

Customer experience dimensions in last-mile delivery: an empirical study on unattended home delivery

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Abstract

Purpose – The success of last-mile delivery is dependent on consumer acceptance of such services, yet little is known about unattended delivery experience. This paper's purpose is to provide empirically based understanding of customer experience dimensions in unattended home delivery.

Design/methodology/approach – Using an engaged scholarship approach, this field study investigated nine households that actively used an unattended delivery service for a period of six to nine months. Empirical data were collected primarily from in-depth interviews.

Findings – The study demonstrates that unattended delivery experience is a multidimensional construct that comprises consumers' cognitive, emotional, behavioral, sensorial, physical and social responses to the service. The empirical evidence provides rich descriptions of each customer experience dimension, and the research offers a framework and propositions on unattended delivery experience.

Practical implications – The results guide and support managers in assessing and developing delivery services using a consumer-centric approach to enhance customer experience.

Originality/value – This research is one of the first to address unattended delivery experience by providing a comprehensive, empirically grounded framework. The results provide a foundation for future investigations of last-mile delivery experience dimensions.

Keywords Customer experience, Last-mile, Unattended delivery, Service, Retail, Grocery, Engaged scholarship

Paper type Research paper

1. Introduction

Creating a superior customer experience has become a holy grail for many businesses, particularly in the retail sector the landscape has been transforming at an unprecedented speed and scale, largely driven by omni-channel development, digitalization and retail innovation (Verhoef *et al.*, 2015). While consumers have a seamless experience with omni-channel retail due to channel integration, managing this experience becomes significantly more complex as firms extend beyond their primary supply chain role to interact directly with the consumer. In retailing, Grewal and Roggeveen (2020) highlight that the various actors in the upstream supply chain need to understand and focus on customer experience. Likewise,

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in light of social and technological changes, [Esper et al. \(2020\)](#) call on the marketing and logistics disciplines to reconnect with their common historic origins. They argue for adopting a consumer-centric approach to supply chain management that focuses on customer experience with last-mile delivery, supply chain visibility and consumer values.

Retail transformation has driven unparalleled growth in last-mile delivery. Lockdowns and social distancing measures during the COVID-19 pandemic have further accelerated this development. In 2020, the first year of the pandemic, e-retail sales in the USA grew 32% to a market volume of US\$792bn ([Statista, 2021b](#)), which drove the parcel market volume to grow 24% to a volume of more than 18 billion parcels ([Statista, 2021a](#)). This tremendous growth in last-mile delivery poses significant operational challenges that go beyond retailers and logistics service providers. To address these challenges, retailers have pushed for development of innovative delivery solutions. In particular, the emerging service of unattended home delivery offers the potential to enhance consumers' delivery experience, as they can receive deliveries even when they are not at home.

Unattended home delivery's distribution advantages, compared with those of attended home delivery, include longer time windows and fewer failed deliveries with sustained customer service. In unattended delivery, time windows can be considerably longer because consumers are not required to be at home to receive their orders ([Hübner et al., 2016](#)). Consequently, unattended delivery enables more efficient transport planning and routing of last-mile deliveries. Specifically, [Boyer et al. \(2009\)](#) found that the cost of offering one- to two-hour time windows was up to 150% higher than offering unattended delivery. Furthermore, failed deliveries due to the consumer not being at home are a major concern in last-mile delivery ([Deutsch and Golany, 2018](#)). Unattended delivery services can reduce failed delivery rates considerably because orders can be delivered regardless of whether the consumer is at home, which can decrease delivery costs drastically, both in urban and rural areas ([Seghezzi et al., 2022](#)).

In recognition of the growing importance of a consumer-centric approach to supply chain management, consumer research in last-mile delivery is increasing, albeit slowly, and it remains fragmented. Rather than investigating the broad construct of last-mile delivery experience, scholars have studied specific customer-centric constructs, including delivery services' impact on e-retail customers' overall satisfaction ([Jiang and Rosenbloom, 2005](#); [Liu et al., 2008](#)), factors that affect customer satisfaction with delivery services ([Mentzer et al., 2001](#); [Xing et al., 2010](#); [Murfield et al., 2017](#)) and how delivery services create customer loyalty ([Jain et al., 2021](#)). However, the literature lacks a holistic view of customer experience with last-mile delivery. In addition, consumer insights on unattended delivery services remain scarce. Previous research has examined security ([Mckinnon and Tallam, 2003](#)), cost ([Punakivi et al., 2001](#)) and intention to use and pay for the service ([Xu et al., 2008](#); [Goethals et al., 2012](#)). To address this gap, the following question guided this research: How do consumers experience unattended home delivery services?

We take on a service-dominant (S-D) logic view of last-mile delivery and adopt an engaged scholarship approach to examine the emerging service of unattended home delivery. The findings demonstrate that delivery experience is a multidimensional construct comprising consumers' cognitive, emotional, behavioral, sensorial, physical and social responses to the service. The results demonstrate how delivery services contribute to a more meaningful and satisfactory customer experience. Our study represents a previously unexplored service and adds to the growing importance of understanding the delivery experience theoretically and empirically.

This paper is organized as follows. First, background on customer and delivery experience is provided. The section also includes a consumer-centric typology of unattended and attended delivery services. The methodology applied in the engaged scholarship approach then is described. Next, the results are presented, including rich descriptions of the identified customer experience dimensions. Finally, implications for theory and practice, limitations and suggestions for future research are presented.

2. Theoretical background

While the influx of consumer research on last-mile delivery is increasing rapidly, customer experience with unattended delivery services remains relatively uncharted territory. Customer experience theory partly emerged from the S-D logic (Vargo and Lusch, 2004, 2008), which views customer experience as the result of interactions in a series of exchanges with multiple actors in the overlapping service ecosystems (Tax *et al.*, 2013). With the shift toward consumer-centric supply chain management (Esper *et al.*, 2020), a new theoretical perspective has been formed wherein delivery operations are reevaluated through the lens of customer experience. In this section, we examine unattended delivery service practices and their theoretical background.

