From Service to Experience Robots: Exploring Customer Acceptance of Automated Delivery Robots in the Hospitality Industry through Experience Design

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Abstract

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The end of the COVID-19 pandemic marks continued growth in on-demand food delivery, solidifying its role as an essential service connecting businesses, customers and couriers through food delivery platforms, exemplifying the dynamics of the platform economy. This research-based thesis aims to assess how food delivery customers perceive the paradigm disruption introduced by automated delivery robots. The objectives include evaluating the current acceptance of automated delivery robots in Finland and exploring how elements of experience design influence such acceptance. In this context, delivery robots developed by Starship Technologies serve as the primary case study due to their significant deployment across the country.

To address these objectives, the study employs a merged theoretical framework that integrates models and theories from both technology and service robot acceptance as well as experience design. The framework leverages the principles of experience design to enhance the hedonic aspects of user interactions with automated delivery robots, thereby influencing acceptance.

The methodology incorporates a quantitative research approach complemented by participatory design. Data collection is facilitated through a self-completion questionnaire supported by video elicitation, which illustrates the current customer journey involving automated delivery robots in Finland. Respondents (n=401) address various sets of questions that analyse their current perceptions of automated delivery robots, evaluate experience design elements that could impact the interaction and assess a hypothetically modified experience.

The findings indicate an overall positive reception of automated delivery robots in Finland, driven by a combination of utilitarian and hedonic motivations. Additionally, significant variations in their acceptance appear across various demographic segments, with the most pronounced differences occurring between respondents with prior experience using automated delivery robots and those without such experience.

Respondents demonstrate a modestly positive acceptance of experience design elements, with stronger support among younger demographics and females. Features that enhance communication gather the greatest support, while elements involving co-creation of the delivery experience receive comparatively lower approval. Moreover, "cuteness" emerges as an inherent and favoured characteristic of the robots. However, the findings suggest that experience design elements do not significantly impact acceptance, as measured by use and recommendation likelihood, and perceived advantages compared to traditional delivery methods.

Key words
Service robots, autonomous delivery robots, experience design, food delivery systems

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1 Introduction

The emergence of the platform economy in the late 2010s received a significant boost during the COVID-19 pandemic due to global physical distancing measures, becoming a crucial support for the struggling restaurant industry (Ahuja, Chandra, Lord & Peens September 2021). As we transition to the 'new normal,' this trend has solidified, with global revenue in online food delivery projected to reach USD 1.40 trillion in 2025 (Statista Market Insights 2024). Food delivery apps, which connect food and beverage providers with couriers and end-customers, address the industry's needs arising from new consumer behaviours. However, their business model is not without controversy.

The profitability of the business model is questionable, with major players like Delivery Hero, DoorDash and Just Eat Takeaway incurring operating losses amounting to billions since their listings (Hodgson & Mersinoglu 2024). Additionally, there is an ongoing international debate regarding the status of platform workers (Ahuja et al. September 2021). Within Europe, there is no consensus on this matter; some countries have recognized couriers as employees (Perkiö, Mbare, Svynarenko, Kokkinen & Koivusalo 2023, 10-11), while in others, including Finland, the status of self-employment prevails (Yle 2024 a).

Launched in 2015, Wolt (DoorDash) and Foodora (Delivery Hero) are the main players in the Finnish platform delivery landscape (Tuomi, Jianu, Roelofsen & Ascenção 2023, 31). Studies in Finland indicate that couriers face physical risks—exacerbated in winter due to extreme weather conditions—along with stress, discrimination, racism (Perkiö et al. 2023, 23-33), and other psychosocial risks stemming from the platforms' algorithmic management, which involves the use of sophisticated algorithms to automatically assign tasks and monitor performance, leading to subsequent power asymmetries (Mbare 2023, 4-5; Tuomi et al. 2023, 35). Furthermore, their status as contractors excludes them from the protective umbrella of the employees' social security system (Perkiö et al. 2023, 49).

In this socio-economic context, a new player is poised to disrupt the traditional food delivery environment: autonomous delivery robots (ADR). In some countries, these robots have been integrated into the business strategy for several years, and ADR models such as Starship Technologies robots and Kiwibot are a common sight on sidewalks and university campuses. By September 2024, Wolt launched a pilot program for food delivery using Coco last-mile delivery robots in Finland (Helsingin Sanomat 2024). However, delivery robots have been present in the Finnish market for a few

years, following the introduction of Starship delivery robots for grocery delivery across the country in 2022 (Starship Technologies s.a. a).

While this innovation is still in its infancy, a crucial question arises*: Is our society ready to embrace this new service, or will this technology fade away?*

To date, user acceptance in the field of service robotics has been examined through various disciplines, including technology acceptance theories, social and behavioural models, technical and health perspectives—particularly influenced by the surge in service robots due to the COVID-19 pandemic—and service design. Nevertheless, existing research on attitudes towards service robots is limited, with studies indicating that cultural differences in locally developed investigations may not adequately illuminate the conditioning factors of these attitudes (Alverhed et al. 2024; Saravanos et al. 2022; Webster & Ivanov 2021).

As ADR become a more common sight in some Finnish cities, evaluating these attitudes and proposing strategies to enhance acceptance provides valuable insights for companies in the food delivery industry. The relevance of this topic is underscored by the fact that the level of acceptance of service robots in Finland remains largely unknown.

1.1 Objectives and demarcation

This research-based thesis attempts to integrate two previously unconnected disciplines: Service robotics and experience design. It aims to initiate a discourse on how experience design could effectively support the development of service robotics, particularly in maintaining sustained interest and preventing the commoditization of experiences with ADR.

Within the presented context, the author hypothesizes that incorporating elements of experience design could enhance customer acceptance of service robots in a manner that respects the core design of the robots and remains cost-effective. By integrating a layer of experience into the current ADR service, it is expected that customer interest could be sustained, allowing sufficient time for continued technical development. Overall, experience design could facilitate a closer connection between robots and people, promoting an investment in the acceptance of these robots with significant future implications. Furthermore, experience design could address a secondary scenario: a time where ADR become routine for customers, losing the novelty and excitement—when the experience evolves into a mere service.

To test this primary hypothesis, the study is structured around several research questions:

Research Question 1: What is the current perception of customers regarding the food delivery experience with autonomous delivery robots in Finland?

1.a: Does this perception change over time, following a certain number of interactions with autonomous delivery robots?

Research Question 2: Can elements of experience design enhance the current food delivery experience with autonomous delivery robots?

2.a: What are the customers' preferred experience design elements applicable to this context?

2.b: Are there significant differences between customer perceptions of the current experience and the proposed enhanced experience with autonomous delivery robots?

Research questions 1 and 1.a aim to assess the current acceptance of ADR in the Finnish market and the risk of rapid commoditization. The results will help define the profile of users in Finland, their motivations, and allow for comparisons with previous studies from other geographical areas.

Questions 2 and sub-questions 2.a and 2.b explore the integration of experience design, evaluating elements that could potentially gain popularity among customers and their perceptions of the modified experience. Although the revised experience to be tested will be hypothetical and the collected data will be constrained by respondents' imaginations, it could nonetheless yield valuable information for companies operating ADR in the country.

In this research, data collection is restricted to Finland to obtain more accurate information from this specific market. Starship robots are utilized as an example of ADR, given their operation in various regions of the country from 2022. In contrast, Coco robots were only in a pilot phase at the beginning of this thesis. Moreover, the Coco model is a remotely controlled last-mile delivery robot, which features characteristics that differ from intelligent ADR (Coco s.a.). The presence of Starship robots in streets, the press and social media has made them familiar to the public in Finland. These robots are used to create a customer journey with ADR, serving as the starting point for the design process.

Data collection is focused on the Helsinki Metropolitan Area (Helsinki, Espoo, Vantaa, and Kauniainen). This region has the highest concentration of outlets offering ADR delivery and has the longest operational history of such services. However, responses from other parts of the country

are not disregarded, as they may provide additional insights into how robots are perceived in more rural or less populated areas.

This research is directed at users of food delivery applications, regardless of their prior experience with ADR. For the purposes of this study, 'on-demand food delivery' is defined as the transportation of freshly prepared meals from dining establishments to end consumers, facilitated through an online platform (Seghezzi, Winkenbach & Mangiaracina 2021, 1334). Ready-to-eat meals prepared in kitchens within grocery stores are included; however, regular grocery delivery services are explicitly excluded from the scope of this research.

A visualization of the topic and geographic demarcation of the thesis is presented in Figure 1.

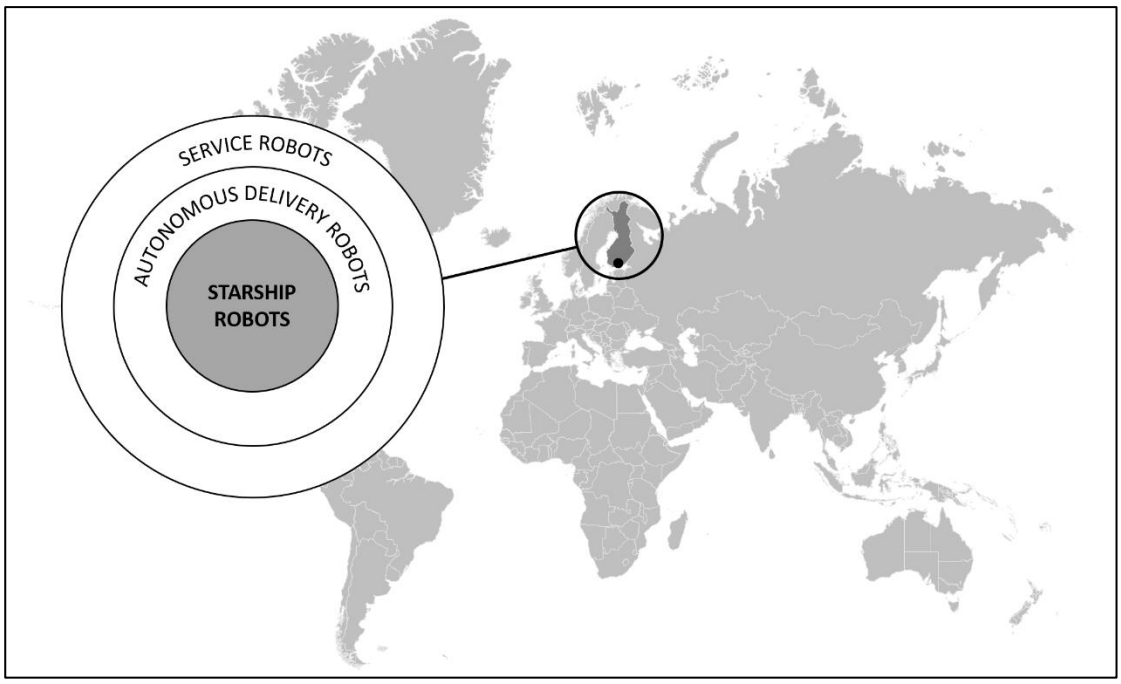


Figure 1 Topic and geographical scope of the thesis

1.2 Methodology in brief

This research seeks to establish a connection between the fields of service robotics and experience design, with the aim of promoting acceptance of the former by leveraging elements of the latter. Following a review of relevant literature in both disciplines and the proposal of a merged

theoretical framework, a quantitative research methodology is adopted, utilizing a self-completion survey. This method was chosen due to the non-existent research on the acceptance of service robotics and the experience economy in Finland, as it enables the collection of extensive data with minimal resources (Williams, Wiggins & Vogt 2022, 85-87).

To address the proposed research questions, the survey is structured into four sections. The first section focuses on establishing a demographic and behavioural profile of the respondents, including specific questions directed at active users of delivery with ADR. These questions assess respondents' satisfaction levels, motivations for use and the frequency of their interactions.

The second section evaluates the likelihood of using food delivery services facilitated by ADR, the potential recommendation through word-of-mouth and the perceived advantages of ADR over traditional delivery methods.

In the third section, respondents are presented with twelve experiential elements that could potentially improve the current delivery experience, which they are asked to evaluate individually. Subsequently, the variables of use and recommendation likelihood and benefits over traditional delivery are re-examined, this time in the context of an experience modified by the evaluated features, to assess any potential increase in acceptance.

To further engage respondents with no prior interactions with ADR, video elicitation is employed to present the current delivery experience.

Upon completing data collection, the dataset is cleaned and examined using univariate and bivariate analyses, with particular emphasis on comparing opinions across different segments, primarily concerning age, gender and prior experience with ADR.

A comprehensive description of the research’s methodology is presented in Chapter 5.

1.3 Key definitions

Service Robots

According to Wirtz et al., service robots are defined as “system-based autonomous and adaptable interfaces that interact, communicate and deliver services to an organization’s customers.” Service robots hold three specific design attributes: representation, anthropomorphism and task orientation. Service robots can be manifested both physically and virtually; they may exhibit varying

degrees of humanoid characteristics or none at all. The scope of tasks they can perform ranges from cognitive-analytical to emotional-social. (2018, 909.) Furthermore, AI-powered service robots possess varying levels of intelligence, categorized as mechanical, analytical, intuitive and empathetic (Huang & Rust 2018).

The labour-intensive nature of the hospitality industry, coupled with the capacity of service robots to mitigate undesirable mechanical tasks such as repetitive, dirty and hazardous ones, as well as their potential to provide entertainment and amusement, makes service robots a compelling subject of research within the industry (Ivanov & Webster 2023, 229-230).

Automated Delivery Robots

Automated Delivery Robots (ADR), also referred to as last-mile delivery robots, are a category of service robots designed to deliver goods from distribution centres -in this case food and beverage outlets - to end consumers (Puig-Pey et al. 2023, 34).

These robots represent an advancement of the automated guided vehicles traditionally utilized in warehouse operations. ADR are characterized by their compact size and box-like cargo compartments and are predominantly powered by batteries (Alverhed et al. 2024, 2). They are typically equipped with advanced sensors and artificial intelligence to navigate their environment efficiently (Lim et al. 2024, 1).

Experience Design

In accordance with Pine and Gilmore (2011, 1-39), the pioneers of the experience economy, experiences represent a distinct economic category, advancing beyond services in the progression of economic value. In the experience economy, value creation is achieved through business differentiation by staging memorable, personalized and engaging experiences. Consequently, experience design involves the strategic planning, creation and conceptualization of experiences that leave lasting impressions and enhance customer engagement.

In this business context, Newbery and Farnham (2013, 64) define experience design as “a strategic framework that allows a business to collaborate more effectively with design with the goal of creating value and engaging customers, even as the larger environmental context changes”.

All of these key terms, which are integral to the core of this research, will be further elaborated upon in the theoretical framework chapters of this thesis.

1.4 Starship Technologies: Robot specifications

Headquartered in San Francisco, California, and originally established in Estonia, Starship Technologies' autonomous delivery robots are operational in six countries globally, with significant presence in the United States, the United Kingdom, Estonia and Finland. Since its launch in 2014, Starship Technologies has achieved over seven million deliveries by March 2025, primarily focusing on food deliveries within university campuses and grocery deliveries from supermarkets. (Starship Technologies s.a. a.)

In Finland, these robots have been in use since 2022, following a pilot project by S-group for grocery deliveries in Espoo, specifically for their Alepa supermarket outlets (Starship Technologies s.a. a). Currently, these robots, colloquially known as "Alepa robots," are a common sight in the Helsinki metropolitan area (see Figure 2) and nearly 30 other locations across the country, including major cities such as Tampere, Turku and Oulu (S-Kaupat s.a.). From their initial deployment, the Alepa robots have been prominently featured in Finnish media, initially covering the pilot implementation and subsequently reporting on various incidents and limitations. Popular are the accounts of a robot falling into a river (Helsingin Sanomat 2024) and another becoming immobilized in snow (Yle 2023 a), which have sparked discussions regarding the efficiency of these devices.

Figure 2 Starship robots outside an Alepa store in Vantaa (Finland)

The Starship last-mile delivery robot is engineered to transport and deliver goods weighing up to 10 kg within its cargo compartment, which can be adapted with insulated sections to maintain cold and hot temperatures, a feature particularly beneficial for food deliveries. The robot, weighing 37 kg and measuring 697 mm in length, 569 mm in width and 571 mm in height (excluding the LED flag), operates primarily on sidewalks at speeds up to 6 km/h. It functions autonomously 99% of the time, utilizing a combination of GPS and computer vision. Additionally, it is equipped with 12 cameras, ultrasonic sensors, radars, neural networks and other technologies to detect obstacles, creating what Starship describes as a “situational awareness bubble.” This enables the robots to halt at a safe distance when encountering obstacles. (Starship s.a. a.; Starship Technologies s.a. b.)

Moreover, several security features are integrated to prevent theft of the device or its cargo. The compartment remains locked until the customer unlocks it using their mobile phone, and an alarm system activates if the robot is lifted off the ground (Starship Technologies s.a. b). The robots are also fitted with LEDs - including their signature LED flag - and reflectors to ensure visibility (Starship s.a. a.). In Finland, they are equipped with winter tires and specialized obstacle sensors to navigate snow piles, supported by a specific “snow mode” that lifts the middle tires to enhance traction on ice and snow (Starship Technologies 10 April 2024).

The robots possess speech functionality, allowing them to request assistance and express gratitude to customers and bystanders (Dobrosovestnova, Schwaninger & Weiss 2022, 1024). They are designed to permit human monitoring and control when necessary (Starship Technologies s.a. b).

2 Human - Service Robot Interaction: Classic approaches and marketing perspective

Robots have long been a part of the human imagination, featuring prominently in literature, cinema and theatre. Concepts of their potential have been shaped by their entry into people's minds through fantasy and science fiction. They have been encountered ranging from deadly and evil to extremely friendly, from destructive to efficient, and from highly humanlike to purely mechanical, offering a fantastic and utopian vision of how robots might appear and perform.

For decades, robots have also been a reality, confined to automated factories and assembly lines, largely out of public view, thus reinforcing dramatic preconceptions. However, robots are now transitioning from screens to the front of house in restaurants, from books to hotel corridors, and from the stage to delivering food orders to those readers' and viewers' doors (Ivanov & Webster 2023, 229).

Service robots are increasingly becoming a reality in the hospitality industry, presenting a compelling landscape for automation. The current technological revolution, particularly the rapid development of AI and robotics, combined with the industry's dependence on human labour and the labour shortages it faces, are often cited as factors driving adoption (Ivanov & Webster 2023, 229; Tussyadiah, Tuomi, Ling, Miller & Lee 2022, 2). The COVID-19 pandemic provided a significant boost to this emerging industry, as service robots gained additional value by enhancing safety during times of social distancing (Seyitoğlu & Ivanov 2020, 1-2).

With the introduction of service robotics in the hospitality industry, the core of services will remain unchanged, but the methods of delivery will be transformed (Seyitoğlu & Ivanov 2020, 1). This shift will impact the tasks and roles of employees (Tuomi, Tussyadiah & Stienmetz 2021, 236-240) and alter customer relationships with companies. It is important to recognize that technological innovations typically experience a hype phase and subsequently encounter resistance before gaining societal acceptance (Hoffmann & Prause 2018, 245). Mistakes committed by AI-driven devices are often perceived more harshly than those made by human employees, fostering what is known as "algorithm aversion" (Dietvorst, Simmons & Massey 2015). Similarly, service failures are more directly attributed to companies when the performer is a frontline robot rather than a human employee (Belanche, Casaló & Flavián 2020, 283).

In the hospitality industry, research on customers' attitudes toward service robots reveals mixed findings. Webster and Ivanov report that while customers generally exhibit positive attitudes, robots

are frequently perceived as deserving of lower service fees (2021, 79). Other studies remark significant resistance to the adoption of robots in hospitality settings, observed among both customers (Wang, Zhang, Huang & Li 2023, 7-9) and employees (Fu, Zheng & Wong 2022, 4-8). Furthermore, Webster and Ivanov (2021, 79-80) identify two basic profiles based on levels of robot acceptance: “robophiles” – the lovers –, who focus on the benefits of this technology, and “robophobes” – the haters –, who reject it and emphasize the dehumanizing effects of robots.

Understanding the drivers of customer adoption, attitudes and acceptance, motivation and mitigation, is crucial at this stage of service robotics development. Addressing these topics is essential to ensure the technology’s survival and proper adaptation, thereby overcoming societal resistance. This field of research, however, is not exempt from difficulties, necessitating continuous investigation to achieve these goals.

2.1 Challenges in research on robot acceptance

Customer acceptance and attitudes towards service robots represent a dynamic research field that continually evolves and presents numerous challenges stemming from robot design, customer-related factors and environmental variables (see Figure 3).

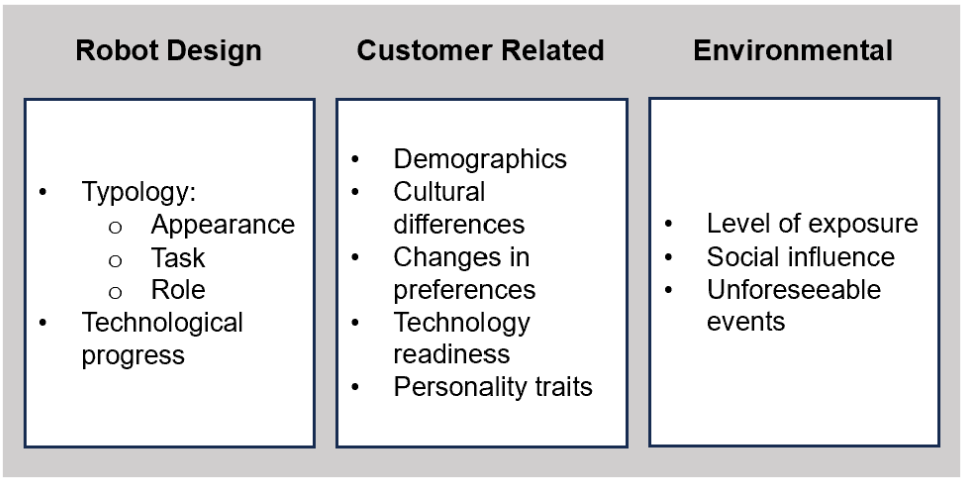


Figure 3 Factors affecting service robots' acceptance research

The first significant obstacle lies in the broad scope regarding the typology of service robots. The term “service robots” includes a diverse array of robots that may vary significantly in terms of role, tasks performed and appearance. The range of tasks performed by service robots is extensive, spanning from cognitive-analytical to emotional-social tasks (Wirtz et al. 2018, 909). To illustrate, the factors driving the acceptance of robots performing easily mechanized tasks, such as cleaning tables or providing room service in a hotel, may differ significantly from those driving the acceptance of robots that cook food (Ivanov & Webster 2023, 233) or engage in social interactions with customers, substituting a frontline employee (Wang et al. 2023, 7-9). This leads to the next differentiation: service robots assume diverse roles. Traditional roles include supporting or substituting human employees. Tuomi et al. (2021, 236-240) expand this categorization by introducing three new roles: differentiation (automation for novelty), improvement (automation for better products) and upskilling (automation for better jobs).

Moreover, service robots can range from highly anthropomorphic designs to those that do not resemble humans at all, with endless variations in between. Robots are commonly classified into mechanoids, humanoids and droids based on their level of anthropomorphism (Walters, Syrdal, Dautenhahn, Te Boekhorst & Koay 2008, 165). Typically, anthropomorphism is a feature connected with increased user acceptance, although an extremely realistic appearance in robots could cause them to fall into the Uncanny Valley (Mori 1970), creating feelings of eeriness in users and, therefore, rejection. For instance, in the case of food delivery, it is debatable whether highly anthropomorphic models released into the wild would be better accepted than the current compact, small-sized and unthreatening-looking ADR available in the market. Possibly, the appearance of robots should be closely aligned with the tasks they perform and the roles they assume to promote a sense of psychological safety.

In addition to technical design features, acceptance is significantly influenced by variables such as cultural differences and demographics. Age is generally presented as a differentiating factor, with younger users being more prone to accept disruptive technologies than older segments of the population (Belanche, Casaló, Flavián & Schepers 2020, 213). Although contested, another common perception is that gender influences attitudes towards robots, with females being less receptive than males to utilizing this technology (Webster & Ivanov 2021, 68). Regarding cultural stereotypes, it is frequently suggested that Japanese and other nationalities tend to embrace service robotics more willingly than other cultures (Webster & Ivanov 2021, 80). Other customer-related factors include the constant change in behaviour—needs and preferences-, the individual level of technology readiness and personality traits (Belanche et al. 2020, 212-215).

Furthermore, acceptance is regulated by environmental factors, such as exposure, which has been increasing over time and was accelerated by the COVID-19 pandemic. This event propelled the adoption of service robots due to their added value of eliminating human contact—a highly demanded feature during periods of confinement and restrictions (Seyitoğlu & Ivanov 2020, 1-2). Many studies were conducted before and during the pandemic; however, it is reasonable to question their current validity. Over the past five years, we have experienced rapid transitions from regular human interaction to total avoidance of contact and then into a new normality. This behavioural and needs-based shift may impact how we embrace service robotics.

Additionally, in the era of social media, social influence seems to be a new moderator of attitudes towards robots (Lin 2022, 12), with authors suggesting that group usage of delivery robots generates a polarization that directly impacts the level of acceptance and trust in these robots (Martinez, VanLeeuwen, Stringam & Fraune 2023, 422-423).

Finally, the rapid pace of technological progress and its resulting improvements in design and successful interactions with service robotics, make the continuous study of this discipline essential for understanding evolving attitudes towards this technology.

2.2 Technology and service robot acceptance models

In this everchanging field of technology adoption, one of the most widely utilized theories to explain human motivation to use technology is the Technology Acceptance Model (Davis 1989). The model's success stems from its intrinsic simplicity and natural flexibility, allowing it to be adapted to specific contexts. Over time, the original model has been augmented by its author and integrated with elements from other behavioural theories, resulting in tailored frameworks for various types of studies (Lin 2022, 4-5).

The Technology Acceptance Model (TAM) is fundamentally based on utilitarian principles, initially focusing on two core constructs: Perceived Usefulness – defined as "the degree to which a person believes that using a particular system would enhance their job performance" – and Perceived Ease of Use – "the degree to which a person believes that using a particular system would be free of effort" (Davis 1989, 320). This foundational framework was subsequently enriched by incorporating a hedonic dimension, "Perceived Enjoyment," which proposes that for a technology to be accepted, it must not only be useful and easy to use, but also enjoyable (Davis, Bagozzi & Warshaw 1992).

Further advancements were made by Venkatesh and Davis (2000) with the introduction of TAM2, another extension of the original model. TAM2 integrates social influence factors—such as subjective norm, voluntariness and image—and cognitive instrumental elements—including job relevance, output quality and result demonstrability.

