Academic Paper

Robot Service as a Smart Click & Collect Solution in the New Heart of Helsinki

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Abstract

Consumer behavior and the business environment are changing rapidly. The Covid-19 pandemic has further accelerated change. The new ways of doing e-commerce are challenging both brick-and-mortar shops and restaurants.

Our study focused on robot's role in customer experience creation in ecommerce click & collect domain as a part of delivery services. There are numerous studies which has advanced benefits of robot related services, but studies of robot's role as part of click & collect delivery systems are scant. The aim of this study was to test a smart Click & Collect solution in a new shopping center in the heart of Helsinki. In practice, the experiment focused on the delivery of restaurant food with the help of a robot from the restaurants of the shopping center to the residents of the hotel, which is located in the shopping center.

The study was conducted in the mall in the summer of 2021, between 6.7-6.8. The study was qualitative in nature and data were collected by many methods (diary, analytics, observation, meeting memos). Robot made altogether 54 deliveries to customers. The data were analyzed by combining the data collected by different methods and raising key observations related to the success of the concept.

Results indicated that robot's delivery raised many positive customer reactions. Hence, robot deliver created positive brand image for the mall. Technologically robot performed generally well (70 %) although it confronted couple of times problems while delivering goods.

Study showed that ecommerce related robotics delivery added clearly value to customer experience and created positive brand image. More research is definitely needed especially with robot performance (i.e. communication abilities), customer-robot relationship and general operational area like ordering system.

Keywords
customer experience, robot, ecommerce, smart city

1. Introduction

Consumer behavior and the business environment are changing rapidly. The COVID-19 pandemic further accelerated these changes. New digital platforms and methods for ecommerce are challenging both brick-and-mortar shops and restaurants. Customers are accustomed to quickly placing orders online, and having them flexibly picked up or delivered. In particular, the number of customers in urban centers and shopping centers has decreased as remote work has increased, and the movement of people in shopping centers has decreased. Even when the COVID-19 global pandemic is controlled, many of these digitized services will remain (Rosenbaum & Russell-Bennett, 2021, p. 262).

One example of service technology advancement is the use of robots in the service context. Robots have many forms and designs (Wirtz, 2018). According to Belanche et al. (2020), robots can contribute to facilitating and enhancing the customer experience. With the help of robots, it is possible to replace human service employees and save on costs (Van Pinxteren et al., 2019, p. 508). Our study focuses on the robot's role and abilities in customer experience creation in the ecommerce click and collect domain as a part of delivery services. Numerous studies have discussed the benefits of robot-related services, but studies on the role of robots as part of click and collect and delivery systems are few. Moreover, many service robot-related studies are conceptual, for example, Čaić et al.'s (2019) meta-analysis of the service robotics research domain. Furthermore, most studies have taken the service organization's perspective, with less focus on the role played by customers. Studies related to actual robot's customer journeys are scant, and research is needed to understand the extent to which service robots influence an end-customer's perspective (Lu et al., 2020, p. 381). Our aim is to contribute to this research gap.

The aim of this study is to test a smart robot click and collect solution in a new shopping center in the heart of Helsinki. In practice, the experiment focuses on the delivery of restaurant food with the help of a robot from shopping mall restaurants to residents of the hotel. The hotel and restaurants are located in the same Mall of Tripla building, the biggest shopping mall in the Nordic countries. The main unit of analysis is the robot's delivery journey from ordering to final food delivery, and our aim is to understand and analyze the critical incidents and the

robot's performance during the delivery journey. Our experimental study's aim is mainly practical, but we will also shed new light on the customer interaction/relationships between robots and humans in the delivery context at the theoretical level. The main research question is: How can a robot delivery solution affect the customer experience?

This study is part of an innovation ecosystem development project run by the Haaga-Helia University of Applied Sciences. The project, PasilaHUB, is developing, innovating, and piloting new solutions in close cooperation with local businesses. We are working together toward an urban and exciting city center in the new heart of Helsinki. Over three years, the aim is to pilot ten new business-driven concepts.

Last-mile delivery has become a critical source for market differentiation, motivating retailers to invest in a myriad of consumer delivery innovations, such as buy-online-pickup-in-store, autonomous delivery solutions, lockers, and free delivery with minimum purchase levels (Lim et al., 2017). Consumers care about last-mile delivery because it offers convenience and flexibility.

2. Digitalization and robotics in the click and collect domain

Digitalization offers companies interesting strategic opportunities (Abaidi & Vernette, 2018). One area of digitalization that has grown quickly in recent years is ecommerce (Mäki & Toivola, 2021, p. 12). This growth has been both global and local. Currently, ecommerce represents a significant amount of retail sales and is expected to continue to grow in the future. One critical area of ecommerce is delivery: How can customers get the ordered product quickly and conveniently?