2.1 Customer experience

Customer experience is a multidimensional construct rooted deeply in marketing. Lemon and Verhoef (2016, p. 71) define *customer experience* as a “customer’s cognitive, emotional, behavioral, sensorial, and social responses to a firm’s offerings during the customer’s entire purchase journey.” While the customer journey’s importance has been highlighted for decades, the intensifying changes in the retail landscape have generated increasing scholarly interest in the matter (Grewal and Roggeveen, 2020). The customer journey can be described as a series of touchpoints related to the delivery of a service from the consumer perspective (Zomerdijk and Voss, 2010). In the literature, the customer journey often is conceptualized in three overall stages: pre-purchase, purchase and post-purchase (Lemon and Verhoef, 2016; Shavitt and Barnes, 2020).

Historically, the academic literature has not considered customer experience as a distinct construct, and researchers instead have studied related, yet more focused, constructs. The development of service marketing elicited the concept of service quality (Parasuraman *et al.*, 1988), which sheds light on the context in which experiences arise and provides an initial attempt to map the customer journey (Lemon and Verhoef, 2016). Managing customer experience requires that firms measure customer reactions to their offerings. The standard practice in marketing has become measuring customer satisfaction, which is conceptualized primarily as the resulting disconfirmation from comparing delivered performance with customer expectations (Oliver, 1980). Thus, customer satisfaction can be viewed as a consequence of customer experience, providing an important building block to the overall understanding and measurement of the construct. When buying products, customers move from need recognition to purchasing and subsequently evaluating the purchased product (Howard and Sheth, 1969). Buying-process models provide a solid foundation for supporting the customer experience created throughout the customer journey (Puccinelli *et al.*, 2009). With e-commerce’s rapid rise, one critical touchpoint has been added to the customer journey: delivery service (Larke *et al.*, 2018).

The surge in e-commerce and the consequential rise in volume of delivered (and returned) parcels have made new service adoption a necessity for logistics service providers. With these novel service formats depending on the consumer to an increasing degree, it has become crucial to understand consumers’ needs, preferences and behavioral responses in the e-commerce logistics environment. The shift toward consumer-centric models indicates that scholars increasingly are recognizing consumers’ role, highlighting the importance of customer experience throughout the customer journey (Lemon and Verhoef, 2016; Grewal and Roggeveen, 2020).

2.2 Consumer delivery experience

While research has contributed substantially to understanding customer experience with retail, knowledge concerning last-mile delivery’s role in e-retail experience remains

fragmented and rather limited. Scholarly investigations have provided evidence that delivery affects overall customer satisfaction in e-retail (Jiang and Rosenbloom, 2005; Liu *et al.*, 2008). Available studies have identified factors such as timeliness, reliability, provision of delivery information and order tracking as antecedents of customer satisfaction and loyalty in e-retail (Mentzer *et al.*, 1989; Sharma *et al.*, 1995; Page-Thomas *et al.*, 2006; Rao *et al.*, 2011).

Given that customer experience is created along a series of touchpoints, last-mile delivery is particularly important to the overall retail experience. While last-mile delivery is rooted in the post-purchase stage, it also can affect the pre-purchase and purchase stages of future re-purchases due to the customer journey's iterative nature. Despite the myriad actors involved in creating the e-retail experience, consumers tend to evaluate the service delivery network holistically without distinguishing between individual actors and their value contributions (Tax *et al.*, 2013). Thus, the delivery experience can affect overall customer satisfaction and eventually loyalty. Vakulenko *et al.* (2019) provided evidence that last-mile delivery mediates the relationship between online experience and customer satisfaction. Jain *et al.* (2021) found that customer satisfaction mediates the relationship between electronic logistics service quality and re-purchase intention, while demonstrating that the shipment's condition is the most crucial determinant of customer satisfaction. Emerging evidence indicates a variety of aspects and facets of consumer last-mile delivery experience, demonstrating that multiple dimensions of the service encounter simultaneously and codependently contribute to the aggregate service experience.

While customer experience has not been approached traditionally from a holistic perspective, segmented elements have shed light on individual elements and specific relationships between them. One example is the relationship between delivery price, delivery length and customers' willingness to wait (Buldeo Rai *et al.*, 2019). An established approach to understanding customer experience adopts tangible service variables, such as delivery time frame, information availability, order condition (Xing *et al.*, 2010), return (return-process design, item replacement process, etc.), delivery price (Marino *et al.*, 2018), channel type (Murfield *et al.*, 2017) and service availability (Goebel *et al.*, 2012).

Early research has examined logistics performance measurement and customer success, emphasizing the B2B perspective, thereby building the evaluation of operations quality and consumer reach through operational measures such as asset management, cost, productivity, customer service levels and logistics quality (Fawcett and Cooper, 1998). The ongoing shift to the consumer-centric supply chain management (Esper *et al.*, 2020) and consumer-driven e-commerce delivery service models design (Lim *et al.*, 2018) has highlighted the gap in consumer knowledge, leading to investigations and evaluations of logistics and delivery services where they intersect with the marketing domain. A broad-context customer journey theory developed by Lemon and Verhoef (2016) has suggested perceiving customer experience through cognitive, emotional, behavioral, sensorial and social dimensions. Bustamante and Rubio (2017) measured physical retail experience through cognitive, affective, social and physical dimensions. Finally, Vakulenko *et al.* (2018) measured the delivery service experience through functional, emotional, social and financial dimensions.

2.3 Unattended delivery

Although under-investigated and heavily dependent on consumer cooperation, unattended home delivery is one of the most demonstrative examples of novel delivery services for addressing restricted delivery capacity. While not a new service delivery format, unattended home deliveries remain under-examined academically and carry numerous concerns and uncertainties, particularly from a consumer perspective. First, the unattended format elicits several potential issues regarding security (Mckinnon and Tallam, 2003). However, its continuous service improvement and convenience for the consumer make unattended home

delivery highly attractive to both consumers and logistics service providers. [Xu et al. \(2008\)](#) conducted a survey of 125 consumers and 15 e-retailers to examine the perception of unattended delivery services, finding that delivery options that retailers offered were not aligned with customer preferences. [Goethals et al. \(2012\)](#) surveyed 245 French consumers to investigate their views on unattended delivery services. While some consumer segments were interested in adopting such services, they were also reluctant to pay for them. Despite these contributions, customer experience remains largely unexamined as a distinct construct in unattended delivery.