Arguably, the most relevant modification of the TAM within the scope of this research is the Service Robot Acceptance Model (sRAM), as proposed by Wirtz et al. in 2018. This model, conceptualized from a marketing perspective, merges the utilitarian dimension of the original TAM with socio-emotional components—namely perceived humanness, perceived social interactivity and perceived social presence—as well as relational elements such as trust and rapport (see Figure 4).

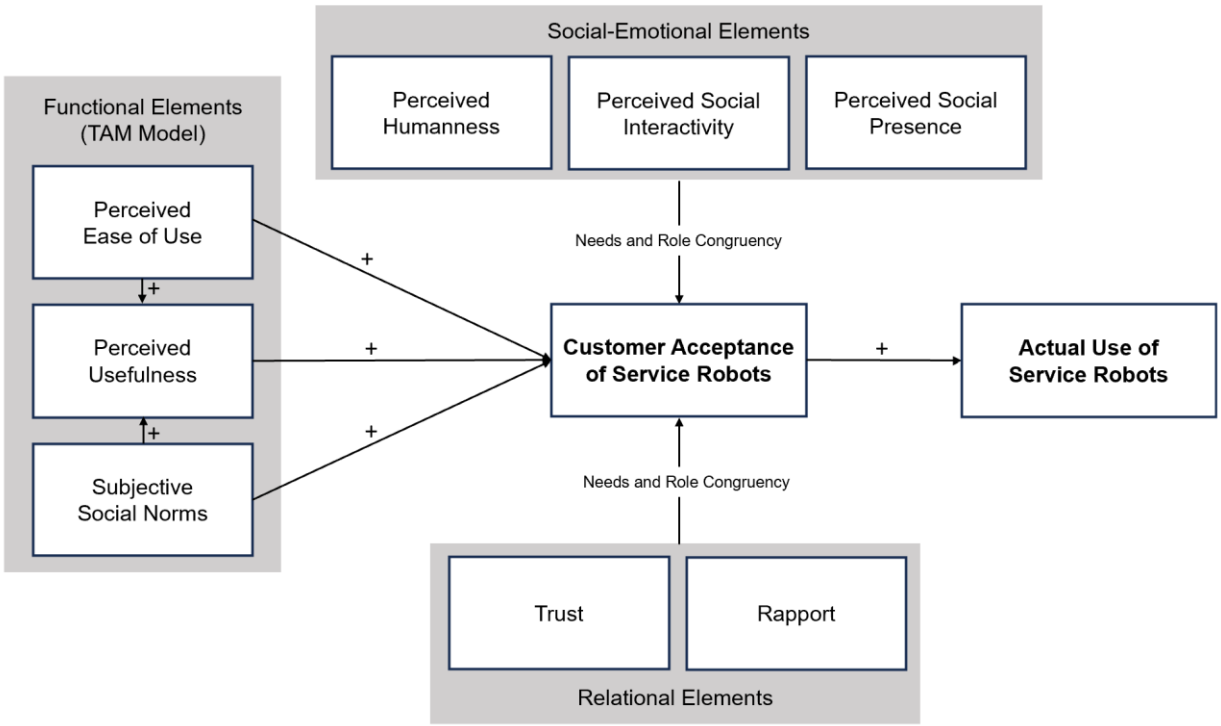


Figure 4 Service Robot Acceptance Model (adapted from Wirtz et al. 2018, 916)

In terms of socio-emotional components, “humanness” is equated with anthropomorphism. The authors emphasize the significance of incorporating anthropomorphic features in robot design, while also cautioning against the heightened expectations these features may generate. Users, now regarded as customers, tend to have elevated expectations of the robots’ capabilities in proportion to

their human-like appearance, potentially leading to dissatisfaction. “Social interactivity” refers to the robot’s capacity for social intelligence and adherence to social norms, whereas “social presence” denotes the extent to which customers feel they are in the presence of another social entity. (Wirtz et al. 2018, 917.)

Regarding relational elements, “rapport” refers to the perception of a pleasant interaction and the consequent personal connection between the customer and the robot. “Trust,” specifically “emotional trust,” relates to the sense of psychological comfort and safety that a robot elicits. (Wirtz et al. 2018, 917-918.)

Lastly, “role congruency” is introduced as a nexus of the aforementioned elements, serving as an overarching objective to promote customer acceptance of service robots (Wirtz et al. 2018, 915).

2.3 The Three-Part Framework for Service Robots

Belanche, Casaló, Flavián and Schepers (2020) advance the theorization of service robot acceptance from a marketing perspective through their Three-Part Framework for Service Robots. The intentionality of this framework is evident, as marketing-related concepts such as customer satisfaction and loyalty are central to their model. This framework is structured around three dimensions of service performance: robot design, customer features and service encounter characteristics (see Figure 5). This conceptualization increases the number of relevant factors that impact interactions between service robots and humans, shifting the focus from a “robocentric” perspective to a framework that equally emphasizes aspects of robot and service design, as well as more uncontrollable variables such as customer characteristics.

Key factors of robot design

The Three-Part Framework for Service Robots expands the key features of robot design that affect service performance. Besides broadening considerations about the robots’ appearance, this framework highlights the importance of social and interactive features that go beyond the physical look of the devices.

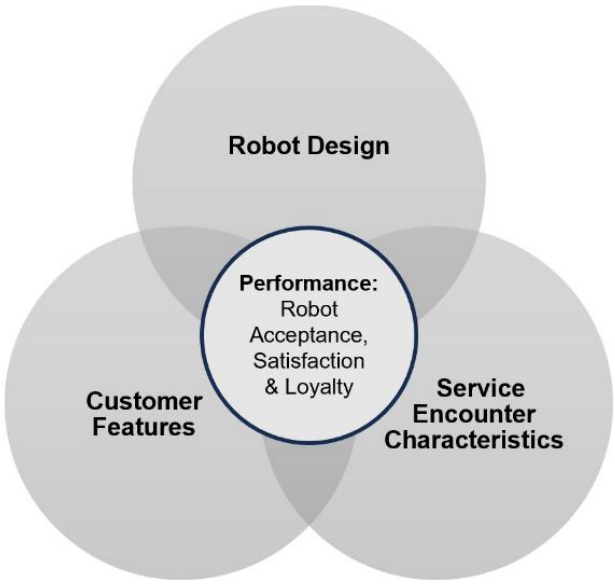


Figure 5 Three-Part Framework for Service Robots (adapted from Belanche et al. 2020, 207)

Regarding aesthetics, in addition to the traditional discourse on anthropomorphism as a means to enhance the perception of robots as social entities, Belanche et al. (2020, 207-212) consider other appearance variables such as the robot's assigned gender and ethnic characteristics, as well as factors that can influence psychological safety, including materials and size.

The concept of manipulability introduces the value of co-creation in the customer experience with robots. The authors argue that greater manipulability of the robot enhances the co-creation value for the customer, promoting a sense of "psychological ownership." To influence manipulability, service encounters can be designed to include moments of communication with the robot, or even physical interactions such as touching or pressing buttons on a display (Belanche et al. 2020, 210-211). Manipulability introduces a multi-sensory perception element closely linked to principles of experience design; the more senses involved in an experience, the more memorable it will be (Pine & Gilmore July/August 1998; Tarssanen & Kylänen 2007, 145).

Robot notification, akin to sRAM's concept of social presence (Wirtz et al. 2018, 917), refers to the awareness customers have of their interaction with a robot (Belanche et al. 2020, 210). While this is not applicable to robots with a physical presence like the Starship robots, it is particularly relevant in interactions with AI applications, such as chatbots.

Finally, proactivity, affect and formality are introduced as significant features of robot design, incorporating various social elements that impact interaction. These features, which have greater usage potential in more advanced social robots, should nonetheless be considered with diverse customer profiles in mind. For instance, older segments might be more inclined to accept service robots that present a less proactive and more formal tone of communication (Belanche et al. 2020, 211-212).

Key customer features

The second aspect of this framework addresses the characteristics of customers that affect service performance with robots. This approach diverges significantly from the sRAM in the inclusion of customers within both theories. In sRAM, the evaluation centres on how customers perceive various factors of robot design—usefulness, ease of use, humanness, social presence and interactivity—and their encounters—trust and rapport (Wirtz et al. 2018, 915-918). Conversely, the Three-Part Framework emphasizes the individual characteristics of customers that may influence these perceptions (Belanche et al. 2020, 212-215).

In addition to the commonly discussed factors of age, gender and culture, the authors introduce the concepts of technology readiness, personality traits and customer tier. Technology readiness refers to the individual predisposition of certain customers to more readily embrace new technologies. Extroversion is highlighted as a personality trait that positively influences customers' attitudes towards service robots. (Belanche et al. 2020, 212-215.) Other studies emphasize this trait alongside other personal characteristics such as innovativeness, openness to experience, self-efficacy, ability and capability as individual drivers of service robot usage (Lin 2022, 3). Both concepts—technology readiness and personality traits—are closely related to the previously discussed profiles of "robophiles" and "robophobes," which describe users who are more likely to accept or reject the use of service robots, respectively (Webster & Ivanov 2021).

Furthermore, the authors discuss the importance of considering diverse customer tiers. For instance, customers with long-standing relationships with companies may feel more uncomfortable with the presence of a robot disrupting their habitual service compared to new customers who have not yet established such relationships (Belanche et al. 2020, 215).

Key characteristics of service encounter

The final dimension of this framework relates to the specific factors influencing the service encounter. These factors include information provision, level of involvement, failure and complaint management, product or service type, transactional versus relational interactions, and finally, employee replacement or collaboration (Belanche et al. 2020, 215-218).

Information provision is introduced as a fundamental feature of many service robots (Belanche et al. 2020, 215). However, this is not the case for Starship robots, which channel this feature through mobile phone applications—either their proprietary Starship Food Delivery App or those of service partners (Starship Technologies s.a. c). This exempts Starship robots from the necessity of appearing more human to fulfil the role of a social entity.

The level of involvement is linked to customer motivation, risk evaluation and their decision-making process, and it can be promoted by experience engagement. Failures and complaints highlight the inherent disadvantage robots face in responding to service failures and subsequent customer complaints (Belanche et al. 2020, 216).

In the context of product or service, the authors emphasize the advantages robots offer in product sales, such as AI-driven product comparisons, as opposed to highly skilled services. Although robots may exhibit extraordinary competence in specific skills, the integration of multiple skills, particularly those related to emotional intelligence, remains challenging (Belanche et al. 2020, 217). This argument is supported by the service delivery classification based on task complexity presented by Wirtz et al. (2018, 918-919), which indicates that emotional-social tasks are more likely to be performed by humans or hybrid teams, whereas cognitive-analytical tasks, regardless of their difficulty, can be executed by robots independently. This aspect connects with the final elements of this dimension, as robots may demonstrate greater efficiency in transactional interactions that do not necessitate the development of a relationship. Additionally, robots can function within human-robot teams in a supportive capacity or entirely replace human roles (Belanche et al. 2020, 217-218).

2.4 Perceptions of customer experience with ADR

In advancing the understanding of the acceptance of service robots, the next layer involves comprehending customers' perceptions of the specific type of robot that is the focus of this thesis: autonomous delivery robots (ADR).

2.4.1 Previous research

Several studies have evaluated these perceptions and attitudes towards ADR. However, these studies present certain limitations: they were all conducted shortly before, during or soon after the COVID-19 pandemic, and their results are often contradictory. The studies discussed in this subchapter were conducted in the USA, Singapore, Germany, France and China, collectively offering inconclusive results regarding what customers value most in their experience with ADR. Additionally, the results are unclear about the demographics that shape the typical customer profile preferring ADR as a delivery method.

Saravanos et al. (2022, 528-529) identify the perceived usefulness of the service as the most relevant factor for American customers, followed by social influence and hedonic motivation. Price does not appear to significantly impact the drivers for using ADR, and contrary to previous literature findings, support for using ADR does not affect their acceptance. Conversely, Kapser and Abdelrahman (2020, 217-219) found that price is the most relevant motivator for the German market, followed by performance expectancy and hedonic motivation. In France, expected performance is the most influential factor, and similarly to the USA, price does not have a strong influence (Oulmakki, Verny, Janjevic & Khalfalli 2023, 2070-2072). Perceived ease of use and usefulness are the main drivers for Singaporean customers. Yuen, Cai, Lim and Wang (2022, 13-14) further highlight that perceived value directly influences customer acceptance of ADR, with this value comprising four dimensions: functional, social, economic and hedonic. Finally, in a study conducted in China, Lim et al. (2024, 10-11) identify two perspectives—utilitarian and hedonic—with gratification and anthropomorphism being the most valued factors within the hedonic perspective, and no conclusive results regarding social influence.

As we can see, the factors motivating the selection of ADR as a delivery method are diverse, making it challenging to determine whether these differences are driven by the research approach, cultural context, demographics or the specific timing of the studies in relation to the pandemic.

Furthermore, there is no consensus regarding demographics, with some stereotypes such as age being challenged in some studies (Yuen et al. 2022, 10-11). Martinez et al. highlight that groups of

adults and/or children may be more inclined to interact with ADR than individuals, and that the drivers of acceptance differ in group dynamics. While increased exposure generally favours individual customers, this relationship is not as clear-cut with groups of customers. (2023, 422-423.)

It is evident that regardless of the primary perceptions and motivators of ADR use in a specific market, all studies tend to identify features that are either utilitarian or hedonic. Perceived usefulness, perceived ease of use and performance expectancy—utilitarian factors—have been extensively researched, as discussed earlier in this chapter, due to their relevance in robot design. Conversely, the hedonic dimension in the interaction with ADR is a relatively new topic of discussion. Many researchers are beginning to emphasize the importance of further exploring this hedonic dimension to increase acceptance. Yuen et al. (2022, 14-15) stress the importance of enhancing the four dimensions of value, suggesting that focusing on aesthetic features and incorporating novel elements into the experience could improve hedonic utility. Saravanos et al. (2022, 529) discuss the relationship between fun and increased acceptance, and suggest elements intrinsically related to the design of the experience, such as gamification. Lim et al. (2024, 11) go even further, emphasizing “fun, pleasure and playfulness” as ways to fulfil customer needs, and introduce the concept of the experiential value of interacting with ADR.

In conclusion, current literature acknowledges the significance of the hedonic dimension, paving the way for a combination of robot, service and experience design as a more effective approach to customer acceptance.

2.4.2 Specific limitations: Accessibility and bystander acceptance

ADR are among the first service robots to operate in uncontrolled environments, navigating outdoor settings where they encounter constantly variable conditions. This mode of operation contrasts significantly with other frontline service robots, which function in enclosed spaces designed or adapted to ensure optimal robot performance. Consequently, several challenges impact the efficiency of ADR.

Firstly, there are numerous issues related to accessibility, both physical and intellectual (Alverhed et al. 2024, 10-11). The customer journey involving ADR always requires the use of an application. In the case of food delivery, orders are typically placed through a mobile app, allowing customers to track the robot’s journey and authorize the opening of the cargo box. This presents a limitation for older segments of the population who may not be familiar or comfortable with these

technologies. Additionally, ADR face physical accessibility challenges, such as navigating stairs or streets under renovation. Moreover, ADR do not provide door-to-door delivery for apartment buildings, requiring customers to specify a street-level pickup point, which can be particularly inconvenient for individuals with limited mobility.

In addition to these limitations, ADR encounter various challenges on sidewalks, including push-button pedestrian signals, cyclists, random obstacles like abandoned scooters and bystanders. Conflicts between ADR and bystanders have been reported in high-density areas, where bystanders have been forced to move aside to avoid collisions. Furthermore, ADR often require assistance from bystanders when they become stuck, for example, at traffic lights. (Alverhed et al. 2024, 10-11.) How bystanders perceive ADR is an additional challenge. Even if they are not considered customers, they might impact public opinion through social feedback (Puig-Pey et al. 2023, 35), potentially modifying general attitudes towards ADR.

2.4.3 Bystander and customer perceptions of Starship delivery robots

A study observing pedestrian interactions and analysing social media acceptance of Starship robots in Estonia provided some insights into how bystanders engage with these robots. Due to previously mentioned limitations, Starship robots often become stuck on delivery routes and require human intervention. This issue is exacerbated by extreme winter weather conditions in countries like Estonia and Finland, which introduce challenges such as driving on ice and avoiding snow piles. (Dobrosovestnova et al. 2022, 1023-1024.)

Overall, the study concluded that Estonian society has a positive perception of Starship robots - it is noteworthy that these robots were originally developed in Estonia- and they are perceived as cute, useful and “quasi-social agents.” This finding is particularly interesting given that Starship robots are fundamentally mechanoid devices with a primary task of delivery. However, not all perceptions were positive; some concerns were raised about the potential overcrowding of streets by robots and the fact that bystanders are assisting robots in tasks that should be reserved for employees. (Dobrosovestnova et al. 2022, 1026-1027.)

According to S-Group, the company employing Starship robots for delivery in Finland, the typical customers of robot delivery are families with children, followed by young people from single households and those aged between 25 and 44 years. Most orders are placed in the evening, with Saturday being the most popular day for ordering. S-Group acknowledges that the popularity of the

robots has boosted the use of their application and reports overall positive feedback—describing it as “amazingly good”. The most valued features include the music that plays when the robots arrive at their destination, which is selected by customers, the speed of delivery and the cuteness of the robots. (Starship Technologies s.a. d.) Press reports indicate common feedback includes a demand for increased anthropomorphic elements, such as facial features, and that in at least one outlet, the robots have been assigned names (Yle 2023 b).

Once again, both utilitarian factors—usefulness and speed—and hedonic factors—cuteness and music selection—can be identified as drivers of acceptance. It can be concluded that, in the case of Starship robots, at least in Estonia and Finland, customers recognize a certain experiential value in their interaction with the robots.

3 Services vs experiences: Entering the experience economy

In 1998, the pioneers of the experience economy Joseph Pine and James Gilmore, proclaimed to the world for the first time that “goods and services were no longer enough”. Their article "Welcome to the Experience Economy," initially published by the Harvard Business Review, laid the cornerstone of a new business paradigm, emerging from the natural advancement of economic progress. In the first paragraph, through their illustrative example of the birthday cake's evolution, the authors introduced a concept that remains a topic of debate nearly thirty years later. This example delineated the four stages of economic progress: baking cakes from scratch in the agrarian economy, utilizing premixed packs in the industrial economy, purchasing ready-made cakes from the bakery in the service economy, and ultimately, outsourcing the entire birthday celebration in the emergent experience economy. This practical visualization served as the first representation of the Progression of Economic Value. (Pine & Gilmore 1998, 97-98.)

3.1 Advancing the Progression of Economic Value

The Progression of Economic Value (see Figure 6) effectively illustrates the aforementioned evolution of economic progress: from the extraction of commodities to the production of goods, the delivery of services, and ultimately, the staging of experiences (Pine & Gilmore 1998, 98). While the distinctions between commodities, goods and services are well-accepted, there remain some ambiguous boundaries between the terms "service" and "experience" and their intersection. Pine and Gilmore (2011, 3) elucidate this distinction by asserting that the purchase of a service includes a “set of intangible activities carried out on behalf of the customer," whereas the purchase of an experience entails a payment for “time spent enjoying a series of memorable events that a company stages […] to engage the customer in an inherently personal way”.

The authors argue that this novel currency—time—creates new value, distinguishing businesses in a saturated market of undifferentiated services, which are increasingly commoditized. In this economic paradigm, services serve as a stage to engage customers in memorable experiences. (Pine & Gilmore 2011, ix-xviii.)

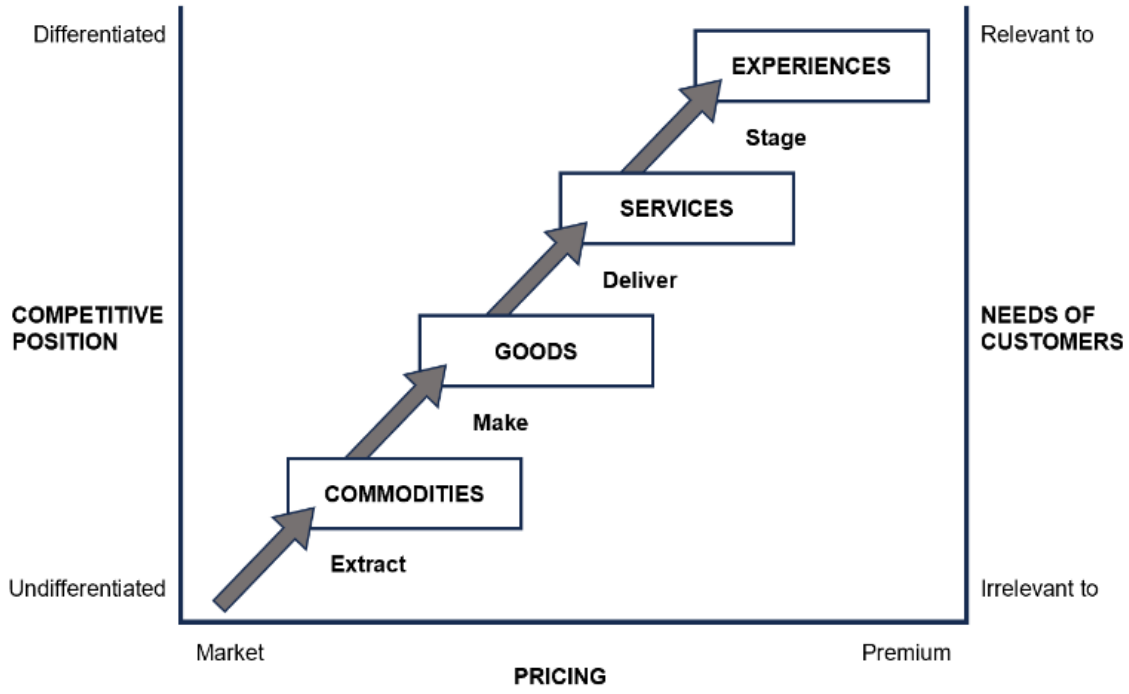


Figure 6 The Progression of Economic Value (adapted from Pine & Gilmore 2011, 34)

Several elements contribute to the initial conceptualization of experiences within the experience economy: experiences are economic offerings wherein customers pay for time, and these must be staged, engaging, memorable and personalized. Furthermore, as the debate evolved, and new disciplines emerged around this paradigm—experience design and management—other scholars have expanded upon or challenged the conceptualization of the term "experience."

Sundbo and Sørensen argue that an experience is "the mental impact felt and remembered by an individual caused by the personal perception of external stimuli." This impact may be entertaining, educational or of a different nature; however, experiences are characterized by their extraordinariness, thereby being out of the ordinary. (2013, 4.) The dichotomy between learning and entertaining stems from the fact that the term "experience" in English contains concepts that have distinct terms in other languages. For instance, in German, "experience" can be translated as "Erlebnis"—enjoyment or feeling—or "Erfahrung"—learning. These linguistic differences may add to the complexity of the conceptualization. (Sundbo 2021, 3.) In this definition, the term "experience" does not refer to a specific economic offering but rather a mental process derived from engaging in what

Pine and Gilmore define as "experience". Sundbo (2021, 10) further explains that this mental process can be conscious or subconscious and can be based on impressions originating from sensory stimuli.

A similar conception based on mental and sensory processes is introduced by Hassenzahl (2010, 8), who defines the term "experience" as "an episode, a chunk of time that one went through—with sights and sounds, feelings and thoughts, motives and actions; they are closely knitted together, stored in memory, labelled, relived, and communicated to others. An experience is a story, emerging from the dialogue of a person with her or his world through action". Hassenzahl's definition reinforces the multisensory and memorable aspects of experience, with particular emphasis on the latter, as experiences appear as files in our memory that can be recalled and shared.

Rossman and Duerden build their definition of experience around the immersion of active participation, asserting that customers are no longer passive service recipients, but rather subjects engaged through willing actions: "Experience is a unique interactional phenomenon resulting from conscious awareness and reflective interpretation of experience elements that is sustained by a participant, culminating in personally perceived results and memories". The authors make a deeper analysis of the definition by differentiating between parts of the experience—anticipation, participation and reflection phases—that are filled with a sequence of interactions with experience elements or microexperiences. These microexperiences can create diverse results depending on the participant's perceptions and reactions, collectively forming the macro-experience. (Rossman & Duerden 2019, 6-11.) This experience breakdown creates a foundational framework for experience design, emphasizing the importance of every environmental interaction throughout the entire journey (see Figure 7).

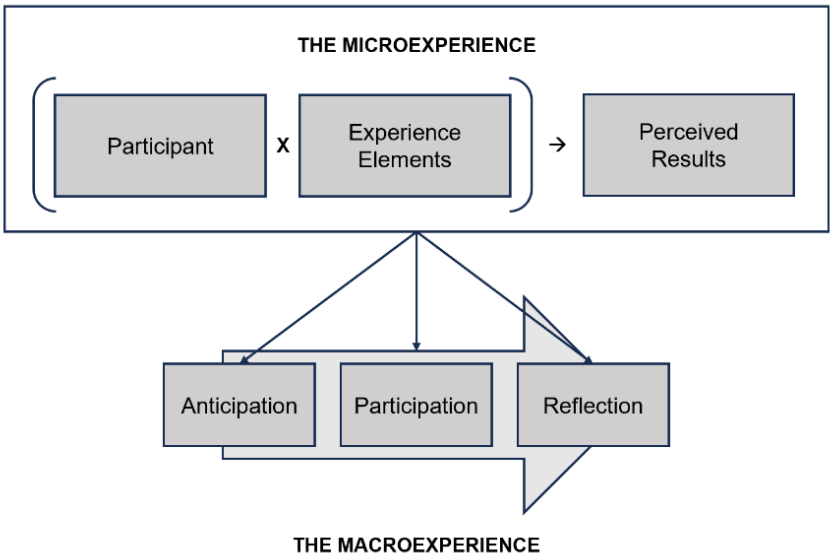


Figure 7 Foundational Experience Components (adapted from Rossman & Duerden 2019, 10)

Starting with these universal conceptualizations of experiences, it is essential to emphasize that the perception of experiences is highly dependent on participants' mood, background and prior experiences, among other factors (Pine & Gilmore 2011, xxi). Consequently, each experience is unique, as it results from the interaction between the designed event and the participant's state of mind (Pine & Gilmore 1998, 99). As observed, the psychological aspect of experiences cannot be underestimated, as perception, evaluation and memorability may, in fact, establish the difference between a service and an experience. For instance, having a coffee brewed by a robotic barista might constitute an extraordinary experience that engages the senses and will be remembered if it is the participant's first interaction with a robot; however, it will likely be perceived as a mere service after this interaction has been repeated for a certain period. Moreover, the perception will naturally differ among a tech enthusiast, a science fiction fan or a 'robophile,' who may find the experience more entertaining, exciting and enjoyable than a 'robophobe,' who would undergo a different mental process during the same interaction.