The term "last mile" means the "last stretch" of order fulfillment aimed at delivering products ordered online to the final consumer (Mangiaracina et al., 2019, p. 902). This last part of the logistics process is typically the most expensive, inefficient, and pollution-creating part of the supply chain (Ignat & Chankov, 2020). In the academic literature, B2C (Business-to-Consumer) ecommerce last-mile delivery has mainly been studied according to three perspectives: environmental sustainability, effectiveness, and efficiency. Few papers have addressed innovative solutions, such as parcel lockers, crowdsourcing logistics,

and drones (Mangiaracina et al., 2019). Our intention is to bring robotics last-mile delivery solutions with a customer focus to this discussion. In general, the last-mile concept fits well with our research theme because of the relatively short delivery distance, restaurants, and customers located in the same mall building.

Robotics has many roles and meanings in service delivery and digitalization in a broader context. According to Wirtz et al. (2018), service robots can have a physical or virtual representation with humanoid or non-humanoid features, and they may have different types of tasks, such as cognitive-analytical or emotional-social tasks. However, there seems to be no perfect design for a robot. In our case, the Taika (the name of the robot) robot did not resemble a human because its main task was food delivery. To build a positive brand image and make it more acceptable among all customer groups, some human elements were added. The Taika robot had animated eyes, hands, and even cloaks. In general, customer responses to a robot are typically a mix of excitement, wonder, curiosity, or disappointment; people experience a low level of control and face-limited robot abilities (Kunz et al., 2019). We attempted to strengthen customers' positive feelings and reactions to a robot with some human features.

Robotics has been studied from customer and employee perspectives (Wirtz et al., 2018) and as part of self-service technologies (Van Pinxteren et al., 2019). One important dimension of robotics is autonomy. Robots' autonomy may range from none to full, where robots function without any direct input from humans (Čaić et al., 2019). Our robot can be defined as autonomous. Taika needed help when food was placed in its delivery box, but when Taika was on its delivery trip, it functioned without human assistance.

Customer experience is critical in all service encounters. End customers have to interact and participate in service delivery with some mandatory activities (Dong & Sivakumar, 2017, p. 950), such as opening the delivery box or automat with the help of an opening code and removing the goods from the box without human assistance. Hence, there is room for service failure and negative experiences. Belance et al. (2020) found that customers indicated a higher level of satisfaction when they experienced a service failure caused by a robot than when they encountered a failure by a frontline service employee. This finding favors robot delivery.

3. Methods

The study was conducted in the Mall of Tripla between 6th July to 6th August 2021.

The main source of data was observations recorded by the trainee, who accompanied the robot and wrote memos about the delivery trips. Moreover, our trainee monitored the mall and end customers and conducted a short interview after each delivery to analyze the customer's experience. The trainee was advised to write down all customer reactions during the robots' delivery trip. The trainee paid attention to both emotional customer reactions, such as facial expressions, and to the functional attributes of the robot, such as whether elevator use was effortless or whether the robot was able to evade passing mall customers. If mall customers asked something about the robot, this was also included in the delivery report. The average delivery time from order to delivery was approximately 30 minutes, ranging from 20 to 45 minutes. The main attributes that affected delivery time were food preparation time and elevator waiting time. All of these observations were written down immediately after the delivery trip. Altogether, 12 end-customer interviews were also documented after the food was delivered. A short end-customer interview included customers' general feelings and experiences about the delivery itself and the robot's suitability for the delivery process.

Other data sources included meeting memos and other robot ecosystem communication notes. The Taika robot made 54 delivery trips to customers, and every trip was documented based on observations and an interview guide. The qualitative empirical analysis coding list was derived from Wirtz et al.'s (2018) classification model, which defined potential positive and deteriorating attributes affecting customer experience while interacting with service robots. An additional framework for analysis was constructed using Kunz and Heinonen's (2019) paper, which addresses "unknown factors" related to human-robot relationships, such as what kind of value service robots represent for the customer and how people develop relationships with robots.

In our study, we applied a qualitative approach and used mixed methods to gather and analyze the data. Our study was conducted following action research principles in which companies, researchers,

and students collaborate closely during the research process (Reason & Bradbury, 2009). Moreover, we underlined practical knowledge, results, and actions throughout the research project. This meant active project communication with all project participants daily. Action research, in general, requires researchers to work with practitioners so that research and practice aim to create results together (Lim et al., 2018).

Our analysis followed the aims and framework of the study. A loose coding list was created and used as a basis for diary data analysis. The data were categorized according to the following themes: general findings related to the robot delivery concept, specific robot-related attribute analysis, customer reaction findings, and confronted development issues. We used the above-mentioned process as a basis for data analysis in order to avoid data overload (Miles & Huberman, 1994).