Unattended home delivery appears in different formats and can utilize various service artifacts ([Figure 1](#)). Notably, from the consumer perspective, the service blueprint can differ from that of delivery providers. To establish a conceptual point of reference and distinguish unattended delivery services' features, we define such service as follows:

a delivery service that does not require customers' presence at the point of delivery and that dismisses the order from the service stream upon delivery.

For the delivery service provider, unattended delivery's pivotal feature is delivery capability independent of consumers' presence (e.g. home delivery with no consumer confirmation requirement). From the consumer perspective, while absence of the personal-presence requirement is integral, the service must be "completed" to eliminate the chances of the order re-entering the service stream if not collected (e.g. "unclaimed deliveries" sent to parcel lockers will be returned after two weeks of storage if not collected).

Previous research has shed light on consumer expectation formation toward unattended deliveries. Accordingly, experience determinants such as personal needs, technology literacy and situational factors have driven service expectations on unattended home deliveries ([Olsson et al., 2021](#)). One of the key limitations concerns delivery safety, which applies to both consumers who fear theft of deliveries left in open areas and service providers who cannot assess consumer-controlled zones easily without additional investments. The growing issue of package thieves known as "porch pirates," put unattended home delivery service in jeopardy already at the delivery service choice stage ([Stickle et al., 2020](#)). Ongoing investigations into viable unattended delivery business models have been eliciting opportunities ([Kamarainen and Punakivi, 2004](#)), but issues with stakeholders' economic ties, consumer trust and readiness and operational excellence remain.

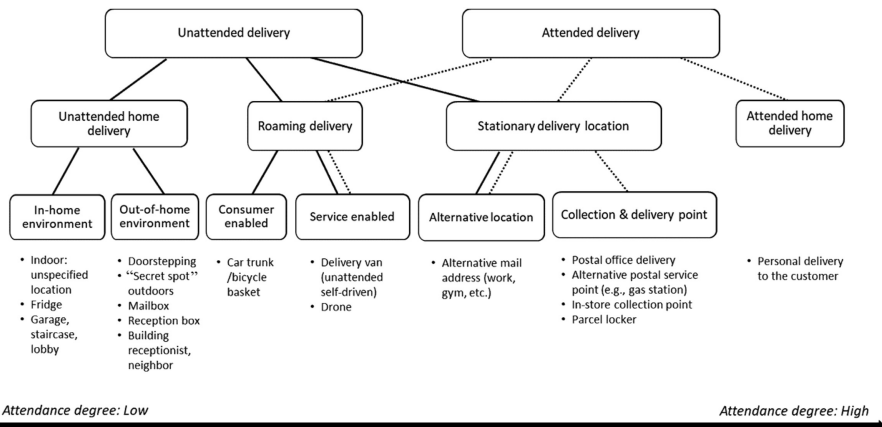


Figure 1.
A consumer-centric typology of unattended and attended delivery services

3. Methodology

Using an engaged scholarship approach, the researchers collaborated with industry partners to advance knowledge on unattended home delivery. *Engaged scholarship* is defined as a participative form of research used to study complex and multi-faceted problems, emerging practices and innovation processes (Van De Ven, 2007). The core of collaborative research, including engaged scholarship, is that researchers and practitioners work together to contribute jointly to knowledge about a problem of common interest (Van De Ven and Johnson, 2006). In logistics and supply chain management, Wong (2021) encouraged engaged scholarship to advance theory and practice, and van Hoek (2021) called for engaged scholarship to foster the managerial relevance of research. Contemporary challenges in logistics and supply chain management call for research to be a driver of innovation and change (Touboullic *et al.*, 2020). Additionally, this study draws on the lens of S-D logic in an effort to expand the frontiers of practice and research. Accordingly, this research approach offers an opportunity to develop an in-depth understanding of unattended home delivery that is equally relevant to both practitioners and researchers.

3.1 Research setup

In a collaborative setting with logistics service providers, retailers, users and sponsors, the researchers were engaged in the innovation process of developing, prototyping, testing and implementing an unattended home delivery solution. The delivery service was integrated seamlessly with temperature-controlled reception boxes installed outside of participating consumers' homes. Each reception box included a built-in refrigerator and freezer, Internet connection, a digital lock to ensure that only the intended recipient received each delivery and remote-control access through a mobile application. While the service is intended for e-grocery delivery, it features an open access system that is not locked into a specific retailer, logistics service provider or product type; thus, the consumer orders from a retailer of their choice and selects their reception box as the delivery location. The delivery courier uses the reception box barcode scanner to access the reception box and place the groceries or parcels inside the refrigerator or freezer. The recipient is notified of the delivery through the mobile application, which recipients use to unlock the reception box and collect their deliveries.

Field research was conducted to shed light on the actual customer experience when using the unattended delivery service in its natural environment. Nine carefully selected households actively used this service for a period of six to nine months. Considering the novelty of open access unattended grocery delivery services, early adopters comprise a highly relevant group to investigate. Therefore, the households were selected based on socioeconomic characteristics of early adopters: urban households with young children, relatively high incomes and previous online shopping experience are most likely to embrace e-grocery shopping (Hansen, 2005; Van Droogenbroeck and Van Hove, 2017). Detailed information of the respondents is presented in Appendix 1.

3.2 Data collection

Empirical data on customer experience were collected primarily through in-depth interviews, which are suitable for examining otherwise-inaccessible complex phenomena (Tracy, 2013). To capture broad and rich description of the unattended delivery experience, a comprehensive interview guide (see Appendix 2) was developed using an iterative process based on the literature regarding customer experience, value, and satisfaction, as well as two pilot interviews. Managers from logistics service providers and retailers critically reviewed the interview guide and provided valuable feedback. Two investigators collectively conducted nine semi-structured interviews in March 2020. The first interviews were conducted face-to-face, with the remaining interviews conducted via video conference due to social distancing measures. The interviews lasted around one hour each and were recorded

with interviewees' explicit permission. One investigator transcribed the interview recordings verbatim. Another investigator checked the transcripts against the recordings and corrected any discrepancies to increase construct validity. Gradually, interviews were added until new insights from additional interviews declined heavily (Bryman and Bell, 2015). Eventually, nine semi-structured interviews were determined to have sufficient grounding for testing the research propositions.