But why are experiences so relevant in the current context?

Over two decades later, Pine and Gilmore maintain that customers are no longer as willing to invest their time, money and attention on mere services, instead continuously seeking personal and memorable experiences (Pine & Gilmore 2019, x). Sundbo and Sørensen (2013, 8-9) attribute the

rise of experiential consumption to the dissolution of previous economic waves and the evolution of human needs. As basic needs become more easily fulfilled and societies grow wealthier, the demand shifts upwards in the Hierarchy of Needs (Maslow 1943), where experiences align with the higher levels of the pyramid and are thus more likely to enhance well-being compared to material possessions (Hassenzahl 2010, 40).

Experiences are purchased not for their traditional use-value but for their value-in-use, more specifically, their experiential value (Sundbo 2021, 27-28) or their value-in-experience (Kukk & Leppiman 2016). Furthermore, the experience economy serves an increased demand for creative and innovative offerings as it is the only business sector that utilizes creativity and art as foundational elements (Sundbo 2021, 32). This demand impacts not only companies specializing in experiences—such as those in tourism, design, entertainment and culture—but extends across the entire economy. Sundbo and Sørensen (2013, 9-12) distinguish between primary sectors, equivalent to the experience industry, and secondary sectors of the experience economy. Companies in the latter have different primary objectives but are supported by experiential propositions, including design and marketing elements (Sundbo 2021, 40). In fact, the idea that “the experience is the marketing” is central to Gilmore and Pine’s (2002, 3) economic philosophy, as they contend that “the best way to market any offering […] is with an experience so engaging that potential customers can’t help but pay attention—and pay up”.

Holbrook challenges this understanding of the experience economy, arguing that hedonism constitutes an integral aspect of consumption, which he refers to as the experiential view. This perspective, grounded in the principles of consumers' "fantasies, feelings and fun" (Holbrook & Hirschman 1982, 132), manifests in market offerings that are not strictly delineated by stages of economic evolution. Instead, Holbrook argues that "all products involve goods that perform services to provide consumption experiences" (Holbrook 2000, 180).

From a managerial perspective, experiences generally yield a higher return on investment (Pine & Gilmore 2019, xxvii) and provide strategies for companies to ascend in the Progression of Economic Value by integrating experiential elements to boost demand, pricing or both. This strategy can also indirectly commoditize the competition through a clearly distinctive offer based on the staging of experiences. (Pine & Gilmore 2011, 215-216.) Additionally, well-staged experiences contribute to brand loyalty and employee retention, although poorly executed ones can have the opposite, undesired effect (Rossman & Duerden 2019, xiii).

3.1.1 The Realms of the Experience

Building upon the conceptualization of experiences, Pine and Gilmore developed the Four Realms of an Experience, a model that explores the characteristics of experiences and provides a practical classification of them (see Figure 8). The model delineates four distinct categories based on the level of customer participation—passive or active—and the nature of environmental connection—absorption or immersion. These dimensions are categorized as entertainment, educational, escapist and esthetic. (July/August 1998.)

The entertainment realm (passive/absorption) represents the most common and easily recognizable type of experience. In such experiences, participants engage in activities designed to amuse and entertain, assuming a primarily passive role as listeners or observers, as in a theatre play. Participants are absorbed by, rather than immersed into, the environment. Pine and Gilmore explain this level of connection, describing how the experience "goes into" the participant, like when watching TV, and feel absorbed by it. (2011, 46.)

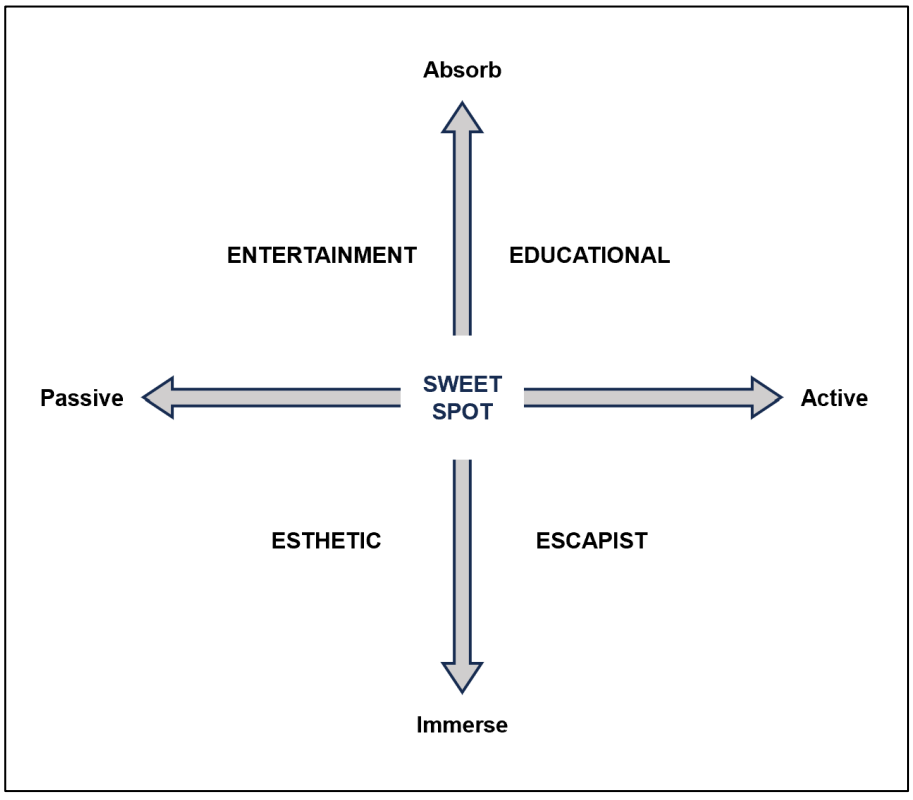


Figure 8 Experience Realms (adapted from Pine & Gilmore 2011, 46)

The educational realm (active/absorption) includes all kinds of learning experiences, regardless of whether they demand physical or mental effort. In educational experiences, participants continue to absorb information from their surroundings as events unfold, yet their level of participation becomes more active. This active engagement is more evident in experiences involving physical activities, such as attending a tennis lesson, but it also manifests in educational activities where participants are primarily watching and listening, such as in a classroom setting. Rather than passively receiving information, participants are actively engaged in processing it. (Pine & Gilmore 2011, 47-49.)

The escapist realm (active/immersion) contains experiences that transport participants out of their ordinary world. In contrast to entertaining and educational experiences, these are immersive: rather than the experience going into the participant, the participant goes into the experience (Pine & Gilmore 2011, 46). Escapist experiences involve active participation in activities and settings that drift from the participant's routine, regardless of whether they are natural, artificial or digital. Examples include visiting theme parks, engaging with a spaceship simulator or chatting online. In escapist experiences, active participation entails co-creating the experience, as it would be fundamentally different without the participant's input. (Pine & Gilmore 2011, 49-53.)

Lastly, the esthetic realm (passive/immersion) includes experiences that immerse participants in environments that are minimally or not at all alterable, therefore impeding active participation. Similar to escapist experiences, settings within the esthetic realm can vary in nature. (Pine & Gilmore 2011, 53-56.) For instance, an esthetic experience may include wandering through the Louvre Museum or admiring the breathtaking beauty of the aurora borealis. In these examples, the environment cannot be modified in any way, yet participants still feel a deep sense of immersion due to sensory stimulation.

Oh, Fiore & Jeoung (2007, 121) interpret the realms as representing experiences of "being entertained", "learning something new", "diverging into a new self" and "indulged in environments". However, experiences are rarely confined to a single realm, as they often contain elements from many of them. Typically, aspects of entertainment are incorporated into most experiences, and many of the previous examples cannot be strictly categorized within a single realm. For instance, a visit to the Louvre may be primarily an esthetic experience, but it can also serve an educational purpose. Similarly, attending the theatre is predominantly entertaining but can also be esthetic and, consequently, immersive. The authors argue that the most memorable experiences are those that integrate elements from all the realms, providing a balance in the level of participation and absorption-immersion, which they refer to as "the sweet spot" (Pine & Gilmore, July/August 1998).

Although a very popular theory of the experience economy, scholars generally concur that the empirical evidence supporting the applicability of the Realms of the Experience remains limited. A key challenge lies in the model's lack of operability for empirical research (Mehmetoglu & Engen 2011, 239). The few studies that have examined this theory often supplement it with additional analytical tools, and their application spans diverse sectors—such as tourism, hospitality, culture and events (Mehmetoglu & Engen 2011, 245-253; Oh et al. 2007, 123-129; Radder & Han 2015, 458-466; Sipe & Testa 2018, 185-190). This dispersion results in the existing research being insufficient for drawing strong conclusions, despite the model's widespread acceptance across various experience-oriented industries.

3.1.2 Mass customization

As previously stated at the beginning of this chapter, one of the distinguishing characteristics of experiences within the experience economy is personalization. Pine and Gilmore argue that when goods are customized, they become services, and when these services are further personalized, they transform into experiences. The process of creating offerings that are more relevant to the needs and desires of customers effectively advances companies upward in the Progression of Economic Value. (2011, 110.)

The term “mass customization,” which combines two seemingly contradictory business processes—mass production versus the customization of goods and services—was first formulated by Stanley David in 1987 in his book Future Perfect (Pine 1993, 48) and was employed years before the rise of the experience economy (e.g., Pine 1993; Gilmore & Pine January/February 1997). Later, this new paradigm—which aims to combine the cost-effectiveness of mass production with the benefits of customization to gain a competitive edge—was introduced with the same purpose in the emerging experience economy (Pine & Gilmore 2011, 111).

The mass customization process relies on the modularization of offerings, involving customers as participants in designing the final product. Pine and Gilmore compare this process to Lego bricks, which come in various shapes, sizes and colours but can be assembled into a cohesive final creation. This process requires what the authors term “environmental architecture,” which consists of a “design tool” that aligns customer demands with the company’s capabilities; and a “designed interaction,” an experience within the experience where customers choose their preferences. (2011, 111-113.) According to Merle, Chandon and Roux (2008, 41), the mass customization process includes two key components of perceived value: the value of the mass-customized product and the

value derived from experiential co-design. These components are further manifested through five distinct dimensions: utilitarian value, uniqueness, self-expressiveness, hedonic value and creative achievement.

Moreover, Pine and Gilmore introduce four distinct types of mass customization processes, categorized based on the nature of customer sacrifices they entail. These processes are termed collaborative, adaptive, cosmetic and transparent customization (January/February 1997).

In collaborative customization, the product—be it a good, service or experience—does not pre-exist; instead, it is developed through a dialogue with the customer that helps the company identify their needs and create the product accordingly. Conversely, adaptive customization occurs when a standard product is modified to align with customer demands. Cosmetic customization involves a personalized presentation of an already designed product, and finally, transparent customization takes place when companies offer personalized products without explicitly informing the customers of their customization. (Pine & Gilmore January/February 1997.)

This mass customization approach presents an opportunity for experience co-creation, a feature increasingly prevalent in the experience economy (Sundbo 2021, 34), thereby enriching the experiential value of the offering (Pine & Gilmore 2011, 116).

3.1.3 The Performance Model

The Progression of Economic Value not only delineates the evolution of economic offerings throughout history but also their respective economic functions: commodities are extracted, goods are made, services are delivered, and experiences are “staged.” In the experience economy, sellers are considered “stagers” and buyers “guests”. (Pine & Gilmore July/August 1998.) The authors emphasize the significance of this paradigm shift through their influential work “The Experience Economy: Work is Theatre and Every Business a Stage”. They maintain that this new economic offering requires a novel business model wherein work is perceived as an ongoing performance, with processes taking the shape of scripts and employees playing roles like theatre actors. The so-called Performance Model (see Figure 9) draws upon dramatic concepts associated with theatre, not merely as a metaphor but as a new business model that emphasizes “the quintessential dramatic nature of an enterprise”. (Pine & Gilmore 2011, 151-167.)

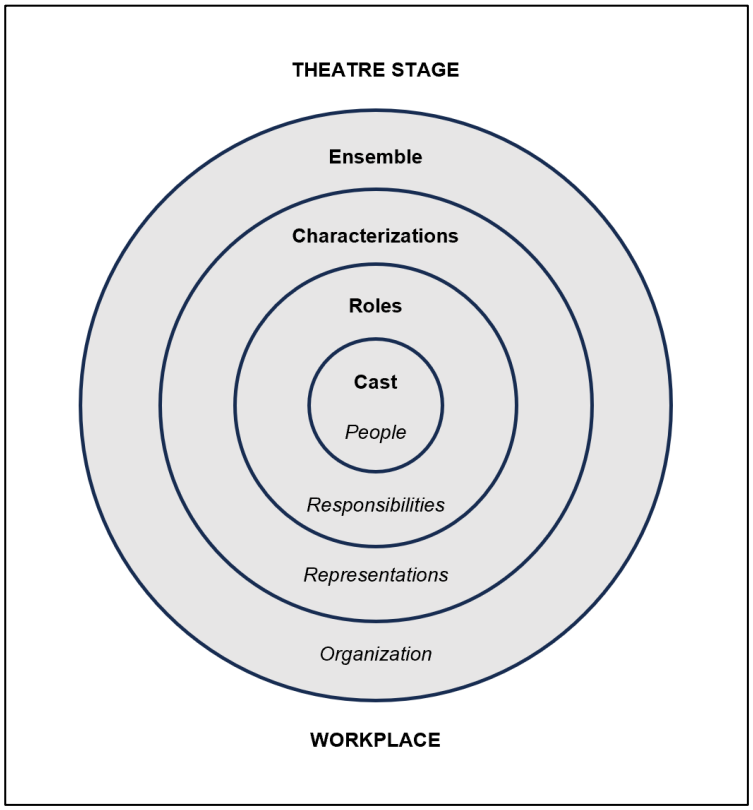


Figure 9 The Performance Model (adapted from Pine & Gilmore 2011, 211)

At the core of the Performance Model, employees are regarded as the "cast," playing roles regardless of whether these involve direct interaction with experience guests. A significant aspect of business success depends on the meticulous selection of human resources, which functions as a casting process. Responsibilities are thus viewed as “roles” to be played, requiring clarity and definition to develop a credible “characterization”. Collectively, these characterizations form an “ensemble” (organization). In summary, “a company’s cast must take on roles by each making choices to develop a compelling characterization that forms a cohesive ensemble, engaging guests in memorable ways”. (Pine & Gilmore, 2011, 210-214.)

Similarly, Sundbo and Hagedorn-Rasmussen utilize additional concepts from theatre to explain the process of experience production, dividing responsibilities between backstage and frontstage roles. The backstage, consisting of management, and the frontstage, made up of the artists, form two integral parts of a whole that, despite occasional conflicts, are interdependent. (2008, 83-102.) Rossman and Duerden (2019, 29) introduce a new element to the model, connected to the

previously mentioned co-creation, wherein participants (guests) also play a role, dynamically altering the script in real time.

3.2 Experience design

If defining 'experience' within the context of the experience economy proved to be complex, conceptualizing 'experience design' presents an even more challenging task. In this case, additional layers of complexity emerge as the term is often confused with a multitude of other disciplines or varied experience design approaches, such as service design (the design of service encounters), customer experience design (customer-company interactions), and user experience (UX) design (human-computer interaction) (Rossman & Duerden 2019, 13).

Excluded these other concepts from the scope of experience design within the experience economy, scholars' definitions still fluctuate between a business-driven perspective and a human-centred approach. For instance, Newbery and Farnham (2013, 64) define experience design as a "strategic framework that allows a business to collaborate more effectively with design with the goal of creating value and engaging customers, even as the larger environmental context changes". This conceptualization aligns with Pine & Gilmore's initial theorization of the experience economy, as it is built on the idea of experience design as a business strategy aimed at differentiating companies from the competition through increased value and engagement.

More frequently, definitions of experience design centre around aspects of the design process. While user design focuses on interactions between humans and computers, and customer experience design addresses interactions between companies and customers, the design of experiences involves considering the interactions between participants and the environment, the space and the people engaging in the experience. For Rossman & Duerden (2019, 14), experience design is "the process of intentionally orchestrating experience elements to provide opportunities for participants to co-create and sustain interactions that lead to results desired by participants and the designer". In this definition, experience design does not focus on developing a final experiential product, but on generating tools for participants to create their own experiences, akin to Hassenzahl's definition of experience as a story, a conversation between the participant and their interaction with the environment (2010, 8). Similarly, Tussyadiah's (2014, 546-547) approach to designing experiences once more involves developing "the prerequisites that enable consumers to have desired experiences," emphasizing the importance of connected disciplines that help understand human behaviour, such as psychology, ethnography and cultural or linguistic sciences. Furthermore, Sundbo

(2021, 85) argues that the core of experience design is a combination of psychology and marketing, with the latter considering the size and location of the market.

The relevance of psychology and understanding human behaviour as a basis for creating meaningful experiences is so evident that most authors (Pine & Gilmore 2020, xiv; Rossman & Duerden 2019, 17-19; Sundbo 2021, 48-50; Tussyadiah 2014, 547), draw on the Theory of Flow (Csikszentmihalyi 1990) to understand the requirements of optimal experiences as drivers of happiness. Csikszentmihalyi's theory is based on a balance between the participant's skills and the challenges presented, stating that a combination of high challenge and low skills would create anxiety, while a low challenge with high skills would result in boredom. Finding the right amount of challenge for the level of skill and maintaining it consistently is key to creating positive experiences. (1990, 71-77.) Rossman & Duerden (2019, 17) refer to this theory when they state that children naturally play to find their flow—the equilibrium between overstimulation and understimulation—and as adults, we seek the same balance.

In addition to the human-centred approach, Tussyadiah incorporates the iterative nature of the process and the holistic character of the experience as foundational elements of the Designing and Design Research process—a framework developed for the design of tourism experiences. The integration of these three fundamental approaches introduces additional concepts such as participatory design and integrative research. A key aspect of Tussyadiah's model is the active involvement of participants in the design of experiences; they are engaged in every part of the process, generating ideas, testing and providing feedback. (2014, 552-555.)

Other authors incorporate tools from various disciplines, such as the elaboration of customer personas and journey mapping, to create more complex frameworks (Newbery & Farnham 2013, 132-164; Rossman & Duerden 2019, 88-102). For instance, Rossman & Duerden's (2019, 103-121) framework is developed as a combination of touchpoints and transitions, employing detailed touchpoint templates as a basic tool for the design of experiences.

Moreover, some authors focus on elements that form or enhance an optimal experience. Examples include THEME-ing, an acronym representing the five essential elements of experiences according to Pine and Gilmore (2011, 65-92)—theme the experience, harmonize impressions with positive cues, eliminate negative cues, mix in memorabilia, and engage all five senses—or Tarssanen and Kylänen's Experience Pyramid (2007), a complex tool that offers an experience analysis to identify weak points and ways to improve them.

3.2.1 The Experience Pyramid

The Experience Pyramid is a model originally conceptualized by Tarssanen and Kylänen that serves as a basis for the analysis of experiences within the tourism industry—a sector profoundly dependent on the staging of experiences that has inspired numerous frameworks in the context of experience design. According to the authors, the pyramid exemplifies the "perfect product" and aims to identify weak elements or flaws in the designed experience, providing guidance on how to rectify them. At the base, six elements appear as fundamental features of every experience, and they are combined with the five levels of customer experience along the vertical axis (see Figure 10). (Tarssanen & Kylänen 2007, 134-139.) Although initially developed as an analytical instrument, the pyramid effectively functions as a design tool, offering a comprehensive overview of the elements that constitute the ideal experiential product and serving as guidance during the ideation stages of the design.

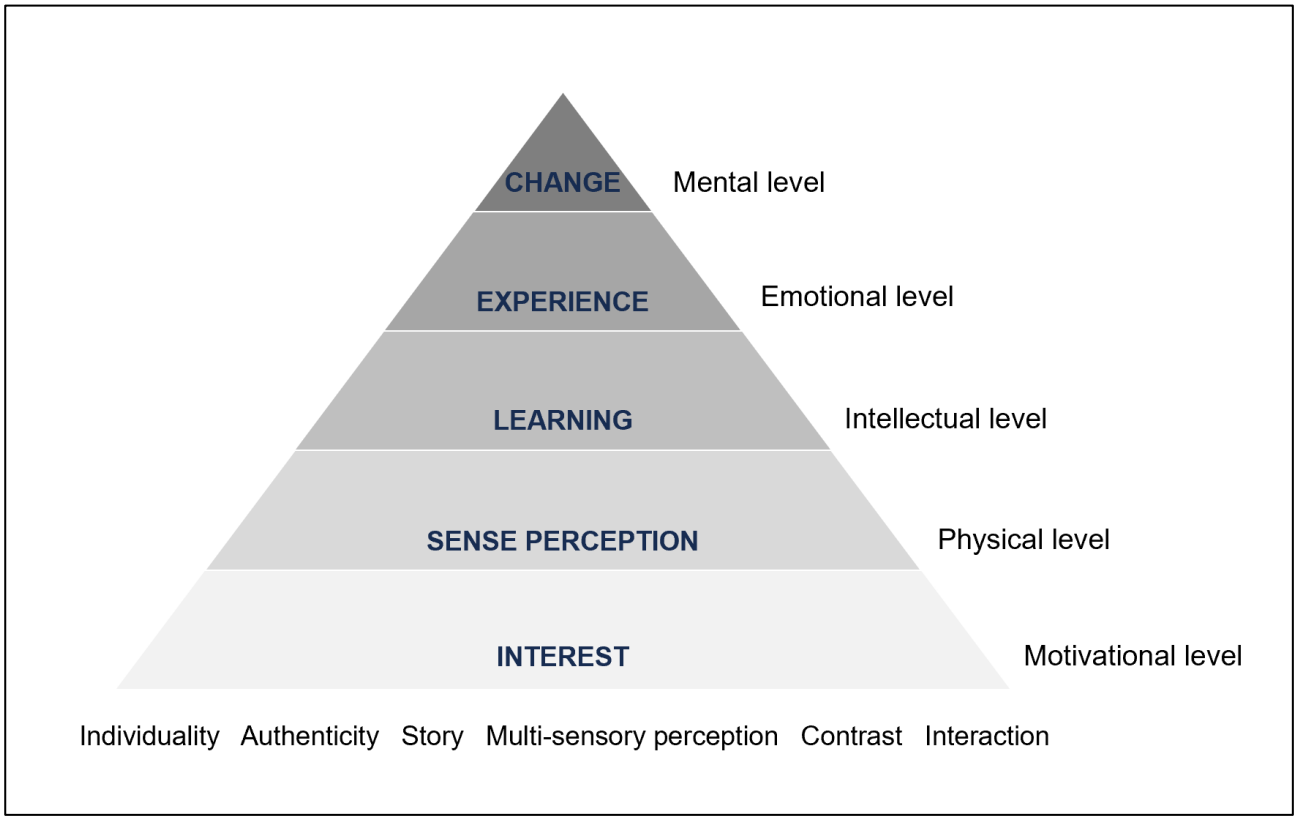


Figure 10 Experience Pyramid (adapted from Tarssanen & Kylänen 2007, 139)

The six elements or "influential factors" are individuality, authenticity, story, multi-sensory perception, contrast and interaction. When present, they increase the emotional impact, uniqueness and memorability of the experience. (Tarssanen & Kylänen 2007, 139-140.)

Individuality refers to the unique nature of the experience, indicating that it is one-of-a-kind and unlike any other product on the market. This uniqueness adds value, as customers feel special when involved in exclusive experiences, particularly those that are personalized for them. The authors emphasize the importance of customization, recommending proper segmentation and pricing to maintain affordability while recognizing the challenge of preserving product uniqueness as costs rise with higher levels of personalization. (Tarssanen & Kylänen 2007, 140-142.)

By authenticity, the authors refer to the credibility of the experience, not as a synonym for genuine, which is presented as the official version of regional culture and traditions. An experience is deemed authentic when customers perceive it as such, aligning it with their own preconceptions and perceptions. (Tarssanen & Kylänen 2007, 142-143.) In the field of service robotics, authenticity is framed as contrasting with automation, as human employees are regarded as carriers of authentic cues (Seyitoğlu 2021, 3). However, in experiences where the primary element is the interaction with a robot, the heritage aspect of traditional conceptions of authenticity should probably be disregarded, with the focus placed solely on what customers perceive as authentic.

The element of authenticity is intrinsically linked to the story, another foundational feature of the pyramid, as stories serve to connect the experience with reality. Authentic, believable stories are crucial for maintaining the product's cohesiveness. The authors emphasize the significance of storytelling in imparting meaning to the experience and strengthening its memorability, as well as connecting all its elements. (Tarssanen & Kylänen 2007, 144-145.)

Next, Tarssanen & Kylänen (2007, 145) introduce the concept of multi-sensory perception, insisting that experiential products should provide varied sensory stimulation. The more senses involved, the higher the likelihood of increased memorability, provided the sensory cues are harmonized with the experience's theme. In the context of experiences with ADR, the most prominent sensory cues are derived from touch, sight and sound. While smell may be present depending on the nature of the products ordered, it is not a controllable variable; taste, on the other hand, is likely to be engaged only after the interaction with the robot has concluded. Hultén conceptualizes sensory cues as "sensors" and provides a detailed taxonomy of relevant sensors that contribute to enhancing the multi-sensory brand experience. For sight, these include design, packaging, style, colour, lighting, themes and graphics. For sound, key elements involve music, jingles, voices,

atmospheric sounds and attentiveness. For touch, the contributing factors include material, surface texture, temperature, weight, form and stability. (2011, 265–267.)

Contrast, in this context, parallels the concept of escapism described by Pine and Gilmore (July/August 1998) in the Experience Realms. It refers to the experience as an event that disrupts the customer's regular routines, offering an opportunity to engage in something different, extraordinary and free from the constraints of daily habits (Tarssanen & Kylänen 2007, 145-146).

Finally, the authors refer to the element of interaction, which in this case is restricted to the social dimension, including communication with experience stagers and fellow participants. This interactivity nurtures a sense of integration and acceptance among customers, enhancing their social status by connecting them with the group. (Tarssanen & Kylänen 2007, 146-147.) Eide & Mossberg (2013, 253) expand this interaction beyond the staff and other participants in the experience, including other humans, animals, objects and oneself.

