special place in my heart since I was a child passed away while this article was being revised, I, Dr. Işık Özge Yumurtacı Hüseyinoğlu, dedicate this article. May he rest in peace.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jretconser.2024.103769.

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