3.3 Analysis

The qualitative data were analyzed using *a priori* coding (Miles *et al.*, 2018) as well as open coding and axial coding (Corbin and Strauss, 2008). Concurrently with further data collection, the researchers familiarized themselves with the data by listening to interview recordings, reading through the interview transcripts and processing fieldwork notes. *A priori* coding was conducted based on previous customer experience literature. In this coding procedure, the data were coded simply in nodes based on experience. More importantly, the open coding allowed for the emergence of themes from the transcripts, which helped elicit rich descriptions and gain a detailed understanding of unattended delivery experience. The emerging themes were linked to the original text from the interview transcripts to ensure reliability. Continuing with axial coding, the investigators critically examined these themes and made comparisons along conceptual lines to organize, synthesize and categorize them into higher order concepts (Tracy, 2013). This synthesis required the researcher to describe the derived codes and demonstrate how they related to other codes (Corbin and Strauss, 2008). Finally, three investigators collectively compared and matched outcomes from the *a priori* coding with the open and axial coding to ensure trustworthiness. To establish a transparent chain of evidence, the coding results – including first order coding (themes), second order concepts (higher order concepts) and aggregated dimensions (customer experience dimensions) – are presented in Table 1. Further, the set of measures to ensure trustworthiness of the research are presented in Appendix 3.

4. Results

This study demonstrates that the total customer experience in unattended delivery is multidimensional and comprises customers' cognitive, emotional, behavioral, sensorial, physical and social responses to the service. The analysis of the empirical data provided rich insights into each customer experience dimension. The following sections lay out the research results by presenting detailed descriptions of the six customer experience dimensions in relation to unattended delivery (see Figure 2). The dimensions' roles in the total delivery experience vary in frequency, weight and whether they appear with a positive or negative magnitude. Moreover, the empirical analysis suggested interaction and potential correlations between the experience dimensions. The interconnectedness became apparent when some of the responses revealed the positive/negative experience effect translating from one experience dimension to another (e.g. negative physical experience could translate into negative emotional experience).

4.1 Cognitive experience

Cognitive experience represents the mental evaluation process of the service's functional aspects (Gentile *et al.*, 2007; Verhoef *et al.*, 2009). In previous research, consumers' cognitive responses to the delivery service and experience elements from other dimensions took the form of perceived service attractiveness (Goebel *et al.*, 2012), risks, effort, efficacy (Zhou *et al.*, 2020), convenience (Mckinnon and Tallam, 2003; Yeo *et al.*, 2017), reliability and usefulness (Wang *et al.*, 2018). This study's results found that cognitive experience in unattended

Example insights	First order coding	Second order concept	Aggregated dimension
<p>"It's quite simple to use [...] really it's just very simple. And it's really handy to just have the groceries in the box when you get home" (Respondent E)</p> <p>"It's easier to buy stuff to get it delivered." (Respondent H)</p> <p>"I don't have to make an effort, I can be at home, do the shopping at home and just open the door and the groceries are there" (Respondent B)</p> <p>"From the moment I press 'buy' the [unattended delivery service] takes over. I didn't have to do anything until I got home and that was really smooth" (Respondent C)</p> <p>"It has been smooth when you just have been working and your groceries have been delivered" (Respondent D)</p> <p>"I think it saves a lot of time so it's a time saver" (Respondent D)</p> <p>"[The service] integrated really nice, I did save some time" (Respondent C)</p> <p>"Today I think time is very valuable. We both work full time, and we have kids with activities and try to have our own activities and try [to] work out [...]. I think time is very valuable to us [...]. and I think we save a lot of time [using the service]" (Respondent E)</p> <p>"I know the delivery is safe because it's locked, no one can steal it or take it" (Respondent F)</p> <p>"Safety of goods that I already paid for, so I want to have it under surveillance that nothing happens to it" (Respondent I)</p> <p>"The most important factor is [...] that they deliver the food, and they can get into the box and close it again." (Respondent H)</p> <p>"The main advantage is you get it delivered home and kept in a safe condition" (Respondent A1)</p> <p>"The freezer is amazing. It keeps the temperature cold in the refrigerator as well so no complaints" (Respondent B)</p> <p>"I like the flexibility of doing what I want with my time if that's possible. If I have to be home, sure I'll be home, but if I don't have to then I don't want to be home" (Respondent C)</p> <p>"That you don't need to be at home to get the delivery that's a great thing. So that's the most valuable thing" (Respondent D)</p> <p>"Having the groceries outside the door when you came home was a really nice feeling where you didn't have to do much work to receive it; that's the luxury part" (Respondent C)</p> <p>"People just think that it seems to be a great product and that it's something that probably is the future for almost everybody" (Respondent H)</p> <p>"I think maybe that the [unattended delivery service] is a bit ahead of [its] time" (Respondent B)</p>	<p>Simplicity</p> <p>Effortless</p> <p>Saving time</p> <p>Value of time</p> <p>Theftproof</p> <p>Monitored</p> <p>Access control</p> <p>Safe condition</p> <p>Temperature-controlled</p> <p>Flexibility</p> <p>Location</p> <p>Luxury</p> <p>Prevalence</p> <p>Ahead of time</p>	<p>Ease of use</p> <p>Time</p> <p>Security</p> <p>Food safety</p> <p>Sense of freedom</p> <p>Contentment</p> <p>Futurism</p>	<p>Cognitive Experience</p> <p>Emotional Experience</p>

(continued)