The vertical axis of the pyramid represents the five levels of customer experience and the associated mental processes. From bottom to top, the motivational level represents the awareness and interest of customers in selecting the product, essentially marketing. One step up is the physical level, where customers engage with the environment of the experience. This stage involves moments of realization and recognition. Practically, key aspects of this level include the physical safety and comfort of the customer, unless the experience intentionally aims for the opposite effect. (Tarssanen & Kylänen 2007, 147-148.)

Above it is the intellectual level, which involves the processing of all information received at the physical level. During this stage, customers learn about the experience, acquire new information, and form opinions. Another step up is the emotional level, where customers actually experience the event. At this stage, positive emotions surface, provided the correct functioning of the previous levels. Even in experiences designed to enhance customer discomfort (e.g., a terrifying one), there should be a positive response, whether it be excitement, achievement or pure joy. (Tarssanen & Kylänen 2007, 148-149.)

Finally, at the top of the pyramid, the mental level represents the potential transformation of customers through profoundly meaningful experiences that lead to permanent changes in habits or opinions. Needless to say, this level is by far the hardest to achieve, as transformations require the awakening of incredibly powerful emotional responses, not merely basic contentment or enjoyment. (Tarssanen & Kylänen 2007, 149.)

The pyramid's application involves analysing the six elements across the five experience levels. The authors maintain that high-quality experiential products should contain all these elements at every level (Tarssanen & Kylänen 2007, 147).

3.2.2 THEME-ing

Another theory that defines the elements constituting a successful experience was already presented by Pine and Gilmore in their seminal article in the Harvard Business Review. At the time of introducing the experience economy, the authors also provided several methodologies for adopting the concept, one of which is THEME-ing, or the “five key experience-design principles (Pine & Gilmore July/August 1998).

The first component of this acronym, “T,” stands for “theme the experience.” A theme is defined as “a dominant idea, organizing principle, or underlying concept for every element in the experience.” Themes function in a manner akin to stories within the Experience Pyramid, creating cohesive concepts around which customers can organize their impressions, thereby enhancing the memorability of the experience. Themes should be compelling, succinct and consistently maintained throughout the experience. They should alter the perception of reality, modifying the dimensions of the experience: space, matter and time. Additionally, to avoid an artificial construct, themes should resonate with the character of the company; they are inherently present, and the challenge lies in identifying them. (Pine & Gilmore July/August 1998; 2011, 67-78.)

“H” signifies “harmonize impressions with positive cues.” Pine and Gilmore define impressions as the “takeaways of the experience,” essentially the feelings or opinions that unconsciously surface post-experience. Stagers should incorporate positive signals—cues—that will shape the impressions forming the customer's experience. These cues can be found in the environment or in the interaction or behaviour of stagers, and they need to be clear and consistent with the theme. Consequently, “E” represents “eliminate negative cues,” as unnecessary, confusing or poorly designed cues, regardless of their minimal appearance, can lead to no impression or, worse, an undesired one. (Pine & Gilmore July/August 1998; 2011, 78-84.)

“Mix in memorabilia” refers to the letter “M” and concerns the provision of “physical reminders of an experience” (Pine & Gilmore July/August 1998). A souvenir serves as a keepsake, a memory a customer chooses to purchase to remember and share a positive experience, thereby extending it beyond its temporal limits (Pine & Gilmore 2011, 85-88). In the contemporary context, the notion of

memorabilia extends to embrace the digital transformation influencing customers' behaviour. Today, customers seek virtual memories that can be shared online, such as pictures, videos, reels and stories. Companies should thus orchestrate the means to provide these digital keepsakes (Pine & Gilmore 2019, xvi).

This inclination to share personal memories was already anticipated by Holbrook at the beginning of the millennium. In his analysis of the interplay between the loss of privacy and the rise of voyeurism, Holbrook suggested that these trends would encourage customers to embrace a form of exhibitionism, showcasing their purchasing behaviours and lifestyles with boundless potential: “their lives as consumers will become open books for all to admire” (Holbrook 2001, 82). Two decades later, this projection has been substantiated by the widespread social media phenomenon and the emergence of concepts such as “shared media” in digital marketing (Macnamara, Lwin, Adi & Zerfass 2016, 378).

Finally, the second “E” stands for “engage the five senses” (Pine & Gilmore July/August 1998), highlighting the importance of enhancing multi-sensory perception—an element already articulated in the Experience Pyramid, which is widely recognized by scholars as crucial to the memorability of experiences.

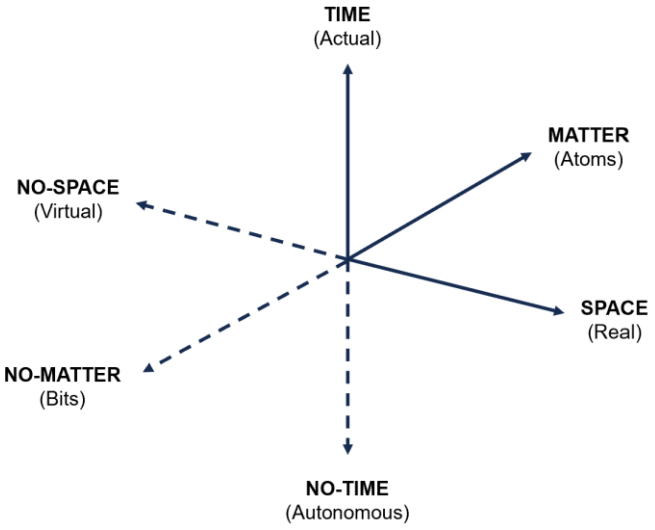
As illustrated by these theories—THEME-ing and the Experience Pyramid—different authors present distinct elements or principles that constitute an ideal experience. Given that these elements may impact various dimensions, it is crucial for designers to select and combine the appropriate ones to achieve an optimal outcome.

3.2.3 The Multiverse

Pine and Korn introduce an advanced perspective in the design of experiences by exploring the potential of combining their dimensions: time, space and matter. These dimensions, when combined, create six variables—time and no-time, space and no-space, matter and no-matter—which merge into eight realms forming the multiverse (see Figure 11). Between the extremes of reality and virtuality lie six intermediary realms, each differing in one or two dimensions from these poles: substance (material vs. digital), place (real vs. virtual) or event (actual vs. autonomous). (2011, chapter 1.) This model serves as a tool for experience designers to explore the combination of several of these realms within a single experience, thereby increasing the number of touchpoints within the customer journey.

In the case of this study, it could be stated that the interaction with ADR naturally falls within the realm of reality, where matter is present in the form of a robot and an order, the location is at the pickup point, and the time is bound to the moment the order is placed. According to Pine and Korn (2011, chapter 2), reality remains the richest of all realms within the multiverse, as it facilitates a multi-sensory approach engaging both body and mind.

Moreover, the interaction with ADR also occurs in a secondary, less obvious realm of the multiverse, as orders are placed through an application that allows tracking of the robot's journey. Customers using the tracker undergo an experience classified within the realm of mirrored virtuality, characterized by the absence of matter (customers visualize the trajectory digitally but cannot physically interact with it), absence of space (existing as a virtual place—the app), yet still bound by time to the moment of the order. Mirrored virtuality "creates a virtual expression of reality that unfolds as it actually happens, providing a particular bird's-eye view" (Pine & Korn 2011, chapter 10). The proximity of mirrored virtuality and reality is so profound that the experience with ADR presents a situation where both can be simultaneously lived: customers awaiting the robot to retrieve the order can visualize it in both virtual and real dimensions. This scenario exemplifies the model's elasticity, designed to reflect the infinite possibilities offered by the combination of these variables (Pine & Korn 2011, chapter 1).



THE EIGHT REALMS OF THE MULTIVERSE			
Variables			Realm
Time	Space	Matter	**Reality**
Time	Space	No-Matter	**Augmented Reality**
Time	No-Space	Matter	**Physical Virtuality**
Time	No-Space	No-Matter	**Mirrored Virtuality**
No-Time	Space	Matter	**Warped Reality**
No-Time	Space	No-Matter	**Alternate Reality**
No-Time	No-Space	Matter	**Augmented Virtuality**
No-Time	No-Space	No-Matter	**Virtuality**

Figure 11 The Multiverse (adapted from Pine & Korn 2011, chapter 1)

The theories and models presented in this chapter offer but a glimpse into the extent of the discipline of experience design. As illustrated, these theories exhibit varying approaches and objectives, necessitating diverse combinations based on the nature of the experience being designed. The tools selected for this study have been meticulously curated to form a cohesive whole that complements the theories of customer acceptance of ADR, integrated into the author's framework presented in the subsequent chapter.

4 Experience economy, food delivery & robots

If food delivery ever had an experiential value, it has now largely disappeared. The pandemic-induced surge in food delivery and its subsequent stabilization confirm the commodified nature of this service, which is predominantly utilized by customers to satisfy either the basic need for nourishment or the more hedonic desire for culinary pleasure. This service, typically managed by a platform connecting the involved parties, consists of a courier who retrieves an order from a food establishment and delivers it to the final customer. It represents a straightforward transaction with minimal engagement, aside from potential brand loyalty, wherein customers pay for delivery purely for its use-value.

ADR introduce a disruption to this paradigm. The insufficiency of research on motivational factors raises several questions regarding why customers might prefer automation over traditional human courier delivery. Do customers choose robots out of convenience, entertainment, or a blend of both? Is there an additional value-in-use when customers opt for robots for their deliveries?

Currently, food delivery with ADR is not designed as an experiential offering, yet incipient signs of change are evident. In Finland, some robots play music upon arrival, occasionally selected by customers (Starship Technologies s.a. d), representing a very basic approach to co-creating an experience. Additionally, some robots feature design modifications, such as stickers displaying non-permanent facial features or decorations (S-Kaupat 2024). Popular feedback seems to be positive (Starship Technologies s.a. d), with calls for more experiential elements (Yle 2023 b). However, companies largely rely on the novelty of this service to generate customer excitement, where the interaction might be perceived as an experience merely because the delivery is performed by robots rather than humans.

Nevertheless, experiences, particularly those that occur incidentally without deliberate design, can also become commoditized (Pine & Gilmore 2011, 243). Technological products and services rapidly transition from initial hype to eventual rejection or commoditization (Hoffmann & Prause 2018, 245). Illustrative is Wirtz et al.'s (2018, 912) example of ATMs, which surged in popularity and replaced human employees, only to become a basic service. Food delivery operated by robots could follow a similar trajectory, evolving into a successful service, but even its use-value is debatable within the current context. ADR are often perceived as cute pseudo-social agents, yet numerous factors challenge their efficiency, presenting both physical and psychological accessibility limitations (Dobrosovestnova et al. 2022, 1026-1027). In this highly digitalized world, avoiding a poor customer experience is critical, as negative feedback can rapidly proliferate via social media

(Rossman & Duerden 2019, 7), potentially modifying attitudes towards robots and jeopardizing the success of a concept still in development.

Integrating experiential elements into the current ADR offering could enhance its hedonic dimension, providing customers with additional engagement to compensate for its existing limitations. Food delivery with robots could become part of the experiential secondary sector, where value-in-use might equal or even surpass use-value, by incorporating experience design elements. Theoretically, this shift in the conceptualization of the service could boost demand, increase brand loyalty and ultimately ensure the survival of ADR beyond the initial hype.

4.1 Author's framework

This study aims to integrate theories of experience design and service robot acceptance to create a framework that combines their approaches to enhance experiential value and customer acceptance of ADR. Elements from experience design theories and models have been selected based on their potential impact on aspects associated with customer acceptance, namely perceived enjoyment and ease of use (Technology Acceptance Model, TAM, Davis 1989; Davis et al. 1992), perceived humanness and social interactivity (Service Robot Acceptance Model, sRAM, Wirtz et al. 2018), aesthetics, manipulability, formality and technology readiness (Three-Part Framework, Belanche et al. 2020).

This framework has been constructed around the hedonic dimension of the customer experience with ADR. Rather than increasing its utilitarian value, more frequently researched, the aim is to introduce the concept of experiential value into the offering. Consequently, aspects such as perceived usefulness (TAM, Davis 1989) are not included in the framework. Additionally, aspects not directly related to this specific type of robot, such as perceived social presence (sRAM, Wirtz et al. 2018), robot notification and information provision (Three-Part Framework, Belanche et al. 2020), are excluded. Uncontrollable features such as personality traits and customer tier (Three-Part Framework, Belanche et al. 2020) are also omitted.

Experience design tools have been chosen considering the realms in which the experience with ADR naturally falls. Primarily, it is an entertaining experience (Experience Realms, Pine & Gilmore July/August 1998) developed in the reality realm during the order pickup and secondarily in the mirrored virtuality realm within the app (Multiverse, Pine & Korn 2011). The experience cannot be considered aesthetic or escapist, as the pickup location is an uncontrollable variable, often the

customer's home or workplace. It could present a contrast (Experience Pyramid, Tarssanen & Kylänen 2007) as the proposal aims to create a distinctive experience different from customers' regular routines, an overarching principle of the design. Moreover, there is a small educational component in the experience, as customers learn how to interact with the robots—unlock the hatch, retrieve the order, send the robot back—, but this element belongs more to the intellectual level of the Experience Pyramid than to an educational realm.

The design aims to increase the individuality of the offering, creating a unique delivery experience in a landscape where this task is still mainly executed by human couriers. Furthermore, it also addresses a future where more companies introduce ADR in their proposals. When robots need to differentiate from one another, choosing an experiential approach could aid in commoditizing the competition. Multi-sensory perception, as a fundamental component of memorable experiences, and interaction, as a means of enhancing perceived social interactivity, are also among the features incorporated into the framework (Experience Pyramid, Tarssanen & Kylänen 2007).

Additionally, three elements from THEME-ing (Pine & Gilmore July/August 1998) are introduced to reinforce the engagement and memorability of the experience with ADR: the selection of a theme that ensures the cohesiveness of the proposal, the introduction of additional positive cues and a digital approach to memorabilia.

Furthermore, two tools are particularly predominant in the design of these elements: cosmetic customization (Mass Customization, Pine & Gilmore 2011) and characterization (Performance Model, Pine & Gilmore 2011). The justification behind these choices is the author’s aim to introduce experiential elements that do not generate budget constraints and involve minimal robot design modifications, proving that a creative approach can be cost-effective and respectful of the original product.

Together, these theories and elements constitute the framework that inspires the proposal designed to add an experiential layer to the current experience with ADR. A summary of the framework is visually presented in Figure 12.

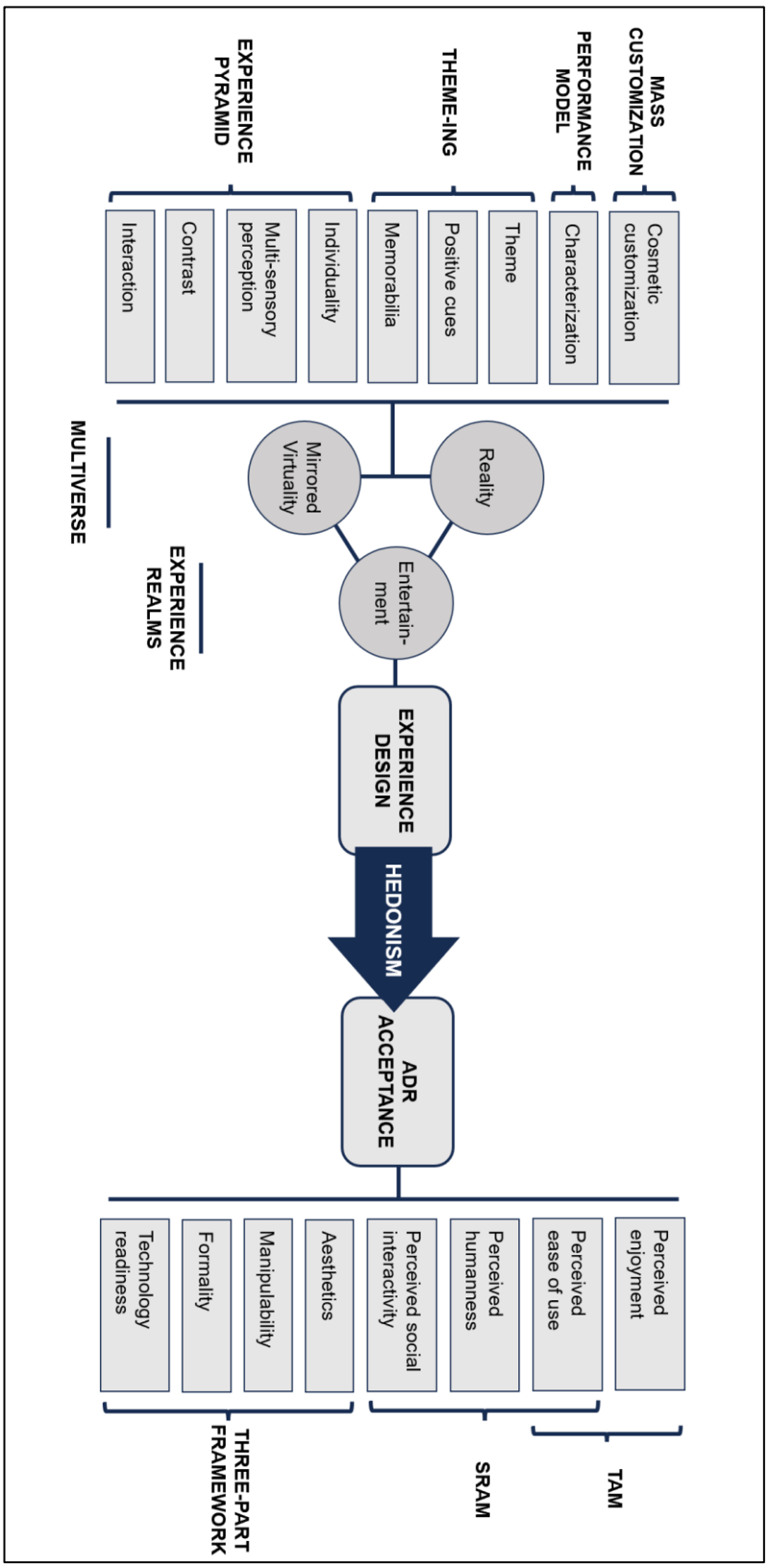


Figure 12 Author's framework

4.2 Design of experience elements for automated food delivery

In the field of experience design, one of the initial steps in the research phase is to identify the target audience for the experience, typically achieved through the creation of a customer persona. In the context of this study, developing a customer persona presents a challenge due to the limited information available regarding typical users of this service and their motivations. S-Group identifies three demographic segments: families with children, young individuals from single households, and people aged 25 to 44 years (Starship Technologies s.a. d). Martinez et al. (2023, 418) assert that groups of adults are more likely to utilize robot delivery services than individuals. It remains unclear who should be the primary target for this design; therefore, this study adopts an approach that shifts focus from building the experience around personas to constructing it around the theme.

4.2.1 Robotic cuteness

It is increasingly acknowledged by both the media and academia that customers who use ADR and bystanders tend to perceive these robots as "cute," often using this adjective in combination with diminutive nouns or terms such as "little" or "adorable" (Dobrosovestnova et al. 2022, 1026). "Cuteness," defined as the quality of being "attractive or pretty, especially in a childish, youthful or delicate way" (Merriam-Webster 2024), is a feature prominently utilized in other types of robots, such as companion robots (Caudwell, Lacey & Benítez Sandoval 2019, 71) and has been a topic of research for both embodied and disembodied AI applications. As a result, cuteness appears to increase the willingness to use disembodied applications when performing emotional tasks, while it diminishes this willingness when the task is knowledge-based, as cuteness reduces performance expectancy (Lv, Luo, Liang, Liu & Li 2022, 10). This diminished performance expectancy is also evident in robots with cute anthropomorphic features, as opposed to those with a mechanical appearance. Cute features in service robots tend to increase positive emotions, and customer acceptance is higher for mascot-looking robots—with animal or cartoonish features—that utilize humour in their interactions (Zhang, Gursoy, Zhu & Shi 2021, 3893-3897). Furthermore, cuteness seems to influence customers' responses to technology service failure by increasing their tolerance levels, a phenomenon referred to as "the cuteness effect" (Lv, Liu, Luo, Liu & Li 2021, 12).

Although the tasks performed by ADR are primarily functional, the experiential elements aim to enhance their emotional impact, thereby increasing enjoyment and engagement throughout the experience. Theoretically, it seems logical to amplify the cute features of these robots to boost

acceptance and intention to use. Dobrosovestnova et al. (2022, 1028) even propose exploring an approach to the concept of *kawaii*, defined as "the Japanese culture or style of cuteness, often involving simple drawings of small people, animals, and things" (Cambridge Dictionary 2024), frequently "endowing seemingly mundane things with personality" (Merriam-Webster 2024). The potential side effect of decreased performance expectancy appears to be an already accepted reality, as ADR are often perceived as weak and in need of assistance (Dobrosovestnova et al. 2022, 1027).

Considering all these factors, it seems natural that "robotic cuteness", an inherently present quality, should be the central theme or common thread of the experience elements to be tested.

4.2.2 Experience touchpoints

This study's proposal involves the testing of twelve experiential elements incorporated into the main delivery experience using ADR. Other stages of the customer journey, such as awareness, consideration, feedback and advocacy, have been intentionally excluded from this research's scope due to the study's extensive nature.

The current customer experience begins with the opening of the food delivery application and the initial selection of the robot option. Subsequent touchpoints include the selection of items, payment, and a series of notifications, including a delivery confirmation and information regarding the robot's departure. From this point until the robot's arrival, live tracking is enabled. As the robot approaches, an arrival notification is sent to the customer. Upon encountering the robot, retrieval instructions are provided to the customer, who then opens the hatch, retrieves the order and closes the lid. The robot subsequently expresses its gratitude to the customer, who then selects the option to send the robot back to the restaurant or store.

These touchpoints represent the typical journey of Starship robots operated by S-Group in Finland. The music feature is not included because it did not appear as an option in any of the three deliveries conducted for this study.

The proposed experience elements have been designed around the concept of "robotic cuteness" with the objectives of enhancing the robots' likeability, offering basic possibilities for personalization and co-creation, and increasing interaction as a means to boost entertainment and customer

engagement. These elements have been classified into three categories: robot design, delivery experience and app interaction.

In the first category, robot design, the experience elements aim to introduce some level of personality to the robots, thereby increasing their perceived humanness and social interactivity. The proposed elements are as follows:

- **Name**: Currently, the robots do not have individual names and are popularly known as “Alepa robots”. Assigning individual names to the robots serves as a form of characterization, aligning them with an assumed role of machine-employee. In some stores in Finland, employees working with robots have been naming them, demonstrating empathy and enhancing their perceived humanness (Yle 2023 b).
- **Facial features**: Adding stickers to the front of the robots is an inexpensive method of enhancing their fictional personality, aligning with the concept of *kawaii*. This aesthetic modification may also increase the likelihood of creating digital memorabilia, as customers and bystanders might be more inclined to take pictures and videos that capture the various facial features of the robots and share them on social media.
- **Voice**: Starship robots already communicate with customers and bystanders using a female human-like voice. Including this element in the test aims to verify whether the current design is preferred by customers, as opposed to other types of voices that might better fit the robot's appearance. In this feature, as with the previous one, an additional test will be conducted to determine if participants prefer the voice to be cute, robotic or human-like.
- **Tone of voice**: A particular tone of voice that aligns with the previous features may further contribute to the robot's characterization. To clarify the level of formality that customers expect from the robots, an additional question will inquire whether the tone should be casual or formal.

Considering the popularity of the robots as cute entities, the author hypothesizes that these features should tend to be cute and casual. As a result, the cohesiveness of these elements could likely increase the perceived personality that this design aims to introduce.

The second category includes elements that directly influence the delivery experience. They are primarily designed to enhance perceived enjoyment and multi-sensory perception, and they introduce an initial approach to personalization through cosmetic customization. This type of customization does not alter the original product design but rather its presentation (Pine & Gilmore January/February 1997). These key elements are:

- **Music**: This element is already present in some of the Starship robots operated by S-Group; however, as previously mentioned, it was not available in the deliveries utilized for this research. Considering the main theme of robotic cuteness, the music feature could be controversial: while music might enhance multi-sensory perception and perceived enjoyment, it does not directly contribute to the theme. It would be more logical for robots to beep—a feature more commonly depicted in popular representations of small mechanoid robots—than to play music. Nevertheless, as this feature appears to be accepted and enjoyed by customers (Starship Technologies s.a. d), it is included in this list for testing.
- **Music selection**: This element has been separated from the previous one to assess the value customers place on the ability to choose the feature, constituting an initial approach to personalization and increasing the individuality of the experience. This represents the first approach to cosmetic customization, as the delivery will occur in the same standardized manner but will be presented with the customer's choice of music.
- **Robotic beeps**: As previously mentioned, beeps are a more commonly depicted form of fictional robotic communication. In the case of Starship robots, the removal of the voice feature is not feasible, as they need to interact during deliveries, often to ask for help or issue small commands if disturbed. Voice is also used to greet customers at the end of the interaction, and even though this feature might feel unnatural to the characterization, it remains necessary. However, robotic beeps could be employed in different situations during delivery, such as when the robot approaches or departs, or when encountering other robots en route. This positive cue adds to the theme and increases the potential for creating digital memorabilia.
- **Seasonal decorations**: Another way to alter the regular aesthetics of the robots is by adding seasonal decorations, with removable stickers or small props. During this study, robots were spotted wearing pumpkin stickers near Halloween, and other festivities such as Christmas, Easter or Independence Day could easily inspire new styles. This feature could enhance perceived enjoyment and increase the likelihood of generating social media content.

The third category introduces elements that primarily influence user interaction through the app. As previously discussed, the experience with robots does not need to be confined to the realm of reality. The characterization of the robots offers an opportunity to develop the app experience, including fictional interactions with them. The features in this category aim to enhance engagement during the robot's journey by increasing the individuality of the experience through improved interaction within the app. Additionally, some features are designed to enhance perceived ease of use,

taking into account varying levels of technology readiness among customers. The designed elements are as follows:

- **Robot profile selection**: Creating fictional profiles of the robots adds to the initial idea of naming them, by including brief characterizations that can increase the perceived humanness. This personality background is not intended to be a story—an element purposely omitted in this design due to the necessity of being maintained throughout the entire experience to be effective—but rather a small profile that adds to the robot's appeal through mild humour. An example could be: *"Hi, my name is Spot, and I love sunbaths and wind-powered energy."* Allowing customers to choose the profile represents a type of modularization, offering a secondary approach to cosmetic customization.
- **Randomized selection**: While customization is a desirable feature in experiences as a means of co-creation, customers should be given the option to avoid it if desired. According to Pine and Gilmore (2011, xx-xxi), it is a mistake to assume that all customers want to co-create experiences in every circumstance. Different levels of technology readiness, motivation, or simply a lack of time to engage further with the experience are valid reasons for customers to opt for a system-selected randomized robot. Ultimately, the ability to avoid customization is another way to personalize the experience, and in this particular case, it could even increase the perceived ease of use.
- **Bot master**: Continuing with the characterization in this proposal, this element extends it to the human employee responsible for operating the robot. The bot master is the character whose role is to offer customer service related to robot delivery. This element represents the Performance Model in this proposal most prominently, as the bot master character should act as the knowledgeable authority on robots, not just a regular customer service operator. This enhances the interaction experience by involving a human employee for the first time and can impact perceived ease of use for customers with varying levels of technology readiness.
- **Robot communication**: To increase interaction between the customer and the robot, this proposal includes extending communication to the app, creating a fictional interaction with a chatbot that operates as the delivery robot. This chatbot could be active during the robot journey, allowing customers to interact with it, supported by the live tracking feature. For instance, when the robot appears to be stationary for a prolonged period, customers could inquire about the estimated time or the issue causing the delay. Incorporating humour and cuteness into this feature can enhance the cohesiveness of the robot's displayed personality. This feature could impact perceived enjoyment, humanness and social interactivity,

even though the interaction is purely fictional, attributing skills to the robot that it does not possess.