4. Findings

In general, customers (end customers and mall customers that the Taika robot confronted during its delivery trips) had a positive or neutral reaction to the robot.

Some mall customers were scared when they confronted the Taika robot, but this only happened when Taika approached customers without warning, for example, from behind. In general, robots may scare customers if they are too human-like in appearance (Belanche, 2020). Our robot had a limited human appearance.

4.1 Robot operations

4.1.1 Ideas about the function and tasks of a robot

Our robot's role was to deliver goods to hotel customers. The task of the robot was not clear to many of the mall's customers:

- A man asked, "Is Taika cleaning the floor?"
- A woman asked, "What is Taika doing?"
- A boy asked about the name of the robot.

Many mall customers thought that the Taika robot was a cleaning machine, and some asked about its purpose.

4.2 Robot delivery operations

In general, the Taika robot performed relatively well. It carried the deliveries to customers; for example, it did not hit any mall customer during the delivery trips, and it was capable of finding the route that was determinate. However, Taika confronted some problems:

- The peep-sound of the robot was too loud.
- When the order was placed in the robot's system, it did not start; we had to restart it.

4.3 Robot interaction and customer relationship

Customer reactions, interactions, and experiences are critical attributes of robot concept evaluation. There were several customer groups in the mall environment, and many of them had ideas, reactions, or experiences regarding the Taika robot.

4.3.1. End customers

The customers who ordered the food that Taika delivered are the most important group and unit of analysis:

- The customer was happy with the delivery.
- Some technical challenges occurred. The customer was informed that the delivery can be picked up at Scandic-hotel (not the hotel where Taika is operating); however, the customer was satisfied.

4.3.2 Other mall customers and robot delivery

Tripla Mall is crowded with end customers. From a branding and appeal perspective, their reactions are important. In general, their reactions were positive, and many people wanted to take a picture of Taika or of them standing with Taika. Moreover, mall customers were curious and asked many questions about Taika's role and tasks. These were

positive reactions because it is essential to generate excitement among customers and gather customer feedback for further development (Lu et al., 2020).

4.3.3 Children

Small children at the mall were categorized into a separate group because of their reactions and behaviors. In our analysis, this group had strong positive feelings toward Taika, but their behavior also caused challenges for robot delivery.

- Kids showed interest in Taika while it was at the charging station; they also touched the robot.
- A kid stood in front of Taika while it tried to turn.
- Kids started to follow Taika. Even a baby started to crawl after Taika...

Even though most children were curious and interested in Taika, they may have challenged its ability to operate independently.

4.4 Logistics performance

In last-mile logistics performance, delivery speed is the second most important factor from the customer's perspective (Ignat & Chankov, 2020). We measured the delivery performance time at three separate points in the customer and delivery journey: the place of the order, the pick-up time of the food, and the time when the customer got the product. The typical timeframe from ordering to delivery was approximately 30 minutes, which was the time required to prepare the food. The actual delivery typically took around 15 minutes, depending on the restaurant chosen and some other variables, such as the elevator status.

In general, robots' service failures can be categorized as technical failures (e.g., problems with hardware or software) or interaction failures (e.g., problems communicating with humans and the environment) (Lu et al., 2020). We confronted some technical failures; for example, sometimes the Taika robot thought it was in an elevator, but it was not, which caused delays in the delivery process. Communication failures

were few, even though Taika's communication (jokes) sometimes did not match the situation.

4.5 Service and other development ideas for the robot

The Taika robot's development group discussed many additional tasks for robots. Some development and new task ideas also came directly from customers. One challenge for robot operations is to utilize robots for multiple tasks, in addition to deliveries. Multitasking robot design will make the concept more profitable and effective. The robot's technical performance and communication skills were also part of the development process.

5. Conclusion, limitations, and future research

The aim of the study was to test a smart click and collect solution in a new shopping center in the heart of Helsinki. The main research question was as follows: How can a robot delivery solution affect the customer's experience? The results indicated that the robot's delivery elicited many positive customer reactions.

End customers were mainly satisfied with the robot's delivery. This finding was in line with previous studies, which found that customers had more positive feelings, even in a service failure situation, toward a robot than toward other humans.

The study did not include the financial aspects and profitability of robot delivery operations. Another limitation of the study was the limited timeframe of the piloting period; hence, the results cannot be generalized, and more robot delivery experiences are needed.

The study showed that ecommerce-related robot delivery clearly added value to the customer experience and created a positive brand image. However, more research is definitely needed, especially with regard to robot performance and customer-robot relationships.

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