Table 1. Customer experience findings with codes and illustrative quotes

Example insights	First order coding	Second order concept	Aggregated dimension
"I'd definitely pay something to have [unattended delivery]" (Respondent E)	Pay for service	Willingness to pay	Behavioral Experience
"If it's a small fee then it would be easy to just rent [the reception box]" (Respondent H)	Subscription service		
"It is clear that we would not like to own a [reception box]. It would be some kind of rental fee. We have no interest in owning it" (Respondent A)	Invest		
"I would have to sit down with my wife, and have a discussion [about] how much are we going to use [the service] and how much time are we going to save? Do we really want this? Do we really save money buying online? With [a certain] range, I would just go "yes do it!" If we go over that, it would be a discussion before investing" (Respondent C)	Share experience	Word of mouth	
"I talk about [it] at work, and people just think that it seems to be a great product" (Respondent H)	Exaltation		
"I think I've mainly shared the positive part of the experience [...] my overall experience is really good because I like the idea and I like the service" (Respondent E)	Modern	Design of the reception box	Sensorial Experience
"I share my experience that we [had] some problems, but I think this is a very good idea, and I think the people I talk to also agree with me" (Respondent G)	Good look		
"I share the dream where everything is perfect and I actually use it a lot, which is a so-so reality" (Respondent C)	Good size	Size of the reception box	
"I like [the reception box]. I think [...] it has a modern design. And it doesn't look ugly to have it in the front of our house" (Respondent B)	Take up space		
"it's a nice product, [...] it looks good and it's not disturbing the areas around the house. I have nothing to complain about" (Respondent F)	Conceal		
"Maybe it could be a little bit bigger but if it were bigger, we wouldn't fit it where we have it now. I think it's a good size" (Respondent I)			
"The only negative thing is [that] it's a big black box that is taking space outside your house. [...] But I mean it has to be big because otherwise, you can't fit stuff in it" (Respondent H)			
"The design is no problem. [...] Sometimes you want to have it smaller because you want to hide the whole [reception box] because you don't want to see it. But then I think the size is a normal size to fit grocery bags and things like that" (Respondent G)			

(continued)

Example insights	First order coding	Second order concept	Aggregated dimension
<p>"I get [my order] delivered home most of [the] time before I get home from work, so it's in the [reception box] when I get home. And then, when I get home, I pick it up and put it in the refrigerator and freezer inside" (Respondent B)</p> <p>"It was terrific, just open the door and just pick up the groceries and when I came home from work at 5 o'clock there were these groceries in the [reception box]" (Respondent F)</p> <p>"You can do a lot with the app to make it a bit more exciting to use but it's got everything that you need. Fridge on and off. Open and close" (Respondent E)</p> <p>"I wouldn't say that the user interface is the best, I think it's quite pale. I mean there is functionality of course, but the user interface is not really the best. It doesn't appeal to me I would say" (Respondent H)</p> <p>"I don't have to interact with the driver, I can go and get the groceries when I want to, not when there is a knock on the door" (Respondent B)</p> <p>"You don't get the social contact. And we're quite social people" (Respondent I)</p> <p>"Especially now in these times with corona some [people] told me 'yeah now it would be great to have the [reception] box to get everything delivered, you don't even have to talk to people'" (Respondent H)</p> <p>"It was a conversation area which actually is quite nice to talk about" (Respondent C)</p>	<p>Grocery pickup</p> <p>Functionality</p> <p>User interface</p> <p>Self-determined choice</p> <p>Lack of social contact</p> <p>Social distancing</p> <p>Conversation piece</p>	<p>Order collection</p> <p>Mobile application</p> <p>Human interaction</p>	<p>Physical Experience</p> <p>Social Experience</p>

Table 1.

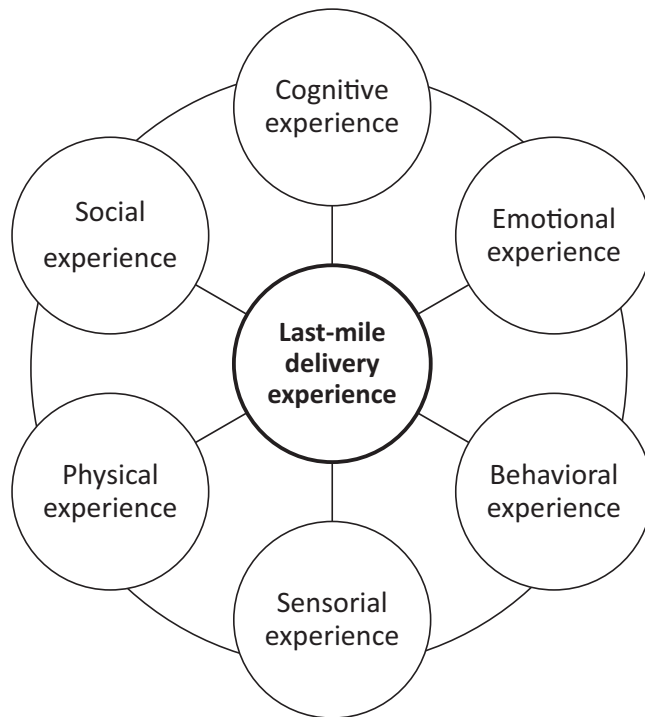


Figure 2.
Last-mile delivery
experience framework:
consumer experience
dimensions

delivery centers on ease of use, effort, time, security and food safety (see [Table 1](#)). *Ease of use* refers to how easy it was to use unattended delivery and operate the associated hardware and software. Respondents repeatedly described the simplicity of using the service, the convenience of online grocery shopping and the ease of collecting deliveries from the reception box. Furthermore, unattended delivery was evaluated strongly in relation to time, i.e. respondents found that they saved time from not traveling to a pickup point or local grocery store.

Respondents highlighted the security aspect of unattended delivery services. [Mckinnon and Tallam \(2003\)](#) found that consumers were wary of such services' security, but our study found that respondents trusted the security that the service offered, perceiving it as theftproof, monitored and access controlled. For example, the digital locking system and access control integrated into the reception box impacted perceived security, corresponding with recent studies that found adding a safe place (e.g. a reception box), particularly for higher-value items, can address consumers' security concerns ([Merkert et al., 2022](#)). Furthermore, respondents perceived that unattended delivery contributed to food safety as the temperature-controlled reception box maintained the cold chain. Grounded in previous research and empirical findings provided in this study, the following research proposition was formulated:

RPI. Last-mile delivery service creates cognitive customer experience.