These twelve elements can either be fully or partially integrated into the current experience and represent a few examples of potential improvements. Nevertheless, it is important to emphasize that for experiences to remain engaging, they must continually evolve. Adaptation and modification of features are essential to maintaining customer engagement and preventing the commoditization of the experience (Pine & Gilmore 2011, 243-244).

A simplified list of touchpoints in the current experience combined with the proposed elements is visually presented in Figure 13. A comprehensive list of features and the theories and elements they are based on is displayed in Table 1.

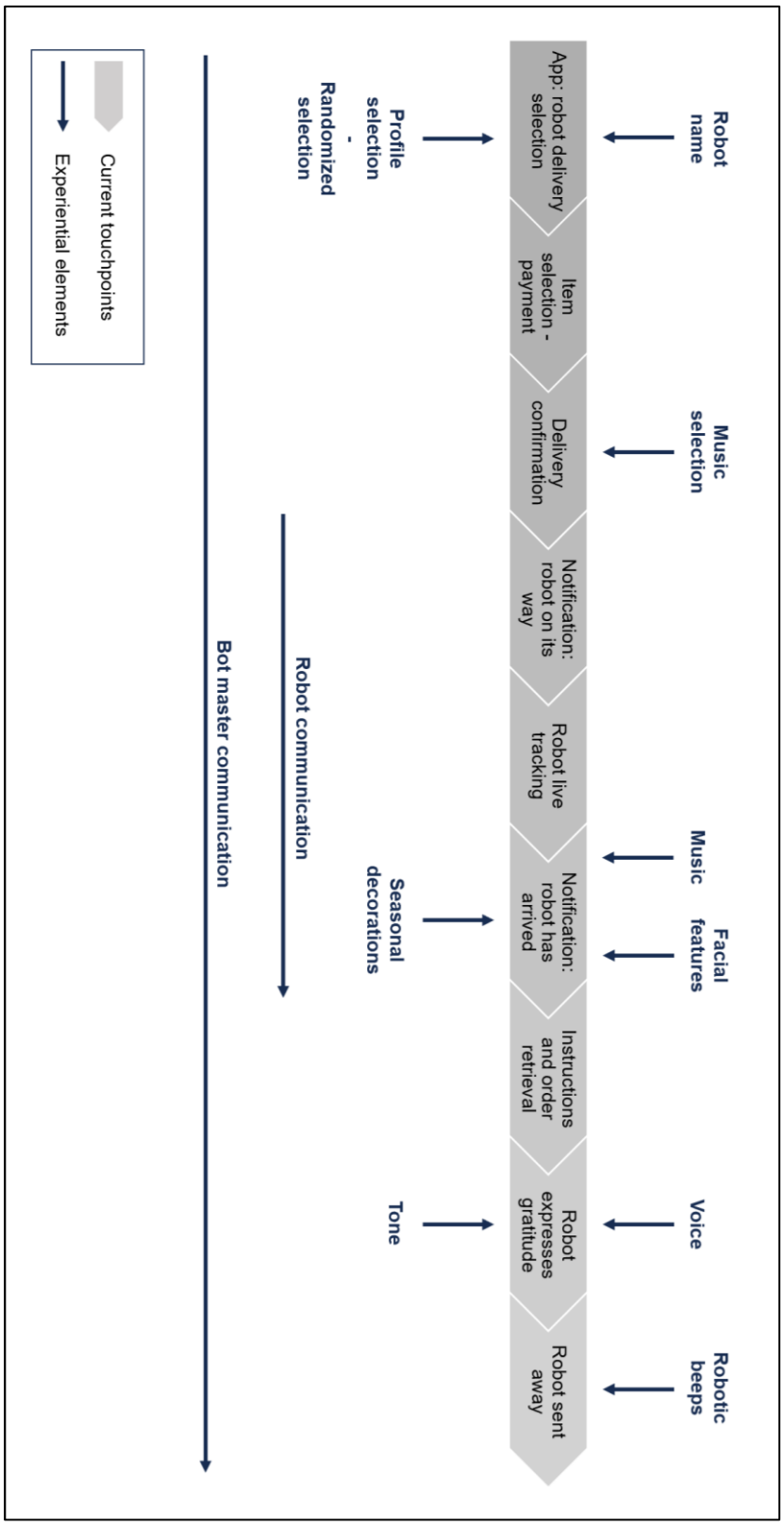


Figure 13 Simplified touchpoint list

Table 1 List of theories and elements of the experience with ADR

Elements of the experience with ADR		
Feature	**ADR acceptance theory** (Element)	**Experience design theory** (Element)
Name	**sRAM** (Perceived humanness and social interactivity)	**Performance Model** (Characterization)
Facial features	**sRAM** (Perceived humanness) **Three-Part Framework** (Aesthetics)	**Performance Model** (Characterization) **THEME-ing** (Memorabilia)
Voice	**sRAM** (Perceived social interactivity)	**Experience Pyramid** (Interaction)
Tone of voice	**sRAM** (Perceived social interactivity) **Three-Part Framework** (Formality)	**Experience Pyramid** (Interaction) **Performance Model** (Characterization)
Music	**TAM** (Perceived enjoyment)	**Experience Pyramid** (Multi-sensory perception)
Music selection	**TAM** (Perceived enjoyment) **Three-Part Framework** (Manipulability)	**Experience Pyramid** (Individuality) **Mass Customization** (Cosmetic customization)
Robotic beeps	**TAM** (Perceived enjoyment)	**Experience Pyramid** (Multi-sensory perception) **Performance model** (Characterization) **THEME-ing** (Theme, positive cues and memorabilia)
Seasonal decorations	**TAM** (Perceived enjoyment)	**THEME-ing** (Memorabilia)
Robot profile selection	**sRAM** (Perceived humanness) **TAM** (Perceived enjoyment) **Three-Part Framework** (Manipulability)	**Experience Pyramid** (Individuality) **Mass Customization** (Cosmetic customization) **Performance Model** (Characterization)
Randomized selection	**TAM / sRAM** (Perceived ease of use) **Three-Part Framework** (Technology readiness)	**Mass Customization** (Cosmetic customization)

Elements of the experience with ADR		
Feature	**ADR acceptance theory** (Element)	**Experience design theory** (Element)
Bot Master	**TAM / sRAM** (Perceived ease of use) **Three-Part Framework** (Technology readiness)	**Experience Pyramid** (Interaction) **Performance Model** (Characterization)
Robot communication	**sRAM** (Perceived humanness and social interactivity) **TAM** (Perceived ease of use and enjoyment) **Three-Part Framework** (Technology readiness)	**Experience Pyramid** (Interaction) **Performance Model** (Characterization)

5 Methodology

Given the scarcity of prior research and the broad scope of the study's research questions, a self-completion survey was selected as the data collection method. This approach facilitates rapid access to large sample sizes with minimal resources, allowing respondents to address more complex questions without interviewer or time pressure (Williams et al. 2022, 85-87). This is particularly pertinent as robotic delivery is a relatively novel phenomenon, and part of the survey employs a participatory design approach that necessitates respondents to imagine scenarios rather than solely reflecting on their personal experiences.

While this quantitative method may lack the depth of insights typically gathered through qualitative research, it provides the capacity to compile substantial amounts of high-quality data for academic scrutiny. The significance of this data volume lies in its contribution to deductive research, wherein a novel theory is tested to produce empirical observations. (Aarons 2020, 2-5.)

This self-completion survey aims to address the research questions posed by this thesis, namely:

Research Question 1: What is the current perception of customers regarding the food delivery experience with autonomous delivery robots in Finland?

1.a: Does this perception change over time, following a certain number of interactions with autonomous delivery robots?

Research Question 2: Can elements of experience design enhance the current food delivery experience with autonomous delivery robots?

2.a: What are the customers' preferred experience design elements applicable to this context?

2.b: Are there significant differences between customer perceptions of the current experience and the proposed enhanced experience with autonomous delivery robots?

Most of the questions – 1, 2, 2a, and 2b – target a population of food delivery customers, regardless of their preference for either human couriers or robotic delivery systems. The objective is to assess ADR acceptance in Finland, explore how experiential elements could enhance the current delivery experience, and determine which proposed elements are most favoured by these customers. Research question 1a, however, necessitates insights from a rarer population: the actual users of ADR in Finland. This question evaluates the risk of commoditization of the delivery experience after multiple interactions.

5.1 Survey design

The survey was designed in Webropol, adhering to a standard content structure: an introduction, multiple blocks of questions (including demographic and screening questions, as well as questions about various dimensions of the research), and a concluding thank you page. The overall design adheres to fundamental principles of survey construction: it is concise, allowing for full completion within 15 minutes; employs straightforward language, provides clear instructions and organizes question blocks in a logical sequence. The questions themselves also aim to align with established guidelines in survey design by emphasizing precision and clarity, avoiding double-barrelled inquiries and biases, maintaining neutrality and providing respondents with sufficient context to answer accurately (Aarons 2020, 171).

The layout features a reasonable number of questions per page (a maximum of 8) to prevent respondent fatigue and incorporates a completion bar, enabling respondents to visualize their progress throughout the survey. Aesthetically, the survey is designed to appear neutral and professional, with a Webropol theme implemented to ensure appropriate background, font styles and sizes. The theme includes white text on a dark background to enhance readability.

The survey commences with an introduction page that includes the title – Customer Experience with Delivery Robots – followed by an overview of the topic, the desired characteristics of respondents, instructions and the estimated duration of survey completion. Additionally, it details the voluntary and confidential nature of the research, conveying the purpose and authorship, including an email address for communication and a link to the data management plan (see Appendix 1). An agreement question is then presented, and a survey rule directs respondents who do not consent to participate straight to the thank you page.

The survey questions are then organized into four blocks and seven pages. A similar question format and identical scales are employed throughout the survey to prevent confusion stemming from methodological changes, while ensuring respondents are not overburdened with instructions. The first block comprises three pages of demographic and screening questions, in addition to inquiries concerning customer behaviour. This block begins with six demographic questions, including: residence location (restricted to Finnish regions), age, gender, education, household type and occupation. These are presented as categorical questions, where participants select their responses from predefined options or dropdown menus. Many of these questions incorporate an additional open-ended option, formulated as “other, please specify.” This approach is consistently applied

throughout the survey to increase inclusivity and provide respondents with the opportunity to identify categories that may not have been initially accounted for (Wong et al. 2024).

The subsequent page contains a series of questions aimed at assessing the respondents' status as food delivery customers and their purchasing behaviour, including the frequency and motivation to order food online. The final questions address their perceived technology readiness and previous experience with ADR. Respondents who answer negatively are automatically redirected to the next block of questions, while those who respond positively proceed to an analysis of their experience on the next page. Here, three categorical questions inquire about the number of interactions with ADR, frequency and motivation. A rating question, ranging from 0 to 5, assesses overall satisfaction with ADR, and an open-ended question explores the reasons for satisfaction or dissatisfaction with the service.

The question regarding motivations to utilize ADR delivery services includes six categories, accompanied by an additional open-ended option in the form of "other, please specify." These categories have been adapted from Lim et al. (2024, 8) but modified for grammatical simplicity: thus, interpersonal influence is referred to as social influence, gratification (“using robotic delivery system is entertaining”) as entertainment, automation-efficiency as reliable service, efficiency (“the robot provides service in a timely manner”) as time saving, delivery task requirement (“I need to receive my parcels without direct contact with the delivery person”) as avoidance of social contact, and value-in-use as value-price (see Figure 14).

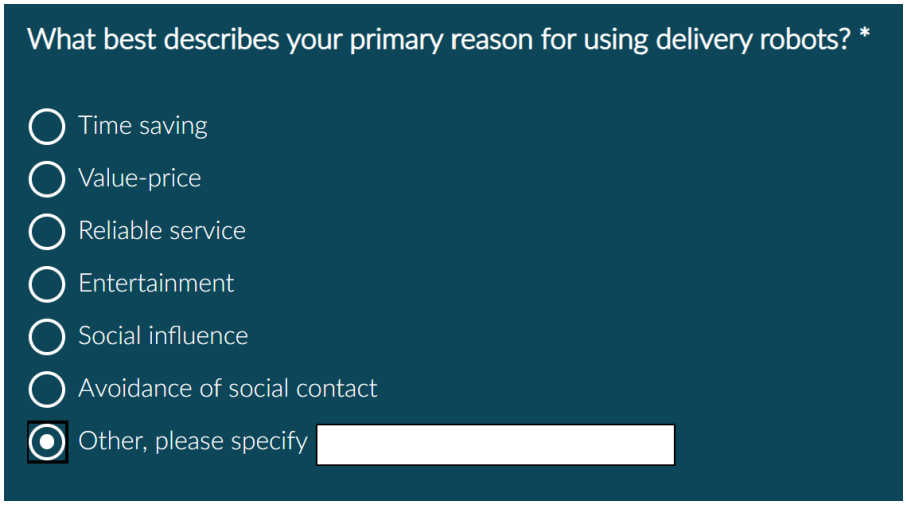


Figure 14 Survey questions on customer motivations to use ADR

This structure contrasts with the one used to evaluate motivation to order food online, that is adapted from Belarmino, Raab, Tang & Han (2021, 3) – price-value and food quality - and Yeo, Goh & Rezaei (2017, 156) – convenience and time saving. The hedonic motivation proposed by Yeo et al. (2017, 156) is included as personal treat, for additional clarity (see Figure 15).

The answers to both questions vary to align with previous literature and, although a direct comparison of customer motivations is not feasible, they are still grounded in a utilitarian-hedonistic dichotomy. Thus, comparing the results can still provide valuable insights into the nature of customer motivations for utilizing these services.

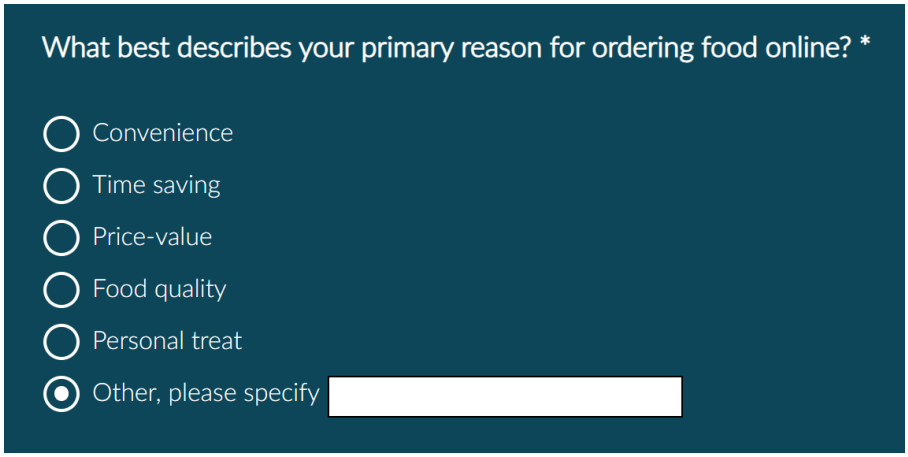


Figure 15 Survey questions on customer motivations to order food online

At the beginning of the next set of questions, video elicitation is employed to present the current customer experience with Starship delivery robots in Finland. Video, or film elicitation is a research method that involves the screening of recorded videos to provoke reflections and uncover implicit understandings of the situations presented in them (Skjælaaen, Bygdås & Hagen 2020). As dynamic and closely representative of real-life scenarios, videos serve as an effective tool for eliciting emotions (Uhrig et al. 2016). They contribute to the generation of rich data by externalizing conversations, eliciting tacit knowledge or revealing contextual details. Furthermore, videos empower participants by improving the accessibility of the research process (Kahlke et al. 2024, 385).

The purpose of the video utilized in this research is to introduce the customer journey to respondents who have not lived it firsthand, and to serve as a reminder for those with previous experience

with ADR. The video follows the interaction with both the robot and the app, starting with the description of a hypothetical situation: *"Imagine you are hungry at home or work and decide to order food online. You order a ready-to-eat lunch from a nearby supermarket and choose the robot delivery option."* The video then shows a sequence of mobile screenshots with clarifications and translations of the app text from Finnish to English, combined with video footage of the customer interacting with the robot (see Figure 16). The video presents the touchpoints of the customer experience as depicted in Figure 13: payment and delivery confirmation, notification of the robot being on the way, live tracking of the robot, notification of arrival, reception of instructions and retrieval of the order, the robot expressing gratitude and being sent away. The total length of the video is 1:55 minutes, and the full script can be found in Appendix 2.

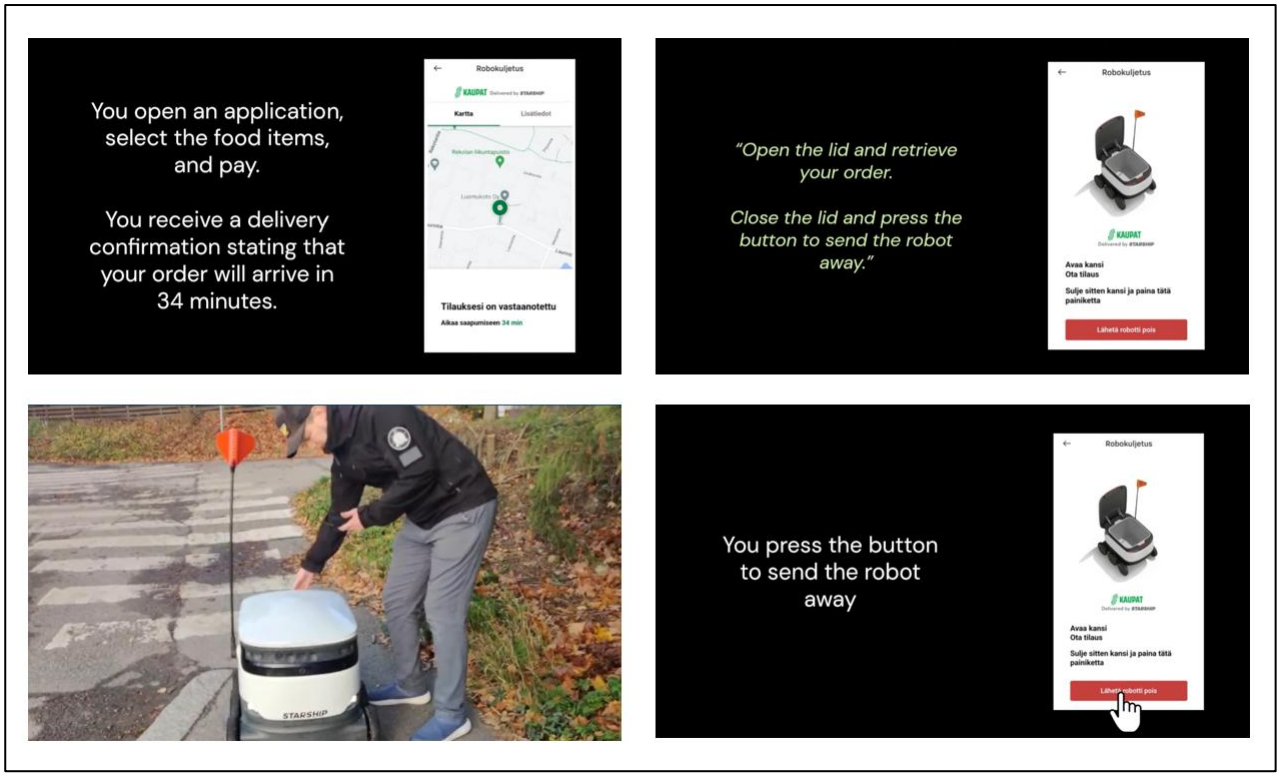


Figure 16 Video captures including instructions (in white) and translations (in green)

Following the video, three questions are designed to assess the likelihood of use, loyalty through word-of-mouth (WoM) and the perceived advantages or disadvantages of using ADR compared to deliveries performed by human couriers. The first two questions draw from Lim et al. (2024, 2-3),

who focus their research on ADR adoption through the concepts of service reuse likelihood and WoM as key variables for measuring post-adoption behaviour among customers utilizing ADR. Service reuse likelihood is reframed as use or reuse likelihood in this context: *“How likely are you to use the service presented in the video for food delivery?”*, addressing a broader population of food delivery customers regardless of prior ADR experience. To evaluate WoM potential, a typical Net Promoter Score (NPS) question is employed: *“How likely would you be to recommend this service for food delivery to a friend or family member?”*. Recommendation likelihood is deemed the most efficient method for assessing loyalty (Reichheld, December 2003). Furthermore, in this field, sharing positive experiences with ADR generates interest that boosts customer acquisition and retention, creating a “ripple effect” (Lim et al. 2024, 3). The third question, *“How beneficial do you think delivery robots are compared to traditional methods in the context of food delivery?”*, is introduced to assess the perceived advantages or disadvantages of using ADR instead of human delivery, allowing for a direct comparison between the perceptions of customers who choose ADR and those who do not.

These three questions are formulated as semantic differential questions, employing a 6-point scale presented with a slider bar and two opposing adjectives. These adjectives vary by question but adhere to the structure "not (..) at all" and "very (..)." The 6-point scale, though controversial, was selected to eliminate complete neutrality in responses given the topic's novelty. This approach eliminates a middle point which, although it might represent a valid opinion, often functions as an escape route (Williams et al. 2022, 96). This same format is utilized in most of the questions within the remaining two blocks as well.

The third block of questions introduces the dimension of participatory design, allowing respondents to evaluate the proposed experience elements. The question format follows the previously described structure and is introduced with the following instructions: *“Now, we would like to understand how much value you place on certain elements that could modify the experience presented in the video. Please evaluate the following elements based on their value to you, using a scale from 0 to 5, where 0 means ‘no value at all’ and 5 means ‘very valuable’.”* Subsequently, the twelve elements are presented in grammatically simple sentences for evaluation (see Table 2).

Table 2 Analysis of experience elements in the survey

Analysis of Experience Elements	
Robot Design	The robot has a name. *
	The robot has facial features, like eyes and mouth. *
	The robot has a voice. *
	The robot has a specific tone of voice. *
Delivery Experience	The robot plays music upon arrival. *
	Users can select the music played upon arrival. *
	The robot beeps to show interaction with other robots. *
	The robot has seasonal decorations (e.g., Easter or Christmas). *
App Interaction	Each robot is presented with a personality profile in the application, and users can select a robot for their delivery. *
	Users are allowed to skip this selection and be assigned a random robot. *
	Users can contact the Bot Master – a human employee who takes care of robots – in case of need. *
	Users can communicate with the robots during delivery (e.g., "Are you coming soon?" "I am stuck at a traffic light but on my way!"). *

The features within the category of robot design include an additional question about style, presented as partially closed questions, with three or four predefined answers (one of which is always “I would not like this feature to be added” for respondents who oppose the inclusion of the feature entirely) and an open-ended question in the format of “Other, please specify.” These questions aim to elucidate respondents' preferred style—humanlike, robotic or cute—in questions concerning name, facial features and voice, and either casual or formal in the question about tone of voice.

Only the question regarding the robot's name is accompanied by examples (see Figure 17), as providing these was comparatively effortless, unlike the other variables, which would have required additional resources such as graphics or audio files. These draw from cultural icons for the robotic category, the most popular Finnish given names of 2023 for the humanlike category (Yle 2024 b), and the most popular dog names of 2023 for the cute category (Kennelliitto 2024).

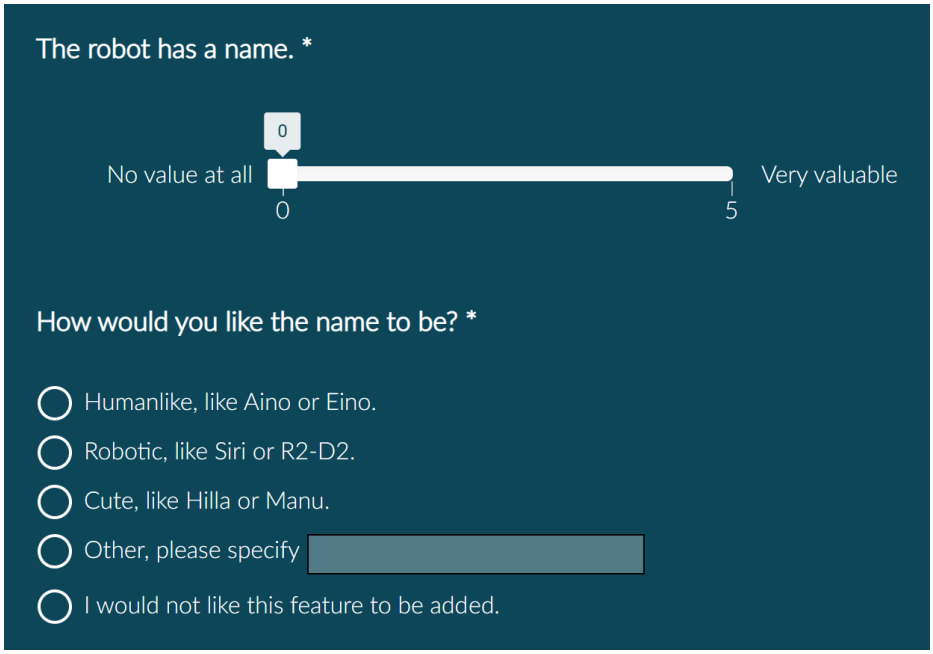


Figure 17 Example of semantic differential and partially closed questions in the survey

The final block revisits the questions initially presented to evaluate use and recommendation likelihood, as well as perceived benefits, but this time aims to assess the customer experience with the proposed elements included. The purpose of this repetition is to establish a direct comparison between the perception of the current experience and the experience with the analysed elements, and to verify whether these variables improve or worsen with the inclusion of said elements. One additional question, which follows the same structure, is included to evaluate the overall value respondents would place on the addition of some or all the evaluated elements to the experience with delivery robots.