4.2 Emotional experience

Emotional experience is built on the generation of moods, feelings and emotions ([Gentile et al., 2007](#)). Consumers' emotional responses to delivery service in previous research have been

expressed through degrees of enjoyability, happiness, delight (Wang *et al.*, 2018), fun and entertainment (Kasper and Abdelrahman, 2020). This research reveals that emotional experience with unattended delivery revolves around a sense of freedom, contentment and futurism (see Table 1). Respondents provided rich descriptions of the sense of freedom that unattended delivery offered them in terms of flexibility and location. *Flexibility* refers to the capability of changing, i.e. customers' ability to change plans spontaneously without compromising service. Likewise, respondents highlighted the freedom of not needing to be in or go to a specific location to receive deliveries. Using the non-essential service of unattended delivery, respondents experienced a feeling of luxury expressed as great comfort that made their lives more pleasant. Furthermore, the respondents viewed unattended delivery services as futuristic. The notion of using a service that is very modern and unusual was compared with a vision of the future. Respondents argued that unattended delivery will prevail and evolve into a well-established service.

Respondents experienced a mix of emotions while getting accustomed to the service and working out technical issues. These emotions varied among the respondents and were sometimes contradictory. For example, some respondents felt strong frustration over operational problems, and thus, one respondent stopped using the service altogether. However, other respondents accepted the operational problems due to their overall positive experience with the service. Grounded in previous research and empirical findings provided in this study, the following research proposition was formulated:

RP2. Last-mile delivery service creates emotional customer experience.

4.3 Behavioral experience

The behavioral dimension refers to customers' behavioral responses to a firm's service offerings. Behavioral experience traditionally has been associated with loyalty and switching to another offering (Zeithaml *et al.*, 1996; Boyer and Hult, 2006). This dimension comprises consumer-initiated action triggered by needs, service or environment. In retail, a depiction of behavioral response can take the form of different behavioral patterns (Hjort *et al.*, 2013), such as level of spending and shopping frequency (Xiao *et al.*, 2018) or return behavior (Pei *et al.*, 2014; Ahsan and Rahman, 2016). Consumer-initiated actions triggered by the unattended delivery service relate to word of mouth and willingness to pay (see Table 1). First, respondents shared their delivery experiences via word of mouth. Despite the operational difficulties that some respondents experienced, they generally shared an overall positive view of their experience. The reaction from the social environment indicates that the respondents' experience sparked curiosity and created a positive attitude toward these services among their social networks. Likewise, respondents also shared their exaltation over the unattended delivery service. The data show that respondents sometimes praised the service beyond their experience, such as describing a flawless experience or their high frequency of use.

While the empirical evidence suggests that respondents are willing to pay for unattended delivery service, it also revealed a lack of consensus concerning the amount they would be willing to pay. The findings show that the service cost was a major concern for respondents. As might be expected, respondents stressed that the cost of unattended delivery needs to be aligned with the value it adds for their households. Some respondents argued that the unattended delivery service requires them to invest in delivery facilities, while others said they would be willing to subscribe to the unattended delivery service, rather than purchase the reception box. Grounded in previous research and empirical findings provided in this study, the following research proposition was formulated:

RP3. Last-mile delivery service creates behavioral customer experience.

4.4 Sensorial experience

The sensorial dimension comprises the elements of the customer experience that correspond with customers' senses (Gentile *et al.*, 2007). Tactile, thermic, visual and other sense-defining experiences are common focal points for customer experience management in the retail environment. Previously investigated sensorial experience elements have concerned specific tools and technologies utilized in the last-mile delivery context, such as aesthetics (Wang *et al.*, 2018) and technology interaction (Kapsler and Abdelrahman, 2020). This study's results revealed that sensorial experience with unattended delivery centers on the reception box's visual design and size (see Table 1). The findings show that respondents evaluated the reception box's design as modern and good looking, suggesting that the reception box could be placed in front of a house without being visually unappealing. Thus, the visual shape, color and form facilitated finding a suitable location for the reception box on the respondent's property near their house.

Moreover, respondents found that the reception box had a reasonably good size. While some respondents argued that the box could have been bigger, they also acknowledged that it would be more difficult to find a suitable location for a bigger one. Furthermore, the respondents noted that the box took up property space in front of their homes. While some respondents acknowledged that they wanted to conceal the box due to its size, they also admitted that the box's size was suitable for grocery deliveries. Grounded in previous research and empirical findings provided in this study, the following research proposition was formulated:

RP4. Last-mile delivery service creates sensorial customer experience.

4.5 Physical experience

Physical experience represents customer response to the service configuration and input. Practically, it is expressed through consumer adaptation to the service-facilitating conditions and consequential use behavior (Zhou *et al.*, 2020). In the traditional delivery service environment, a customer's physical response to the service is expressed through decisions and actions taken during the order-pickup process upon delivery (e.g. travel mode, pickup speed and travel route). In contrast to collection and delivery points, in this study, physical experience with unattended delivery during the order-pickup process was limited and concerned order collection and the mobile application (see Table 1). Respondents described this physical experience as opening the reception box to pick up groceries, then putting them into the refrigerator and freezer inside their homes. To open and close the reception box, respondents needed to use the integrated mobile application. Even though the mobile application's functionality and user interface were perceived as basic, the app was central to creating a meaningful physical experience. It also facilitated other experience dimensions, such as cognitive and emotional experiences. Grounded in previous research and empirical findings provided in this study, the following research proposition was formulated:

RP5. Last-mile delivery service creates physical customer experience.

4.6 Social experience

The social dimension represents responses to human interactions that take place during the experience. Social experience is represented by responses to social influence from the customer's network (Zhou *et al.*, 2020), as well as the service provider's representatives. In line with previous research, this study found that social experience with unattended delivery revolves around human interaction (see Table 1). Overall, the empirical evidence suggests that unattended delivery has reduced human interactions. On one hand, respondents

assessed that these reduced human interactions facilitate self-determined choice. For example, respondents could collect their deliveries at a time of their choice rather than opening the door when the courier arrives at their home. On the other hand, respondents experienced that unattended delivery led to a lack of social interaction compared to traditional grocery shopping. Some respondents acknowledged that they missed this social contact in the grocery store. Furthermore, unattended delivery services enabled social distancing during the coronavirus pandemic as respondents could have their groceries delivered unattended. Finally, respondents also emphasized that the unattended delivery service itself became a conversation piece, i.e. they reported that the service became something that they talked about. Grounded in previous research and empirical findings provided in this study, the following research proposition was formulated:

RP6. Last-mile delivery service creates social customer experience.