Upon completion of this block of questions, respondents are directed to the thank-you page, which includes a question regarding their consent to be contacted for future research, along with a field to provide their email address if they wish to be contacted.

A summary of the survey is presented in Table 3 and a complete transcription is provided in Appendix 3.

Table 3 Survey overview

Survey overview		
Block	**Page**	**Questions**
-	1	Introduction.
1: Demographic and screening questions. Customer behaviour.	2	Location, age, gender, education, household type, occupation.
	3	Food delivery usage: frequency, motivation. Technology readiness. Previous experience with ADR.
	4	Experience with ADR: number of interactions, frequency, motivation, satisfaction.
2: Perception of current ADR experience.	5	Video. Use likelihood, WoM, benefits.
3: Evaluation of experiential elements.	6	Robot design: name, facial features, voice, tone of voice.
	7	Delivery experience: music, music selection, beeping, seasonal decorations. App interaction: personality profile, randomized selection, Bot Master, robot communication.
4: Perception of modified ADR experience.	8	Use likelihood, WoM, benefits, overall value.
-	9	Thank you.

Before initiating the data collection, a pilot test was conducted to identify errors, ensure comprehension of the questions and verify the proper sequencing of the survey. Given the diversity of the target population, ten testers from different age groups, occupational backgrounds and educational levels participated in the testing phase. The participants included two IT specialists, two restaurant workers, two higher education students, a communication specialist, a psychologist, an event producer and a salesperson. Feedback was collected, leading to the implementation of two changes: the first addressed the style of the hyperlink to the data management plan, which was overly bright, and the second focused on the description of the scales, which did not accurately align with the actual scales.

5.2 Data collection

To understand the perception of ADR in Finland among not only service users but also the general population of online food delivery customers, the research aimed to collect data from a diverse array of demographic and behavioural profiles. Consequently, convenience sampling was deemed the most appropriate method. This non-probability sampling technique allows any respondent who finds the survey to participate, considering that pre-applied filters can be used (Aarons 2020, 238). The survey instructions included two requisites: one geographical—restricting participation to residents of Finland—and one behavioural—targeting customers of food delivery platforms. Although it was impossible to prevent unqualified respondents from participating, demographic and screening questions were incorporated to exclude irrelevant data before analysis. Additionally, the occupation-related demographic question served to monitor potential snowballing within university student populations.

The survey was disseminated across various social media platforms and channels to maximize the diversity of respondents. It was shared via WhatsApp, Facebook, Instagram, LinkedIn and Jodel, and further reshared by some of the author's contacts within these networks and on private company intranets. The survey was also posted in specific Facebook and Jodel groups with geographic delimitations, including municipalities such as Helsinki, Turku, Tampere, Jyväskylä, Kotka, Lappeenranta, Savonlinna and Porvoo, as well as neighbourhoods primarily within the Helsinki Metropolitan Area, such as Pasila, Herttoniemi, Matinkylä-Olari and Itä-Vantaa. Many of these groups are identified by the name of the location or by the name of the location combined with the term “puskaradio,” a Finnish term for “grapevine,” and serve as virtual community noticeboards. All these groups were selected because they are named after locations where Starship delivery robots currently operate. Additionally, the survey was shared in a Facebook group about Finnish robotics and a Jodel channel for Starship robot enthusiasts called Starshipsimps, with the aim of attracting actual ADR users to participate in the survey.

The survey was open from November 2024 to February 2025, and a total of 451 responses were collected.

5.3 Data analysis

In preparation for the data analysis, the collected data first underwent a cleaning process. To create a dataset suitable for analysis, the following steps were taken:

1. Respondents who did not consent to participate in the research were removed from the dataset. No further data was collected from these individuals, therefore additional cleaning was not necessary.
2. Responses from individuals who did not meet the required sample characteristics were excluded. Screening questions were employed to identify unsuitable respondents; data from those who answered "no" to "Have you ever ordered food online?" or "never" to "How often do you order food online?" were deleted.
3. Data initially categorized under "other, please specify" were reclassified to pre-existing categories when applicable. For example, "single parent with joint custody" was recategorized as "single parent with children," "couple with many pets" as "couple without children," and "entrepreneur" as "self-employed." When dealing with behaviours or opinions, recategorization was applied only in cases where it was unequivocally obvious, such as converting "entertainment/amusement" to "entertainment." Otherwise, responses were treated as qualitative data and recorded numerically as "other."
4. Minimal data was missing from the questions. Instances of missing data were observed in the gender-related question where three respondents selected "prefer not to say," as well as in questions concerning robot design preferences with a few responses like "I don't mind" or "any of them." These responses were not recategorized, and no new categories were created, thus they remained classified as "other."

After data cleaning, the final dataset consisted of 401 responses. Univariate and bivariate analyses were employed to compare various demographic and behavioural segments, primarily focusing on age, gender and prior interactions with ADR. Other categories, such as residence location, were excluded from further analysis due to insufficient representation within many groups, which limited the feasibility of a comprehensive examination. In such cases, this information was solely utilized to characterize the sample.

Qualitative data from open-ended questions was systematically coded, and the most representative testimonials were selected to exemplify the trends identified during the analysis.

A detailed introduction to the presentation of results is provided in Chapter 6.

5.4 Ethical guidelines

This research has been conducted in adherence to Haaga-Helia's guidelines for research-based bachelor's theses (Thesis coordinators 2022), following the ethical recommendations of the Rector's Conference of Finnish Universities of Applied Sciences Arene (Arene 2020), and the ethical principles of reliability, honesty, respect and accountability as outlined in the European Code of Conduct for Research Integrity (Allea 2023):

Privacy protection and data management: The handling of data complies with Haaga-Helia's recommendations on data management, with a particular focus on the communication of rights, data collection, analysis and security. A data management plan was developed and annexed to the self-completion survey, allowing respondents to access it prior to initiating the survey. The plan provides details regarding the purpose of data collection, processing, storage, access, disposal and withdrawal limitations. The survey was designed to collect only the minimum amount of personal data necessary for participation, and no sensitive personal data was requested. Furthermore, the survey questions were structured to ensure respondents could not be identified through their answers. Information on the confidentiality and voluntary nature of the survey was included on the introductory page, along with the author's contact details. The data management plan complies with Haaga-Helia's guidelines for data management in theses (Haaga-Helia University of Applied Sciences 2025).

Intellectual property rights: The information from other authors included in the literature review and survey design is utilized respectfully and truthfully. Figures are adapted or replicated rather than directly reproduced from the original sources. All sources of intellectual property are cited within the text and referenced in the source list at the end of the report.

Ethical review and research permits: Due to the nature of this research—its confidential character, the absence of sensitive information collection and the profile of the respondents—no ethical review or research permits are required.

Conflict of interest: This thesis is not commissioned, and the author is not affiliated with Starship Technologies, S-Group or any other companies mentioned in the report. Therefore, no conflicts of interest are present.

6 Results

The results presented in this chapter describe the most relevant findings derived from the cross-analysis of the collected data. Frequency tables, as well as bar and pie charts, are utilized to display the outcomes of univariate analyses, primarily focusing on demographic variables such as place of residence, age, gender, education level, occupation, household type and basic behavioural patterns.

For the presentation of bivariate analysis results, stacked bar charts and cross-tabulations are employed, with the choice between these methods depending on the volume of data being presented and the clarity each method contributes to the visualization. For instance, stacked bar charts are utilized to illustrate analyses with substantial differences across segments, providing an immediate visual distinction. Conversely, when differences are more nuanced, frequency tables including additional metrics are preferred. These tables typically include frequency counts (n), averages, medians and standard deviations (SD). The rating questions utilize six-point scales, ranging from 0 to 5.

The use of colour variations is limited to pie charts and stacked bar charts, where colour serves a critical role in data visualization. In contrast, the use of colour is minimized in other tables and charts to enhance the accessibility of the report. For charts that incorporate colours, a palette of highly contrasting shades is employed to improve clarity in the presentation of results.

6.1 Demographic and behavioural profile

As anticipated, the majority of respondents originated from the Helsinki Metropolitan Area, where the presence of delivery robots has been established the longest and is most prominent. Over 50% of respondents selected this option, followed by 19% from other municipalities within the same region, and 7% from Varsinais-Suomi, the region where Turku, the third largest municipality in the country, is located. The "Rest of Finland" category includes responses registered in Etelä-Pohjanmaa, Kanta-Häme, Pohjois-Pohjanmaa, Pohjois-Savo, Päijät-Häme and Satakunta (see Table 4). No responses were registered from Ahvenanmaa, Kainuu, Keski-Pohjanmaa, Lappi (Finnish Lapland), Pohjanmaa and Pohjois-Karjala. In these regions, delivery using ADR was not yet operated by S-Group at the time of data collection (S-Kaupat s.a.).

Table 4 Place of residence

Region	n	Percent
Helsinki Metropolitan Area	204	50,9%
Rest of Uusimaa	76	19,0%
Varsinais-Suomi	28	7,0%
Kymenlaakso	23	5,7%
Keski-Suomi	20	5,0%
Pirkanmaa	18	4,5%
Etelä-Savo	13	3,2%
Rest of Finland	11	2,7%
Etelä-Karjala	8	2,0%
Total	**401**	**100%**

By age, the most represented groups are those aged 35 to 44 years (31,2%) and 25 to 34 years (28,2%). The least represented groups are older generations, with 7.5% of responses from individuals aged 55 to 64 years and only 1.7% of responses from those over 65 years (see Figure 18). The underrepresentation of older generations is a common issue in research regarding attitudes towards service robots (Ivanov & Webster 2023, 232; Lim. et al 2024, 7; Webster & Ivanov 2021, 10). Regarding gender, there is an overrepresentation of females, constituting 64.6% of respondents, compared to 32.9% of males and 2% of non-binary individuals.

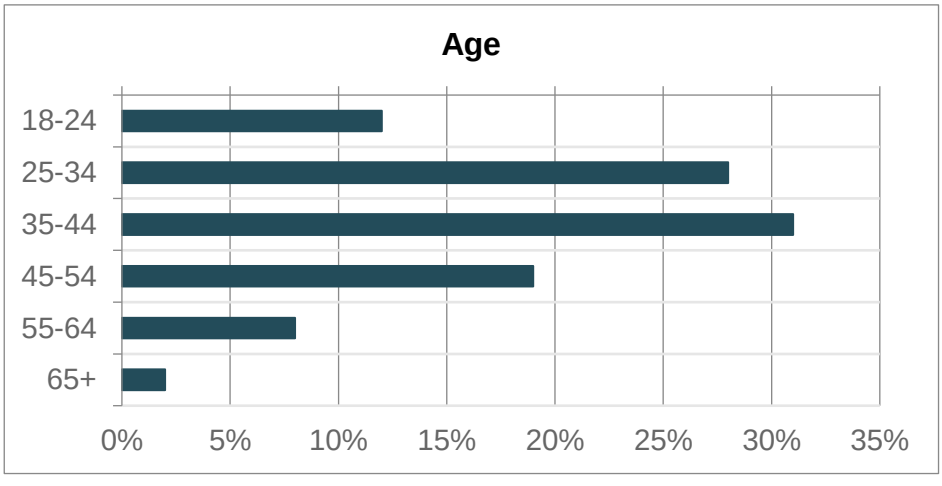


Figure 18 Age (n=401)

The educational level of respondents appears to reflect the overall educational profile of the Finnish population (Statistics Finland 2025), with the exception of the basic education, which is proportionally underrepresented, accounting for only 8% of responses (see Figure 19). With respect to the respondents' occupations, nearly half are employed in the private sector (47.9%), followed by those in the public sector (26.9%) and students (13.7%). The most underrepresented segment includes retired individuals, which is consistent with the previously mentioned issue of underrepresentation of older generations in this type of research (see Figure 20).

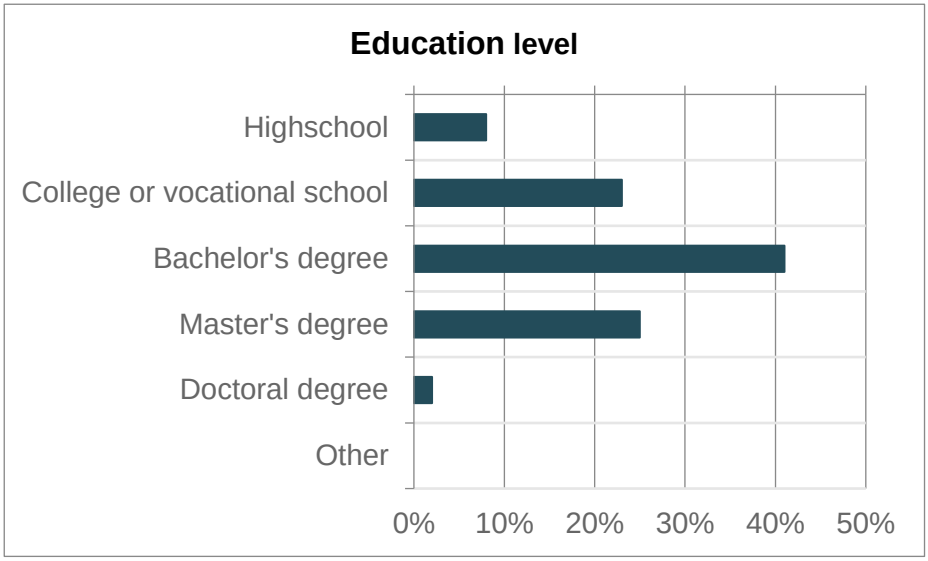


Figure 19 Education level (n=401)

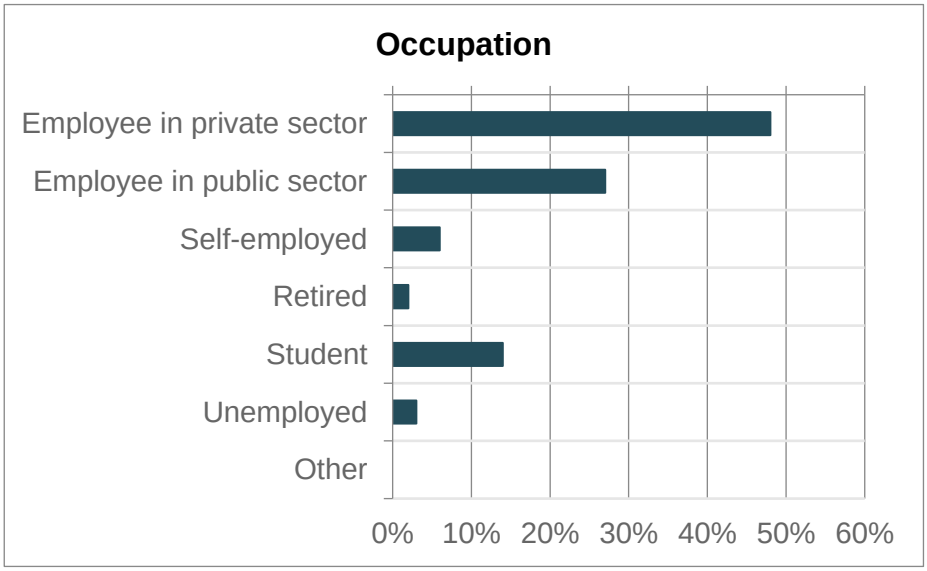


Figure 20 Occupation (n=401)

Regarding household type, couples with and without children are the most represented categories, each constituting 32.9% of the total. Following are single occupants (23.4%) and single parents with children (7.7%). The "other" category includes three cases of couples with adult children (see Figure 21).

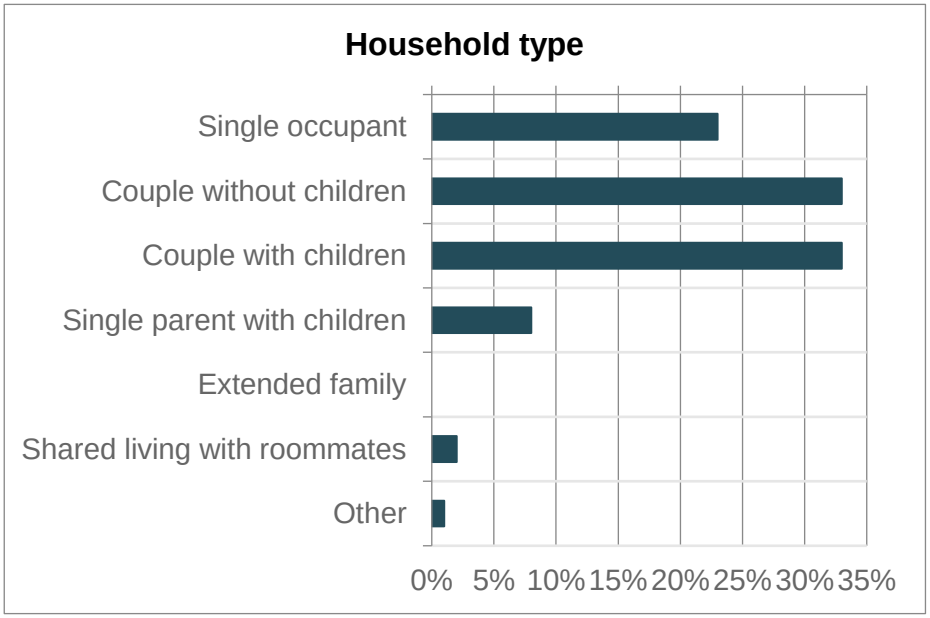


Figure 21 Household type (n=401)

In terms of respondents' online food ordering habits, 42.1% reported using these services rarely, while 35.9% indicated monthly usage and 21.2% reported weekly usage. A mere three respondents (0.8%) stated they use food delivery platforms on a daily basis.

Regarding motivation, utilitarian factors emerged as the predominant reasons, with 44.4% of respondents citing convenience and 30.9% mentioning timesaving. Only 20.2% of respondents identified hedonic motivations, identifying their orders as personal treats. In the "other" category, respondents predominantly referred to health-related reasons, including illness and mobility restrictions (see Figure 22).

Figure 22 Food order motivation (n=401)

On average, respondents exhibit a fair degree of confidence in their use of technology, with lower levels of confidence observed among the age segments of over 65 years and 55 to 64 years (see Table 5). Among the total respondents, 181 individuals (45.1%) have had prior experiences with ADR, while 220 respondents (54.9%) have never utilized a delivery robot before.

Table 5 Perceived technology readiness

Age	n	Average	Median	SD
18-24	50	4,3	4,0	0,8
25-34	113	4,4	5,0	0,8
35-44	125	4,5	5,0	0,8
45-54	76	4,3	4,0	0,7
55-64	30	4,2	4,5	1,1
65+	7	3,6	4,0	0,8
Total	**401**	**4,3**	**5,0**	**0,8**

6.2 Motivation, usage and satisfaction in the experience with ADR

Focusing exclusively on respondents with previous experience with ADR, utilitarian motivations again emerged as the most prominent reasons for choosing this type of delivery. The majority of respondents (51.4%) cited timesaving as their primary motivation. Conversely, 25.4% of respondents identified hedonic motivations, specifically entertainment, as their main driver for using ADR. Other utilitarian motivations were less commonly mentioned, including the avoidance of social contact (5.5%) and value-price (3.9%). No respondent cited social influence as their reason for using delivery robots. In the "other" category, most respondents mentioned convenience and curiosity as their motivations.

Significant variations in the motivations for ADR usage were observed across age and gender groups. Among respondents aged 18 to 24, 50% cited entertainment as their primary motivation (see Figure 23). A similar pattern was observed among male respondents, with 44.4% citing entertainment as their main driver, compared to 16% of female respondents (see Figure 24). This contrasts with the motivations for ordering food online via traditional methods, where 22.8% of female respondents and 13.6% of male respondents reported hedonic motivations. A possible explanation for this difference is that the hedonic motivation in traditional delivery refers to the personal treat provided by the ordered goods, whereas the hedonic motivation in ADR delivery pertains to the actual delivery experience.

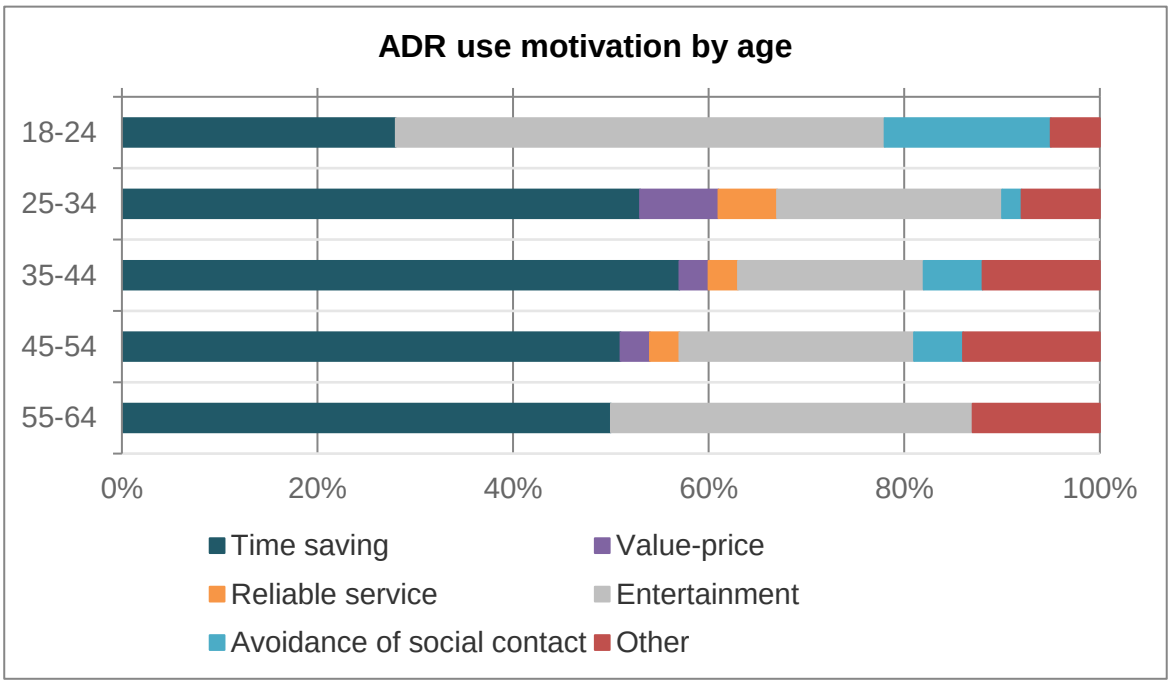


Figure 23 ADR use motivation by age (n=180)

In the age comparison analysis, the motivations for respondents over 65 years old were omitted, as this category included only one respondent.

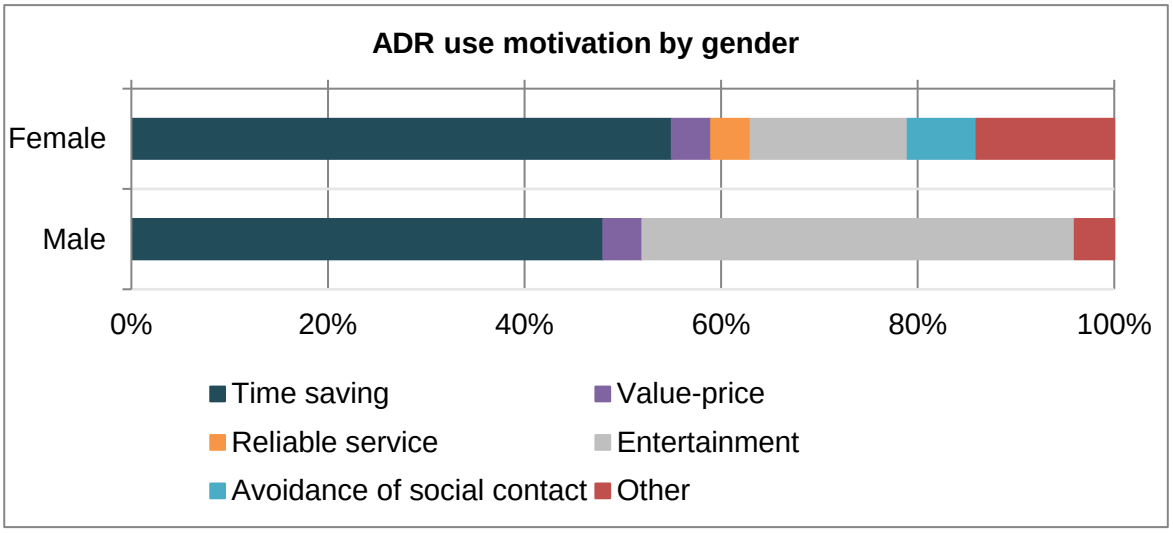


Figure 24 ADR use motivation by gender (n=181)

The motivation to use ADR varies significantly depending on the frequency of interactions. For customers who have used delivery robots once or twice, the principal motivation is entertainment (39.7%). However, this hedonic driver decreases with increased interactions, with 22.6% after 3 to 5 interactions, 11.5% after 6 to 10 interactions, and 0% for more than 10 interactions. Conversely, timesaving as a motivation appears to be proportionally opposite, displacing entertainment the more frequently customers use ADR (see Figure 25).

This data provides insights into the perception of ADR delivery as primarily an experience among Gen Z and male respondents, whereas older generations and female respondents may place greater value on the utilitarian aspect of robot delivery as a service. Notably, females tend to be more loyal customers and have greater representation in the segments of 3 to 5 uses (36%) and 6 to 10 uses (16%), compared to males (3 to 5 uses: 30%, 6 to 10 uses: 13%).