5. Discussion

In the following sections, the main findings from this research are discussed in the light of two distinct areas. First, the dynamic and holistic nature of the delivery experience is highlighted. Second, the unattended delivery experience is discussed in relation to delivery lead times.

5.1 *Dynamic and holistic experience*

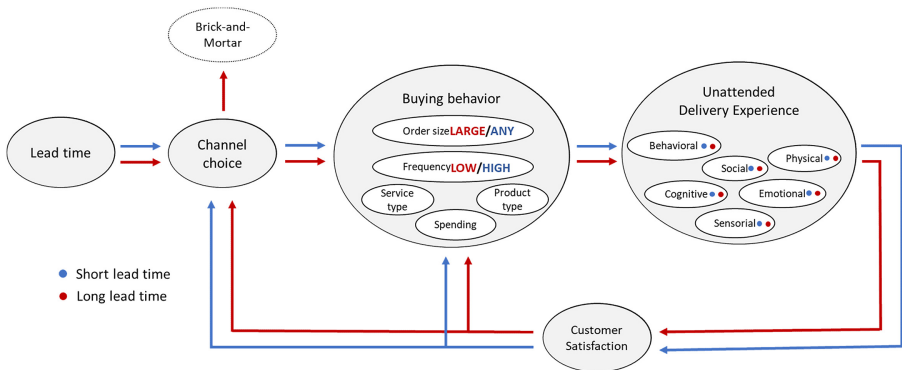
This study emphasizes the dynamic nature of unattended delivery experience. [Verhoef et al. \(2009\)](#) recognized the importance of customer experience dynamics and acknowledged that little is known about these dynamics. Taking a holistic approach to unattended delivery experience, it is important to recognize that customer experience is not static, but evolves and is impacted by situational factors and experience with other retail channels. Situational factors can influence consumers' last-mile delivery choices. For example, Respondent G illustrated the dynamics of unattended delivery experience as follows: "Sometimes you want to have something delivered, and sometimes you want to pick it up." Moreover, the comparison between alternative retail channels influences the unattended delivery experience. As Respondent B explained, "Sometimes I want the delivery on Friday, and there is no time to deliver it on that day. Then, I will go to the store instead." It is important to consider these dynamics to understand unattended delivery experience's aspects and facets.

5.2 *Delivery experience and lead time*

The e-grocery segment's development and continuous growth put mounting pressure on retailers to reduce delivery lead times. In other more mature e-retail segments, it has been observed that lead times have been turned into a source of market differentiation. [Gawor and Hoberg \(2019\)](#) found that lead time is a critical factor for consumers in choosing omni-channel retailers. Likewise, [Marino et al. \(2018\)](#) found that delivery lead time is of high importance for consumers' purchasing decisions, even in the furniture industry, which typically involves longer lead times. [Hübner et al. \(2016\)](#) pointed out that delivery lead time is critical to customer satisfaction in e-grocery retail.

This research indicates that delivery lead time has an impact on consumers' retail channel choices and buying behavior, impacting the unattended delivery experience (see [Figure 3](#)). Our study was conducted in Sweden, where delivery times for groceries range between two to four days. Swedish consumers also can choose delivery dates several weeks beyond the delivery lead time. Fast grocery delivery, such as same-day delivery, remains largely unavailable; thus, respondents usually could not choose this option. Respondents elaborated on numerous situations when they chose to buy groceries in the brick-and-mortar channel

Figure 3.
Last-mile delivery
experience
feedback loop



because of established lead times in e-grocery retail. For example, Respondent E pointed out that online grocery shopping was not suitable for spontaneous purchases because of the lack of fast delivery options, which spurred them to shop in their local grocery store:

On a Friday, we usually plan quite late what to eat that evening and then it's too late to use the [unattended delivery service], and we just pick up something on the way home, maybe fresh fish or something like that. Then you don't actually use [unattended delivery] for that.

The lack of fast delivery options introduces the risk of channel switching and consumer migration and impacts consumers' buying behavior. The respondents described how they placed relatively large e-grocery orders infrequently (e.g. weekly or biweekly). Simultaneously, they argued for the need for smaller and more frequent e-grocery deliveries. Despite buying groceries online using unattended delivery, respondents elaborated on numerous occasions involving complementary purchases in their local grocery stores. Thus, our study indicates that respondents could not take full advantage of the unattended delivery service, leading us to conclude that delivery lead time and consumer buying behavior ultimately affect customer experience, including cognitive (time), emotional (freedom) and behavioral (willingness to pay) experience. This corresponds with previous research that also suggests a correlation between lead time, buying behavior and customer experience with consumer satisfaction (Xing *et al.*, 2010; Cui *et al.*, 2020).

As our results demonstrate, respondents experienced flexibility when using the unattended delivery service, suggesting that respondents could benefit from placing smaller and more frequent orders to elevate this experience further. Simultaneously, smaller and more frequent e-grocery orders could put further pressure on e-grocery fulfillment and delivery. Dedicated online fulfillment centers could enable retailers to become more agile and responsive to changing order profiles. Unattended delivery services could be introduced as subscription models to build sustainable operations and financially viable business practices. With growing online order volumes, grocery retailers tend to reconfigure their logistics networks. While brick-and-mortar structures initially are used for fulfillment of all channels, retailers typically separate online and offline channels by establishing online fulfillment centers. Wollenburg *et al.* (2018) highlight that online volumes largely depend on how satisfied consumers are with the availability of different delivery services and fast delivery speed.