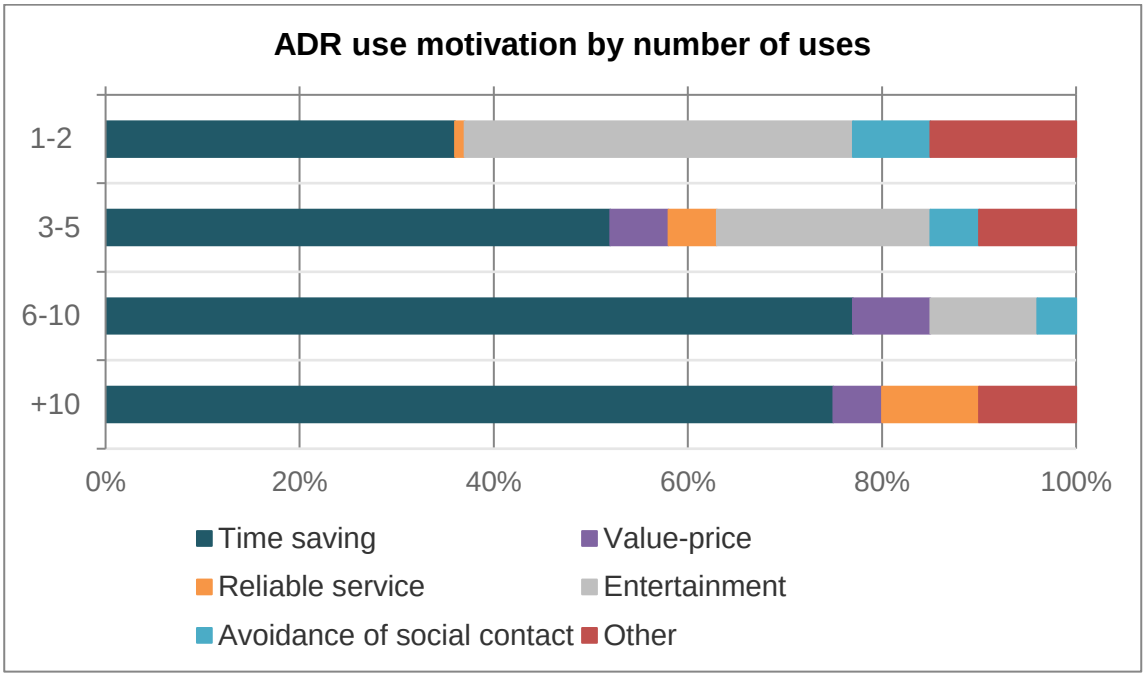


Figure 25 ADR use motivation by number of uses (n=181)

The hedonic motivation clearly diminishes with increased interactions, with the most significant decline occurring after 1 or 2 interactions. This trend may be interpreted as many customers initially ordering out of curiosity or to try a novel experience without the intention of repetition. The subsequent proportional decrease could reflect the rapid commoditization of the experience, which is perceived as a mere service after a few interactions.

Regarding the frequency of use, the majority of respondents indicated that they use delivery with ADR less than monthly (74.6%), followed by monthly (18.2%) and weekly (7.2%). Overall, most respondents have had 1-2 interactions with delivery robots (40.3%). The number of total interactions declines more significantly after 3-5 interactions (see Table 6). Several plausible explanations exist for this phenomenon: customers may lose interest, utilitarian factors may not suffice to sustain continued usage of robot delivery in the long term, or the relatively recent introduction of delivery with ADR in Finland means it remains a rather new option in many parts of the country.

Table 6 ADR use by number of interactions

ADR usage	n	Percent
1-2 times	73	40,3%
3-5 times	62	34,3%
6-10 times	26	14,4%
More than 10 times	20	11,0%
Total	**181**	**100%**

The overall perception of delivery robots is very positive, with an average satisfaction score of 4.3. Female respondents exhibit a slightly higher level of satisfaction (avg. = 4.4) compared to male respondents (avg. = 4.0). Additionally, generational differences are apparent, as individuals aged 45–54 and 55–64 report higher satisfaction levels (avg. = 4.4 and 4.6, respectively) compared to younger respondents in the 18–24 age group (avg. = 4.1).

In terms of the factors influencing satisfaction or dissatisfaction, many customers cite a combination of utilitarian and hedonic attributes. Common descriptors include phrases such as "quick, cheap and fun," "easy, practical, reliable," or "cheap, fast enough, adorable." Time is frequently highlighted, either as a timesaving advantage or in reference to the time required for delivery. For the latter, customers predominantly share positive experiences, such as: "The service from order to the robot arriving is very fast despite the fact it comes from about 3 km away!" and "[The robots] work perfectly; the delivery is smooth and fast." However, delays are occasionally attributed to navigation challenges during winter, street renovations or obstacles. One respondent further describes an instance when failing to retrieve an order on time required following the robot back to the store.

Many respondents describe their interactions with delivery robots as entertaining, enjoyable or exciting. Illustrative remarks include: "It was great fun, watching the robot with my children doing the delivery!" and "I think the robots are cute and fun additions to urban life. Finnish culture is usually quite serious, but I think these robots in a way highlight the fun side of us with how we interact with them." Feelings of joy upon the robot's arrival are frequently noted, as evidenced by comments such as: "Delivery robots […] make me happy for some reason," and "They are so cute and make one's day better when they arrive." One notable account involves a respondent whose child was unwell. Their narrative emphasizes recurring themes of reliability, entertainment and emotional upliftment, even referring to the memorable nature of the experience: "The delivery robot saved our day, and once it arrived, it started playing the famous Finnish song Maarit's 'Jäätelökesä' ('Ice

Cream Summer')—as one part of the order was ice cream. It was such an uplifting and hilarious experience, especially for the kid who was feeling under the weather, having a fever. It was such a great surprise from the Alepa delivery robot; it still makes me smile." Numerous respondents mention experiencing these moments alongside their children and often cite shared experiences with kids as their primary motivation for using ADR: "The robots are an entertainment to our kids" or "The robots entertain the kids with their cute appearance and music."

The cuteness or adorability of the robots emerges as a consistently valued feature. This attribute is associated not only to their physical design but also to the charming nature of interactions with them: "It's just cute to look at it coming down and singing Christmas songs," and "The best thing was that the robot is sooo cute, and it made some dance moves for us." Music also receives considerable attention, with mixed opinions. While many customers appreciate the music's seasonality and its playful nature, such as summer tunes or Christmas carols, others express dissatisfaction with the volume: "The music is embarrassingly loud. I love the tune, but please, take it down like 5 notches; it's not a disco," or "Hate the sounds on them. Especially songs when opened. I do not want the whole neighbourhood knowing that I’m picking up food from there." Another respondent offers an alternative perspective, describing the social interactions provoked by the loud music: "The store that I order from has robots that play a song […] obscenely loud when you open it, which has made some fun interactions with people that have seen the 'show' or otherwise just made my day better."

Health-related motivations are also frequently cited, including temporary illnesses, mobility issues and mental health conditions. For instance, customers report that: "[The robots] have been wonderful for those times when I’ve had worse flares in my agoraphobia or when I had COVID-19," and "Due to my health condition, it is a big help in everyday life. I have difficulty walking, and the robot helps a lot." A few responses underscore the value of avoiding social contact during periods of illness.

Many respondents emphasize the affordability of the service, often describing the delivery as "cheap." Other frequently mentioned advantages include reliability, as exemplified by the recurring phrase "they get the job done," and ease of use in terms of both app interface and delivery experience. Some respondents identify advantages over human delivery services, such as the avoidance of social contact and the ability to specify a delivery point on a map, which minimizes address-related errors: "When a robot is delivering products, it comes directly to the address I have given. People sometimes don’t." Additionally, some respondents highlight the surprising capacity of the

robots and, to a lesser extent, their own interest in technology and robotics as motivation, occasionally expressing empathy towards the robots themselves.

In contrast, many respondents underline the clumsiness of the robots as a significant source of dissatisfaction. One respondent states that "the main downside is that robot navigation/obstacle clearing is still lacklustre, and the need to contact customer service when a robot gets stuck is not infrequent enough to be totally acceptable." In addition to previously mentioned challenges such as extreme weather conditions and street renovations, several respondents also point to the limitations of the robots on difficult terrains. For instance, one comment notes that "the robot couldn't get close to our home because we live on top of a high hill, and the road is not paved."

The requirement of a pick-up point is perceived by many as a disadvantage, as it undermines the convenience of the service. This is reflected in a statement by one respondent: "The robot doesn't reach my apartment or even my front door, so it defeats the purpose of not having to go out. But my child enjoyed the experience, so it was a nice experiment, although not very convenient for frequent use." These issues, coupled with delays caused by navigation challenges, emerge as the primary concerns expressed by respondents.

In addition, a smaller number of respondents raise concerns regarding the condition of temperature-sensitive goods, such as ice cream, upon delivery. Other reported disadvantages include the robots' lower convenience compared to traditional human delivery services ("They are fun, but compared to traditional food delivery to your doorstep, the robots are not as convenient"), the limited availability of robots ("It's disappointing if there are none of the robots available and the waiting time is more than 1 hour") and language limitations, as the service is offered exclusively in Finnish.

Despite these challenges, positive feedback outweighs negative comments overall. Furthermore, negative remarks are often mitigated by the perception of the robots as cute and the experience as entertaining, with many customers expressing an understanding attitude regarding the physical limitations of the robots, particularly during winter months. These attitudes align with the mitigation of failure previously described as “the cuteness effect” (Lv et al. 2021, 12).

6.3 Analysis of perceptions of current experience

To assess the perception of experiences with ADR, a video elicitation method was employed and therefore all respondents were subsequently asked about their likelihood of using ADR, likelihood

of recommending it through word-of-mouth (WoM) and their perception of its benefits compared to traditional delivery methods. Once again, notable differences emerged across population segments, categorized by gender, age and prior experience with ADR.

In terms of gender, female respondents demonstrated a higher intention to use delivery with ADR (avg. = 3.7) compared to their male counterparts (avg. = 3.3). They also reported a greater likelihood of recommending it (avg. = 3.9 for females versus avg. = 3.4 for males) and expressed a slightly more favourable perception of the benefits of ADR over traditional delivery methods (avg. = 3.7 for females versus avg. = 3.4 for males). These disparities may be attributed to differing levels of satisfaction between male and female users of ADR, a pattern that persists among non-users as well. This suggests that both perceptions and expectations surrounding ADR vary significantly by gender.

A similar trend is observed across age segments, with middle-aged respondents exhibiting the highest willingness to adopt ADR as a delivery method. In contrast, respondents aged 55 and older displayed the lowest willingness to try ADR services (see Table 7).

Table 7 Use likelihood by age

Age	n	Average	Median	SD
18-24	50	3,5	4,0	1,3
25-34	113	3,5	4,0	1,4
35-44	125	3,7	4,0	1,4
45-54	76	3,9	4,0	1,3
55-64	30	3,1	3,0	1,3
65+	7	3,0	3,0	1,4
Total	**401**	**3,6**	**4,0**	**1,4**

This trend persists with individuals aged 45 to 54 being the most likely to recommend delivery with ADR to their family and friends (see Table 8). This segment also perceives delivery with ADR as more beneficial compared to traditional methods. In contrast, younger and older population segments remain the least likely to recommend delivery with ADR and are less inclined to perceive this method as more beneficial than alternative delivery options (see Table 9).

Table 8 Recommendation likelihood (WoM) by age

Age	n	Average	Median	SD
18-24	50	3,6	4,0	1,4
25-34	113	3,7	4,0	1,4
35-44	125	3,8	4,0	1,4
45-54	76	4,1	4,0	1,1
55-64	30	3,4	3,5	1,4
65+	7	2,9	3,0	1,6
Total	**401**	**3,7**	**4,0**	**1,4**

Table 9 Delivery comparison by age

Age	n	Average	Median	SD
18-24	50	3,5	4,0	1,3
25-34	113	3,6	4,0	1,3
35-44	125	3,6	4,0	1,4
45-54	76	3,9	4,0	1,2
55-64	30	3,5	4,0	1,3
65+	7	3,0	3,0	1,2
Total	**401**	**3,6**	**4,0**	**1,3**

Nevertheless, the most significant differences in these variables are observed between respondents who have previously used ADR as a delivery method and those who have not. In this analysis, ADR users base their responses on personal experiences, while non-users rely on information presented in the video, as well as pre-existing opinions formed through indirect interactions as bystanders, media coverage, social media content and testimonials. These opinions can be categorized into actual perceptions versus expectations, although the magnitude of the differences may also be influenced by these pre-existing conceptions. This could also align with Webster and Ivanov's (2021, 79-80) distinction between 'robophobes' and 'robophiles'; although many factors could explain why some individuals have adopted ADR as a delivery method while others have not, it is plausible that this dichotomy of affinity and aversion plays a role in shaping the observed

disparities to some extent. These differences are particularly pronounced in respondents' likelihood of using and recommending ADR, with slightly less variation in their assessment of ADR as a more beneficial delivery method (see Table 10).

Table 10 Acceptance of current experience with ADR

Variable	ADR experience	n	Average	Median	SD
Use likelihood	**Users**	181	4,2	5,0	1,0
	Not users	220	3,1	3,0	1,4
WoM	**Users**	181	4,3	5,0	1,1
	Not users	220	3,3	3,0	1,4
Delivery comparison	**Users**	181	4,0	4,0	1,3
	Not users	220	3,4	3,0	1,3

6.4 Evaluation of experience elements

In the evaluation of experiential elements, respondents generally express a neutral opinion, with some exceptions both positively and negatively (see Table 11). On one hand, the Bot Master element, which represents the unique interaction with a human employee during the experience, is highly valued (avg. = 4). Similarly, robot communication is another highly rated element (avg. = 3.4). The combination of these two features suggests a general preference for interaction options that extend beyond mere entertainment to include information provision. Responses to the open-ended question regarding satisfaction and dissatisfaction with the use of ADR frequently highlighted navigation issues encountered during the robot's journey, as well as a lack of information about these issues, which often required customers to contact customer service. The high valuation of these elements may indicate a need to expand communication channels during the delivery process to improve customer satisfaction.

Respondents also demonstrate a strong preference for randomized robot assignment (avg. = 3.7). Consequently, the profile selection feature is the least valued (average score = 2), followed by facial features (average score = 2.1) and music selection (average score = 2.2). These findings suggest that co-creation is not a highly desired feature among customers, potentially due to their

primary motivation of time efficiency. If customers prioritize quick delivery, incorporating features that extend interaction time with the application may not align with their preferences.

Table 11 Evaluation of experience elements (n=401)

Feature	Average	Median	SD
Name	2,7	3,0	1,6
Facial features	2,1	2,0	1,6
Voice	3,2	3,0	1,5
Tone of voice	2,6	3,0	1,5
Music	2,6	3,0	1,7
Music selection	2,2	2,0	1,7
Beeping	2,5	3,0	1,6
Seasonal decorations	2,9	3,0	1,6
Profile selection	2,0	1,0	1,6
Randomized selection	3,7	4,0	1,6
Bot Master	4,0	5,0	1,3
Robot communication	3,4	4,0	1,4

With regard to elements influencing robot design, respondents exhibit a generally neutral position toward the robot's name (avg. = 2.7) and tone of voice (avg. = 2.6) but express notably negative opinions regarding the facial features (avg. = 2.1). Conversely, the voice feature is more positively received (avg. = 3.2), appearing as the most highly valued element in this category.

In terms of delivery experience elements, music (avg. = 2.6) and beeping (avg. = 2.5) are perceived with neutrality, while seasonal decorations obtain slightly more favourable support (avg. = 2.9). The highest-rated elements, however, pertain to app interaction, except for the mentioned profile selection feature, which remains less favoured.

The results based on prior experience with ADR reveal no substantial differences, with minimal variations observed across most elements. In this case, the most significant disparities are found in the voice feature (avg.: users = 3.4; non-users = 3) and music (avg.: users = 2.8; non-users = 2.4).

Nonetheless, more relevant differences are observed between genders, and even more prominently, across age groups.

In respect to gender, female respondents demonstrate greater support for all experiential elements across all categories, particularly those related to robot design and the delivery experience (see Tables 12 and 13). The differences between female and male respondents are slightly less pronounced in elements concerning app interaction; yet females consistently rate all elements more favourably than males (see Table 14). This finding is noteworthy since, as previously illustrated, males are generally more inclined to use ADR driven by entertainment-related motivations, whereas females primarily cite utilitarian factors as their driving motivations. At first glance, it might seem more logical for males to favour elements that enhance enjoyment in their experience. However, these results suggest a divergent trend.

Table 12 Evaluation of robot design features by gender (n=401)

Feature	Gender	n	Average	Median	SD
Name	Female	259	2,9	3,0	1,6
	Male	132	2,3	3,0	1,6
Facial features	Female	259	2,2	2,0	1,7
	Male	132	1,8	2,0	1,4
Voice	Female	259	3,4	4,0	1,5
	Male	132	3,0	3,0	1,5
Tone of voice	Female	259	2,8	3,0	1,5
	Male	132	2,5	3,0	1,5

Table 13 Evaluation of delivery experience features by gender (n=401)

Feature	Gender	n	Average	Median	SD
Music	Female	259	2,7	3,0	1,7
	Male	132	2,2	2,0	1,6
Music selection	Female	259	2,3	2,0	1,8
	Male	132	2,0	2,0	1,5
Beeping	Female	259	2,6	3,0	1,6
	Male	132	2,5	2,0	1,6

Feature	Gender	n	Average	Median	SD
Seasonal decorations	Female	259	3,1	4,0	1,6
	Male	132	2,6	3,0	1,6

Table 14 Evaluation of application features by gender (n=401)

Feature	Gender	n	Average	Median	SD
Profile Selection	Female	259	2,1	1,0	1,6
	Male	132	1,9	1,0	1,5
Randomized selection	Female	259	3,8	5,0	1,6
	Male	132	3,5	4,0	1,7
Bot Master	Female	259	4,1	5,0	1,2
	Male	132	3,8	4,0	1,5
Robot communication	Female	259	3,5	4,0	1,4
	Male	132	3,2	3,0	1,5

In the evaluation of experience elements across age groups, differences are more pronounced than those observed by gender, with particularly notable variations in the 18–24 age group. This segment is especially supportive of experience elements, rating all of them the highest across all categories. Support for these elements generally declines with increasing age, although this trend is not consistent across all features. Among younger respondents, the most valued elements are the Bot Master figure, the randomized selection option and seasonal decorations, with average scores of 4.4, 3.9, and 3.8, respectively. In contrast, profile and music selection are the least rated elements (avg. = 2.5 and 2.7), placing them in a position of neutrality.

Middle-aged and older respondents demonstrate a preference for features related to app interaction, with the Bot Master element being the most favoured across all age segments. A detailed summary of the analysis of experience elements by age is presented in Table 15.

Table 15 Evaluation of experience elements by age (n=401)

	18-24	25-34	35-44	45-54	55-64	65+
Feature	**Average**					
Name	3,3	2,9	2,4	2,6	2,7	2,3
Facial features	2,8	2,0	1,8	2,1	2,0	2,4
Voice	3,6	3,1	3,2	3,3	3,3	2,4
Tone of voice	3,3	2,5	2,5	2,7	2,5	2,6
Music	3,4	2,5	2,5	2,3	2,3	1,9
Music selection	2,7	2,4	1,9	1,9	2,1	1,7
Beeping	3,3	2,6	2,4	2,5	1,8	2,1
Seasonal decorations	3,8	3,0	2,8	2,8	2,4	2,6
Profile selection	2,5	1,8	1,9	1,9	1,8	2,4
Randomized selection	3,9	3,8	3,6	3,9	3,4	3,1
Bot Master	4,4	3,9	3,9	4,0	3,7	4,3
Robot communication	3,6	3,4	3,5	3,4	2,9	2,9

6.4.1 Style of experience elements

In terms of the preferred style for the proposed experiential features, the results indicate that "cute" and "casual" are the most favoured options. An exception is observed with the voice feature, where the "humanlike" style, which represents the current option, receives the highest support from respondents. These preferences are relatively consistent between users and non-users of ADR; however, notable differences emerge across gender and age segments.

Regarding the robot's name, a majority of respondents (48.1%) favour a "cute" naming style, followed by "humanlike" (15.5%) and "robotic" (14.7%), which received comparable levels of support. In contrast, 16% of respondents expressed a preference for the exclusion of this feature and refrained from offering an opinion on naming preferences. Within the "other" category, several respondents indicated indifference toward the naming style, while others expressed that any of the three options would be acceptable. Additional suggestions included fun, non-binary or brand-related names, a clever wordplay or names inspired by popular culture. For instance, a few respondents mentioned "Robotti Ruttunen" ("rumpled robot"), a character from a popular Finnish TV show

from the 80s and 90s. Furthermore, some customers proposed the idea of individually assigning names to robots and selecting these names via customer voting.

A gender-based analysis reveals that female respondents demonstrate greater support for the "cute" style (52.9%) compared to male respondents (40.9%), who exhibit a secondary preference for the "robotic" style (18.2%) more frequently than their female counterparts (12.4%). Age-based segmentation shows that, while all age groups favour the "cute" style, respondents aged 18–24 exhibit the highest level of support for this feature, with 74% expressing a preference for this style (see Figure 26).

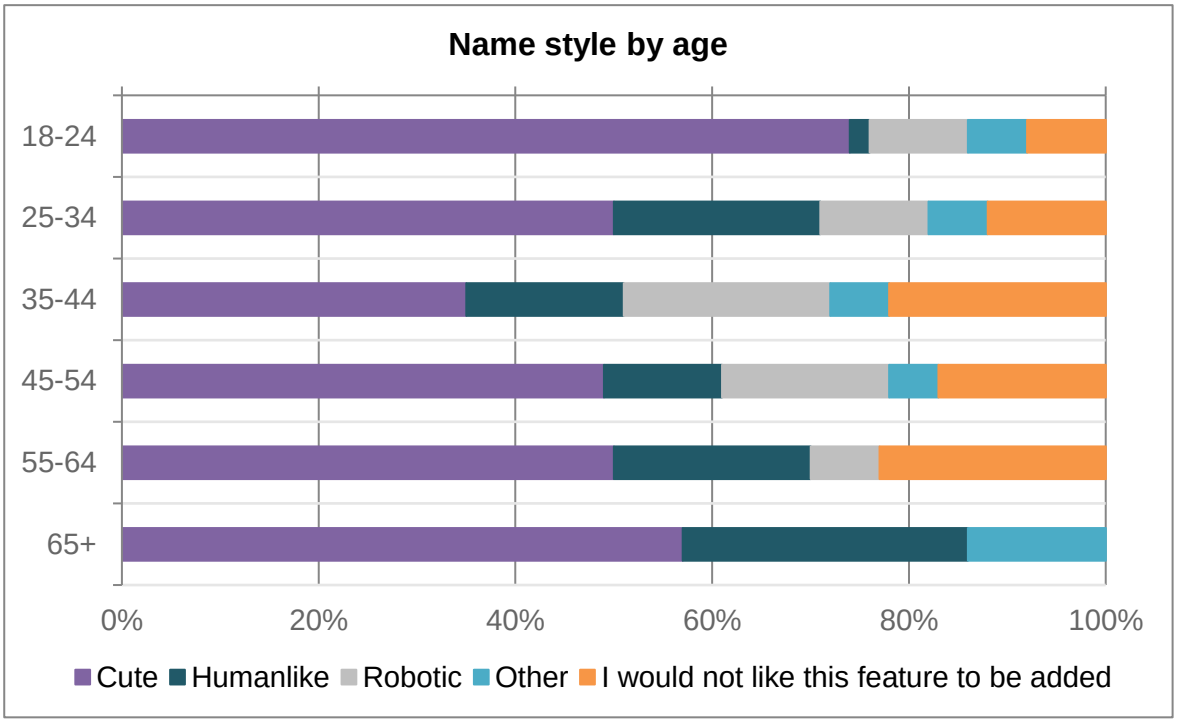


Figure 26 Name style by age (n=401)

With regard to facial features, the "cute" style emerges as the most preferred option, receiving 54.4% of the respondents' support, followed by the "robotic" style at 16.5%. The "humanlike" style gathers only 2% of support, possibly due to the perceived uncanniness it might introduce to the robot's design or potential mismatches with the overall aesthetic. As this feature was generally not highly popular, 24.9% of respondents opted for the "I would not like this feature to be added"

option. Within the "other" category, some respondents suggested that they would prefer facial features to be cartoon-like, cheerful or inspired by iconic robotic designs from popular culture.

Female respondents demonstrate considerably greater support for the "cute" style (60.6%) compared to male respondents (43.2%), reinforcing what appears to be an emerging trend. The "robotic" style ranks second, with 12% support among females and 24.2% among males. In terms of age, all segments show a preference for the "cute" style, with the 65+ age group (71.4%) and the 18–24 age group (66%) leading this trend (see Figure 27).

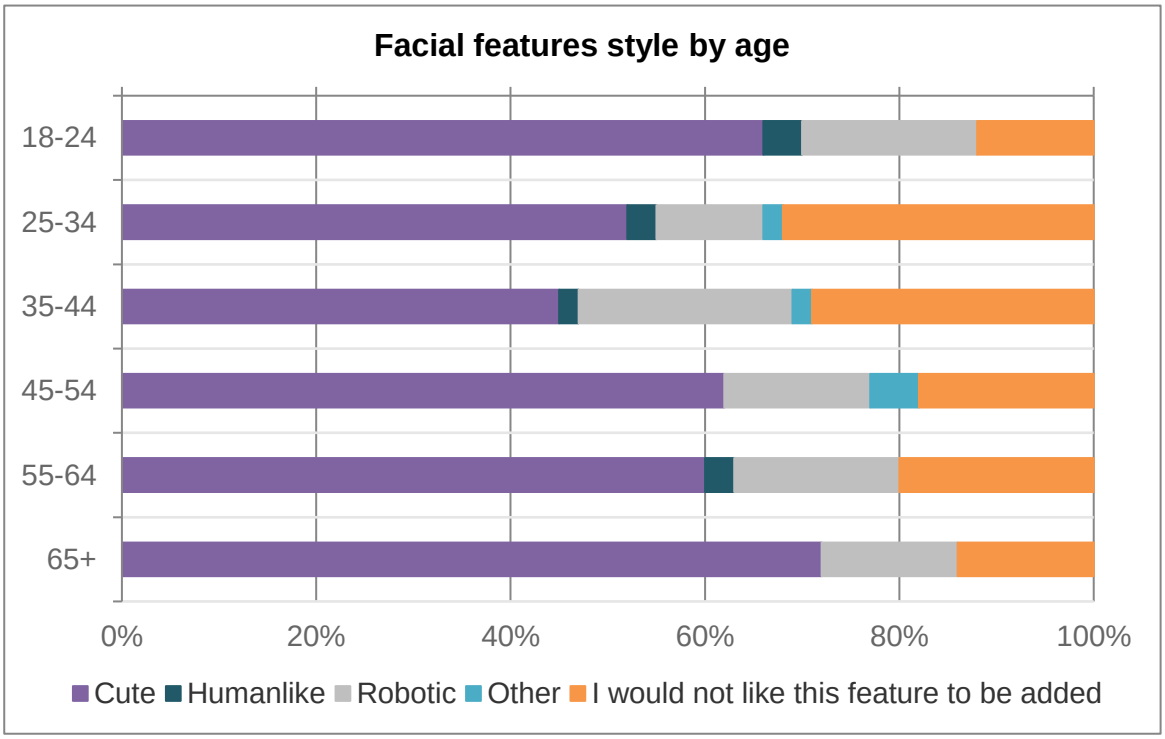


Figure 27 Facial features style by age (n=401)

In contrast to the previously discussed features, the majority of respondents prefer the robot's voice to sound "humanlike" (41.9%), followed by the "cute" and "robotic" options, which receive similar levels of support (23.7% and 22.5%, respectively). Additionally, some respondents suggest that the voice should be humorous and clear, with a few referencing popular culture icons (one respondent, for example, proposed that the robot should produce beeping sounds similar to those in Star Wars).