6. Conclusions

Despite growing scholarly attention, research focusing on customer experience with delivery services is scarce. This study demonstrates that the total unattended delivery experience is

multidimensional comprising consumers' cognitive, emotional, behavioral, sensorial, physical and social responses to the service. Based on these findings, we discussed the dynamic and holistic nature of delivery experience, as well as delivery lead time's impact on experience. The following sections outline the study's theoretical and managerial implications, as well as its limitations, while also offering directions for future research.

6.1 Theoretical implications

This study, focusing on consumers' last-mile delivery experience, contributes to theory by adopting S-D logic in the context of last-mile delivery and by providing a rich understanding of consumers' delivery experience. This study demonstrates that last-mile delivery should not be understood as being merely about parcels that need to be handled and transported but rather about the service the system provides for the consumer. S-D logic offers a theoretical platform for innovative thinking about the challenges and opportunities in last-mile delivery (Wang *et al.*, 2021). We contend that adopting this perspective broadens the domain and intellectual contributions of scholars in this area.

In recent years, siren calls have echoed an emerging focus on consumer centricism in physical distribution and logistics management (Esper *et al.*, 2020). This research builds on the notion that consumer experience is directly impacted by logistics and supply chain performance. Drawing on S-D logic, our research adds how last-mile delivery services create consumer experience and how value is co-created in the service ecosystem. The research complements prior studies of delivery experience that have mainly focused on the impact of delivery services on customer satisfaction (Jiang and Rosenbloom, 2005; Liu *et al.*, 2008). The broad perspective of this study reveals six dimensions of total last-mile delivery experience and this knowledge, in turn, can help scholars to understand how value is co-created based on the customer experience of a firm's service offering.

This study extends previous research by suggesting that last-mile delivery lead time impacts consumers' channel choices, buying behavior and customer experience. Previous studies indicate that delivery lead time affects logistics service quality and consumer satisfaction (Xing *et al.*, 2010; Cui *et al.*, 2020; Jain *et al.*, 2021). Building on this previous research, our study indicates that delivery lead time impacts consumers' retail channel choice and buying behavior (e.g. order frequency and size). This, in turn, affects last-mile delivery experience and consumer satisfaction, implying that delivery lead time is a critical factor for consumer adaptation of emerging last-mile delivery options in e-retail.

Finally, this study offers an initial consumer-centric typology of unattended delivery services. The typology clarifies the various unattended delivery formats and offers a conceptual point of reference. Most importantly, the typology clarifies the similarities and differences between attended and unattended home delivery formats. In addition to this typology, we put forth a comprehensive definition of *unattended delivery*.

6.2 Managerial implications

Our research results illustrate how customer experience has become more supply chain-related and how logistics and supply chain management significantly contribute to a more meaningful and satisfactory customer experience. This study exemplifies the role of logistics and supply chain management in enhancing customer experience. Supply chain managers need to acknowledge the growing importance of customer experience and adopt a holistic approach to it to develop consumer-centric delivery services. Based on this study's findings, we suggest a number of interconnected dimensions to help enhance the customer experience.

The findings suggest that there is no single delivery service that can satisfy all consumers' needs and that experience using unattended home delivery varied among respondents. Some provided an overall positive evaluation of the service as supported by their self-reported usage frequency, positive word of mouth and general willingness to pay for the service. However, respondents also reported that they experienced occasional failures when using the service. For example, the delivery drivers occasionally switched to attended home delivery because they had difficulties locating the reception boxes. Consequently, one respondent reported such strong dissatisfaction with the service that they stopped using it. Therefore, retail and distribution managers should diversify, rather than limit, their service offerings so that consumers can select the service alternative that fits their preferences. This implies that distribution managers need to expand their view of delivery services beyond operational and functional aspects, take a holistic approach to managing such services and develop consumer-centric strategies and operations.

This research highlights the need for a new way of thinking about delivery services in retail. It is recognized widely that retail managers should focus on customer experience and satisfaction. Consequently, managers use last-mile delivery as a means of differentiation to achieve competitive advantage. This study identifies six dimensions of unattended delivery experience that managers should consider when developing their delivery service offerings, namely consumers' cognitive, emotional, behavioral, sensorial, physical and social responses to the delivery service. Distribution and logistics managers in e-grocery retail proactively can address the various dimensions and dynamics of the delivery experience. For example, managers can reduce delivery lead times to increase flexibility for consumers. Shorter delivery lead times require either a high number of decentralized fulfillment centers or a small number of centralized fulfillment centers with high degrees of automation. Furthermore, the results from this research indicate a need for smaller and more frequent deliveries, which would enhance flexibility for consumers. Logistics managers can facilitate smaller and more frequent deliveries by moving toward automated fulfillment centers that can enhance agility and handle changing order profiles.

Offering consumer-centric delivery services requires in-depth understanding of consumer expectations, experience and satisfaction. Thus, distribution managers are encouraged to measure customer experience to gain better insights into the various dimensions. The framework of last-mile delivery experience, with its six experience dimensions, builds a basis for operationalizing and measuring delivery experience. However, further operationalization may be required to develop measures that can be used to enhance delivery services.

6.3 Limitations and future research

Several limitations to this research should be noted. First, the number of respondents was limited because the emerging service of unattended grocery delivery has not been implemented on a larger scale yet in Sweden. Second, the respondents live in southern Sweden, which provides a suitable context for this study, as it has one of the highest e-commerce penetration rates in Europe. However, despite unattended delivery services' increasing popularity, they still comprise only a niche market in the nation's grocery retail sector, forcing consumers into conventional home delivery. Considering that qualitative research is highly context dependent, the results might have limited application with other consumer segments and in other cultural contexts, which future research could examine. The distribution advantages of unattended delivery services allow for a substantial reduction in the environmental impact and cost of last-mile delivery services. Thus, future research should investigate last-mile delivery experience from an ethical and financial perspective. Future research also could examine the antecedents and consequences of last-

mile delivery experience. Specifically, service expectations' role in unattended delivery experience remains uncharted territory. Finally, this research could not establish how strongly the six customer experience dimensions affect last-mile delivery experience. Quantitative studies could add to the literature by investigating to what extent these experience dimensions affect last-mile delivery experience.

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Appendix

The Appendices file for this article can be found online.

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