Male respondents demonstrate greater preference for the "humanlike" voice (48.5%) compared to female respondents (39%). Among females, the "cute" style ranks as the second most favoured option (27%), followed by the "robotic" style (24.7%). In contrast, males rate the "cute" and "robotic" styles equally, at 18.2%.

Regarding age, all demographic groups show a stronger preference for the "humanlike" voice, except for the 18–24 age group, where the "cute" style is the most favoured, with 42% support. The "humanlike" voice gathers the highest level of support among middle-aged respondents, with the 55–64 age group leading this trend at 60% (see Figure 28).

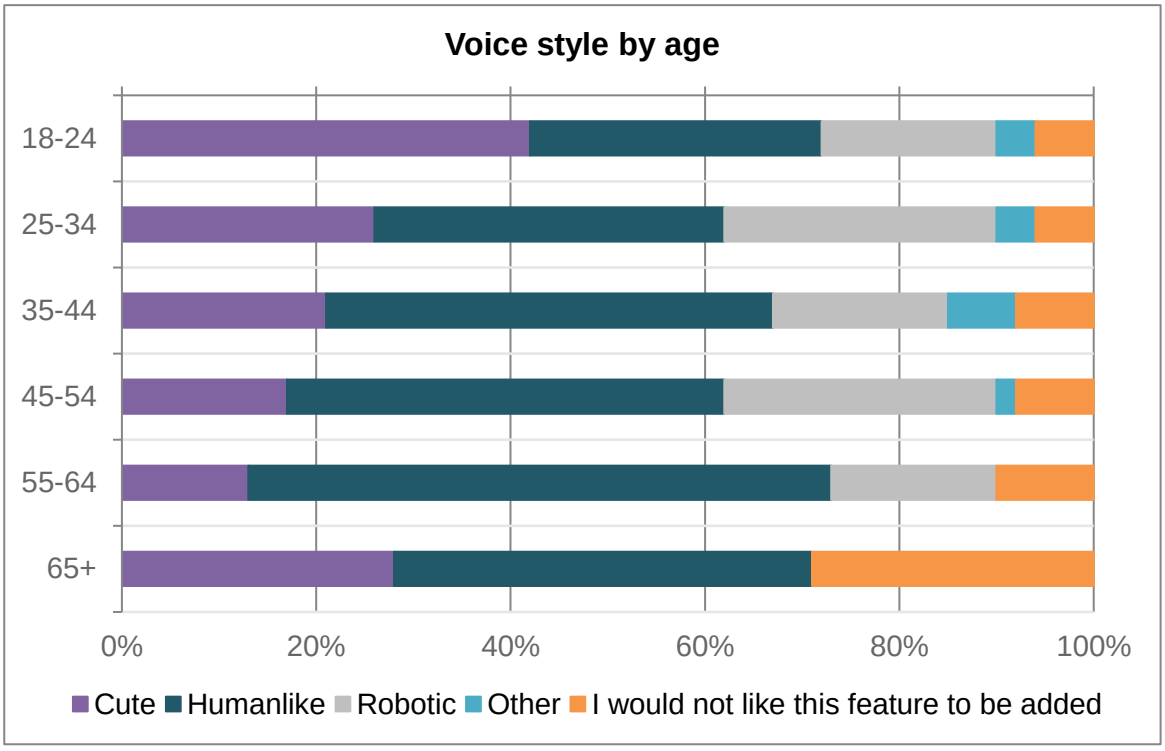


Figure 28 Voice style by age (n=401)

Finally, regarding the tone of voice, there appears to be a consensus that it should be casual, as indicated by 66.6% of total responses. The formal tone received limited support (18.7%). Additionally, 11.5% of respondents indicated that they would prefer for this feature not to be included. Among those who favoured an alternative style, descriptors such as cheerful, friendly, neutral, cute and charming were suggested.

No significant differences were observed based on gender. With respect to age, all segments demonstrated strong support for the casual tone. However, respondents aged 65 and above provided the lowest level of support, though it remains substantial at 57.1% (see Figure 29).

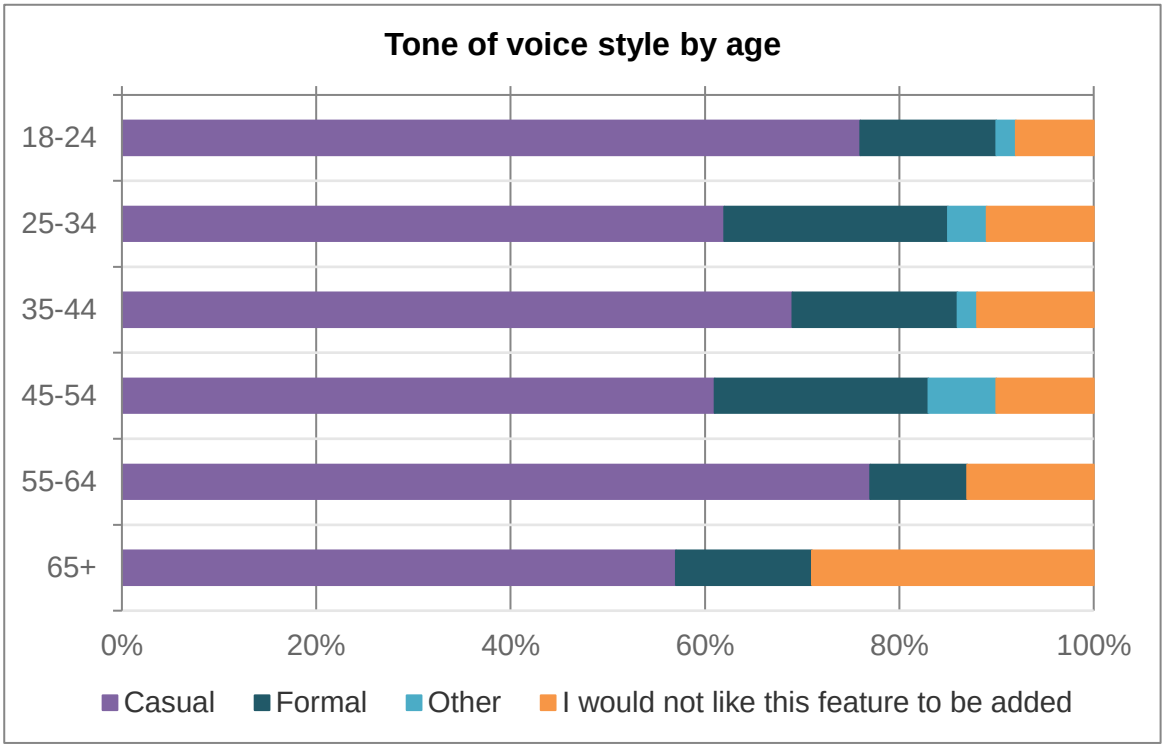


Figure 29 Tone of voice style by age (n=401)

6.5 Analysis of perceptions of modified experience

To evaluate the impact of these features on the overall customer experience, respondents were asked the same questions regarding use and recommendation likelihood, and perceived benefits compared to traditional delivery methods, this time regarding the experience with all or some of the proposed elements. In this context, respondents' opinions were based solely on imagination, as there were no prior experiences or opportunities to utilize video elicitation.

On average, the likelihood of using the modified ADR experience was rated at 3.4, with slightly higher scores among female respondents (avg. = 3.5) compared to male respondents (avg. = 3.2). Recommendation likelihood showed identical scores across both total and gender-based

averages. Regarding perceived benefits over traditional delivery methods, the overall average was 3.5, with a similar gender gap observed (female avg. = 3.6, male avg. = 3.3).

Differences across age groups followed similar patterns, with the 18–24 and 45–54 age segments expressing greater willingness to use and recommend the modified experience (use likelihood avg. = 3.7, recommendation likelihood avg. = 3.6). In contrast, respondents aged 55 and above demonstrated the least intention to engage with the modified experience (use likelihood avg. = 3.0; recommendation likelihood: 55–64 years avg. = 3.0, 65+ years avg. = 3.1). Middle-aged respondents (35–54 years) rated the modified experience as more beneficial than other delivery methods (avg. = 3.6) compared to older segments (55–64 years avg. = 3.2, 65+ years avg. = 2.9).

As in the previous evaluation of these variables for the current experience, the most significant differences were observed between users and non-users of ADR as a delivery system (see Table 16).

Table 16 Acceptance of modified experience with ADR

Variable	ADR experience	n	Average	Median	SD
Use likelihood	**Users**	181	3,9	4,0	1,4
	Not users	220	3,0	3,0	1,5
WoM	**Users**	181	3,8	4,0	1,4
	Not users	220	3,1	3,0	1,4
Delivery comparison	**Users**	181	3,8	4,0	1,3
	Not users	220	3,3	3,0	1,3

When comparing these variables between the current and modified experiences, the values in the latter are generally slightly lower. This trend is most pronounced in the recommendation likelihood for certain segments, such as respondents with prior experience with ADR and individuals aged 45 to 54 years (avg. change = -0.5). Overall, perceptions of the benefits compared to traditional delivery methods exhibit minimal change, with an overall average of -0.1. These variations are very mild across sectors and even show complete neutrality among the 35 to 44 age group.

In terms of use and recommendation likelihood, a mild negative trend is evident. However, there are exceptions in two specific age groups: individuals aged 18 to 24 years, whose likelihood of use increases by an average of +0.2 while their recommendation likelihood remains stable, and

individuals over 65 years of age, whose use likelihood remains unchanged but whose recommendation likelihood increases by an average of +0.2.

A comprehensive comparison of these variables across both experiences and demographic segments is presented in Table 17.

Table 17 Comparison between current and modified experience with ADR

Population	Segment	Use likelihood (avg.)		Recommendation likelihood (avg.)		Delivery comparison (avg.)	
		Current	Modified	Current	Modified	Current	Modified
By gender	Female	3,7	3,5	3,9	3,5	3,7	3,6
	Male	3,3	3,2	3,4	3,2	3,4	3,3
By age	18-24	3,5	3,7	3,6	3,6	3,5	3,4
	25-34	3,5	3,3	3,7	3,3	3,6	3,5
	35-44	3,7	3,4	3,8	3,4	3,6	3,6
	45-54	3,9	3,7	4,1	3,6	3,9	3,6
	55-64	3,1	3,0	3,4	3,0	3,5	3,2
	65+	3,0	3,0	2,9	3,1	3,0	2,9
By experience with ADR	Users	4,2	3,9	4,3	3,8	4,0	3,8
	Not users	3,1	3,0	3,3	3,1	3,4	3,3
Total	**-**	**3,6**	**3,4**	**3,7**	**3,4**	**3,6**	**3,5**

In addition to these three comparative analyses, a final question was presented regarding the overall value of the experiential elements. In general, respondents expressed a slightly positive opinion of these features (avg. = 3.0), with minimal variations observed between genders (female avg. = 3.1; male avg. = 2.8) and with respect to previous use of ADR (users avg. = 3.1; non-users avg. = 2.9). The most notable discrepancies were found among age segments, with the highest levels of support reported by the 18 to 24 age group, followed by an almost systematic decline as age increased. The lowest rating was provided by respondents aged 65 and older, representing a difference of precisely -1.0 in comparison to the youngest respondents. A detailed presentation of the overall value of the experiential elements across age segments is provided in Table 18.

Table 18 Overall value of experience elements by age

Age	n	Average	Median	SD
18-24	50	3,4	4,0	1,4
25-34	113	3,0	3,0	1,4
35-44	125	2,9	3,0	1,4
45-54	76	3,0	3,0	1,4
55-64	30	2,7	3,0	1,4
65+	7	2,4	2,0	1,0
Total	**401**	**3,0**	**3,0**	**1,4**

7 Discussion

In this final chapter, the findings outlined in the results section are subjected to further analysis, with the objective of addressing the research questions formulated in this study. Additionally, this chapter includes an evaluation of the reliability and validity of the research, alongside a reflection on its limitations. Suggestions for future research are presented, as well as a discussion of the author's learning outcomes derived from the study.

7.1 Research questions

What is the current perception of customers regarding the food delivery experience with autonomous delivery robots in Finland?

The findings of this study indicate that, in Finland, customers who utilize ADR as a food delivery method do so primarily for timesaving purposes (utilitarian motivation) and secondarily for entertainment (hedonic motivation). Factors such as price and social influence, often cited in previous studies, appear to hold no relevant significance for customers in the Finnish market. Hedonic motivations are notably more influential among younger demographics and males. Overall, the value attributed to ADR as a delivery method seems to combine both utilitarian and hedonic dimensions, aligning with what some authors refer to as a "balanced" product (Addis & Holbrook 2001, 57; Gentile, Spiller & Noci 2007, 405). This contrasts with the motivations driving customers to order food online without specification of the delivery method, where the hedonic value is marginal and tends to relate to the gastronomic experience (personal treat) rather than the delivery process itself, perceived as a utilitarian service.

While the general perception of ADR is very positive, their use remains infrequent, with most respondents reporting usage less than once per month. Participants cited factors related to perceived usefulness, ease of use and enjoyment as primary factors contributing to their satisfaction with ADRs. Notably, the entertaining nature of the experience and the perceived "cuteness" of the robots were frequently mentioned. This perception of cuteness appears to relate to the overall experience rather than the robots' specific design features. These findings align with the conclusions of Dobrosovestnova et al. (2022, 1026-1028), although the negative attitudes observed in their study in Estonia—such as concerns about street overcrowding and the need for human assistance for robots—did not emerge as significant issues in this research. Instead, respondents in Finland

identified delivery delays, navigation difficulties and the inconvenience of retrieving orders from pick-up points as the primary sources of dissatisfaction.

Customer perceptions regarding use and recommendation likelihood and the perceived benefits of ADR compared to traditional delivery methods were generally similar, indicating a mildly positive trend. Respondents with previous experience with ADR were more inclined to use and recommend them, as well as to perceive them as more beneficial than other delivery methods. One plausible explanation for this disparity is that the actual delivery experience exceeds expectations due to the "cuteness effect" lowering performance expectancy, as suggested by Lv et al. (2021, 12) and subsequently surprises customers with a higher-than-anticipated level of reliability. Another plausible explanation is that some respondents (likely in the group of those who have never used ADR) may exhibit a natural aversion to robots, which could potentially result in lower scores, as discussed by Webster & Ivanov (2021, 79-80).

An interesting finding is that female respondents not only demonstrated a higher propensity to recommend the use of ADR but also appeared to exhibit greater customer loyalty and therefore acceptance of this delivery method compared to males. This observation contributes to the ongoing discourse on gender-based differences in the acceptance of service robots (Webster & Ivanov 2021, 68).

Does this perception change over time, following a certain number of interactions with autonomous delivery robots?

The motivations underlying the choice of ADR as a delivery method appear to evolve with the number of interactions. Hedonic motivations decline as usage increases and disappear entirely after ten interactions. Simultaneously, the majority of respondents have used ADR only once or twice, with a marked decline in the number of respondents who report using them more than six times.

It is not possible to confirm the commoditization of delivery with ADR based on this second finding, as the reasons for limited repetition could vary. Delivery with ADR is still expanding across the country and remains a relatively new offering at many outlets. Therefore, users having only one or two interactions may not necessarily signify a loss of interest or an intention not to use ADR in the future; it could simply reflect a lack of time or opportunity for further engagement.

The observed shift in motivations, however, might be interpreted as indicative of the rapid commoditization of the delivery with ADR. As hedonic motivations fade with repeated usage, customers may begin perceiving delivery with ADR more as a service rather than an experience. Whether this shift translates into a decline in demand remains inconclusive based on the data collected in this study. Further research is necessary once delivery with ADR has achieved broader market penetration and has been available for a sufficient period to allow for more comprehensive analysis.

Can elements of Experience Design enhance the current food delivery experience with autonomous delivery robots?

Overall, respondents exhibit a moderately positive valuation of the experiential elements analysed in this study. The youngest demographic is the most receptive to these elements, while respondents aged 55 years and older display a neutral perspective toward them. Female participants consistently attribute higher value to these features compared to male participants, which appears to contradict the study's findings that females primarily adopt ADR for utilitarian purposes.

One potential explanation is that, while the primary motivation for females may fall under the utilitarian dimension, they may also attribute a more sustained importance to the hedonic dimension. In contrast, hedonic motivations among male respondents might peak during initial interactions and subsequently decline. Another plausible interpretation is that the "cute" approach of the features evaluated might resonate more strongly with female respondents, as supported by the findings of this study. It would be interesting to explore whether alternative approaches or features at different stages of the customer journey are more appealing to male respondents, or if the findings of this study remain consistent irrespective of the features or stylistic variations.

Nevertheless, as will be presented in the subsequent question, support for experiential elements appears to vary strongly depending on the specific features under consideration.

What are the customers' preferred Experience Design elements applicable to this context?

In evaluating the elements of experience design, respondents exhibit a marked preference for features related to communication during the journey, with a clear inclination towards human-to-human interaction. Among all segments, the most highly rated element is the role of the Bot Master, which represents the sole direct communication with a human employee during the experience.

While the voice communication is technically a form of human interaction, it is portrayed as originating from the robot itself, creating a fictionalized form of engagement. These findings suggest that respondents are not fully prepared to embrace the complete replacement of human employees and instead prefer the option of relying on human staff when necessary.

The ratings for both the Bot Master and robot-based communication indicate that the desire for enhanced communication extends beyond mere entertainment. It may reflect a need for greater access to information, particularly in scenarios such as delivery delays. Although both elements are highly rated, the respondents' pronounced preference for human interaction over robotic communication might support the hypothesis that this enhanced communication is primarily driven by a need for information provision rather than additional entertainment.

Experience elements related to co-creation are among the lowest rated, reflecting a preference for standardized rather than customizable interactions. This trend may derive from the high value respondents place on timesaving as a key benefit of ADR. Consequently, features aimed at enhancing the experience should consider the importance of efficiency and avoid introducing elements that could add complexity or require additional time, particularly during the initial stages of robot deployment.

Some of the elements already implemented by S-Group in Finland, such as voice interactions and seasonal decorations, receive greater support compared to features like music and, especially, facial features. While respondents generally exhibit neutrality towards music, with both supporters and detractors regarding its volume, facial features emerge as one of the least favoured elements. Approximately one-quarter of respondents express complete rejection of facial features, resulting in overall low ratings. A plausible explanation for this aversion is the perceived incongruity between overtly anthropomorphic features and the robot's mechanical design, which may evoke a sense of uncanniness. This effect could potentially be mitigated by suggesting facial features—such as eyes or a mouth—through mechanical elements like lights or camera lenses, allowing customers to project their own interpretations, as seen with Starship robots.

Overall, respondents demonstrate a distinct preference for cute and casual styles across features, with the sole exception of the voice, where the humanlike style is generally favoured. Notably, the youngest segment (18 to 24 years old) consistently supports the cute style across all features, diverging from the broader preference for humanlike voice interactions. The cute style also resonates particularly strongly with female respondents, who exhibit significantly higher support for this theme compared to their male counterparts. While male respondents also favour the cute style,

their support is less pronounced, with preferences additionally tending toward robotic features—a style valued more highly by male respondents than by females.

Are there significant differences between customer perceptions of the current experience and the proposed enhanced experience with autonomous delivery robots?

The findings of this research do not provide strong evidence for greater acceptance of an experience modified with the proposed elements. The results indicate mild negative trends in both usage and recommendation likelihood, with certain age segments constituting exceptions, and reveal almost no change in the perception of benefits. As evaluated in relation to the current experience, actual users generally display greater willingness to use and recommend the modified experience, perceiving it as more beneficial compared to non-users. However, the inclusion of experiential features does not lead to higher ratings for these variants.

These findings may appear somewhat contradictory to the overall evaluation of the elements, which tends to range from neutral to positive across various segments. One potential explanation could involve the decreased performance expectancy associated with the "cuteness effect" (Lv et al. 2021, 12). However, this impact would likely manifest as a more significant divergence in the perception of benefits compared to human delivery, rather than in the willingness to use and recommend the delivery with ADR. Additional plausible explanations may stem from methodological limitations within the research itself, wherein comparisons were drawn between a tangible reality and a hypothetical scenario, both assessed using identical tools. A different approach to evaluating this hypothetical modified experience might have better captured respondents' perspectives on its potential impact.

7.2 Reliability and validity

Reliability and validity are among the most widely accepted instruments for evaluating the quality of quantitative research. Reliability refers to the "consistency of respondents’ answers to the same question in the same or similar contexts over time, assuming the nature of the question does not change" (Aarons 2020, 320). A lack of stability in the measure can result in poor reliability (Williams et al. 2022, 97-98).

In this study, consistency in responses is observed throughout the survey, with all measurements falling within less than two standard deviations from the mean. Standard deviation values are closer to 1 for questions related to respondents' behaviour, such as technology readiness or use and recommendation likelihood. However, higher values are observed for questions evaluating experiential features. Open-ended responses reveal a diversity of respondent profiles, with many expressing strong opinions on what appears to be a trending topic, potentially influenced by heightened social media discourse and mild polarization. Missing data is minimal and not significant, and responses to open-ended questions demonstrate coherence and a clear understanding of the topic under discussion.

Validity, on the other hand, relates to whether a question measures "what it is supposed to measure" (Aarons 2020, 321). To ensure the validity of this study, the survey was pre-tested with respondents from diverse backgrounds, and modifications were introduced based on their feedback. Furthermore, the survey design incorporated constructs from prior research, including motivations for ordering food online and the utilization of ADR as a delivery method, and the evaluation of use and recommendation likelihood as indicators of acceptance. This approach was intended to improve construct validity, which "refers to the extent to which variables accurately measure the constructs of interest" (Williams et al. 2022, 99). Nevertheless, there is reasonable doubt regarding the appropriateness of the methods used to measure these variables in the hypothesized scenario. Some incongruences emerge, particularly when compared with the evaluation of experiential elements. Perhaps, more direct questions—such as "*Would you recommend the modified experience over the current experience to a friend or family member?*"—might have better aligned with the intended measurements.

It is also possible that some respondents, despite clear instructions at the beginning of the survey, approached the survey with grocery delivery in mind instead of food delivery. Grocery delivery represents the most common and widespread use case for delivery robots in Finland and was the context in which these robots were initially introduced. However, it is debatable whether opinions would differ significantly based on the type of goods in question.

Finally, challenges to the validity of the research arise from the age and gender distribution of respondents. Certain age categories, particularly older ones, are underrepresented, while there is a clear overrepresentation of female respondents. This invites reflection on the reasons behind the disproportionate female participation in the study. Considering the results, it remains an open question whether this overrepresentation indicates an increased interest in or acceptance of ADR among females or the specific nature of this research.

7.3 Limitations and future research

In addition to the challenges related to the under- and overrepresentation of specific population segments, several other factors present limitations on this study. Among these, the most prominent is the restriction of the participatory design part of the research. This study evaluates twelve specific elements that have been proposed to fit within a particular theme and stage of the customer journey. Future research could explore diverse elements, themes and stages of the journey, including considerations not solely aimed at enhancing customer acceptance but also addressing the perspectives of bystanders. As previously noted, the deployment of ADR in Finland has generated widespread discussion, with bystanders' opinions influencing the discourse. Their feedback offers valuable insights from a different point of view. As proposed by Saravanos et al. (2022, 529), gamification appears to be an appropriate approach to test, not only during the delivery phase but also during earlier stages of awareness and advocacy. Experiential marketing initiatives could integrate elements of co-creation, such as robot naming or decoration design competitions. Additionally, playful activities targeting younger generations, including interactive engagements with robots during their routes, could be explored and tested.

Another significant limitation arises from the novelty of the delivery with ADR, which complicates efforts to assess acceptance and predict the evolution of attitudes toward ADR. Particularly challenging is the evaluation of the potential commoditization of the offering. This process naturally requires time to unfold and involves the waning of the initial hype—a stage in which ADR in Finland are currently situated. Future research could investigate the evolution of public opinions to determine whether delivery with ADR ultimately becomes commoditized or whether their experiential value continues to rise and remains demanded by consumers.

An additional limitation stems from the study's methodology, as the evaluation of elements relies heavily on respondents' imagination in envisioning modified experiences. More robust findings could arise from research in which these modifications are directly presented to respondents, allowing them to compare current and proposed experiences in real-world settings. Given the increasing prevalence of ADR in Finland and the growing ease of access to these technologies, future studies could adopt alternative methodologies that reduce the reliance on image or video elicitation.

Moreover, the quantitative nature of the methodology itself imposes certain constraints. A complementary approach utilizing more open-ended questions or qualitative research methods could

enrich the findings by providing more nuanced data, particularly regarding participatory design aspects. The high response rates to open-ended questions suggest respondents' strong willingness to engage in discussions, share in-depth opinions and relate personal experiences—an aspect that could substantially improve future research.

Furthermore, the chosen sampling strategy may have introduced an additional limitation to the study. The dissemination of the survey through social media channels may have contributed to the underrepresentation of older segments of the population. As different social media platforms tend to attract users from distinct age demographics, efforts were made to engage diverse age groups by promoting the survey across multiple platforms—Facebook, Instagram, LinkedIn, WhatsApp and Jodel. However, the visibility and reach of these platforms might have influenced the age distribution of respondents. Additionally, it remains uncertain whether this sampling strategy affected gender distribution, though this possibility cannot be disregarded. Future research should account for this limitation, particularly regarding the inclusion of older population segments, and adopt alternative strategies to ensure their greater participation.

Finally, this study has identified a trend related to gender disparities in the acceptance of and motivations for using ADR, as well as the evaluation of experiential elements designed to potentially transform these interactions. Exploring whether experiential design strategies resonate more strongly with female participants and improve traditionally lower levels of acceptance is an interesting direction for future research. This line of inquiry could also be extended to other types of service robots in varied roles, with different levels of presence and interaction.

7.4 Learning outcomes

This research and thesis writing process spanned a period of ten months, from June 2024 to April 2025. Each stage of the process provided new learning opportunities for the author, beginning with the identification of the research topic and concluding in the final pages of this report.

An initial key learning related to the justification of the study, involving a balance between personal interest in a research topic and the relevance of the research itself. The literature review proved invaluable in this regard, as academic articles frequently draw attention to trends and identify areas requiring further exploration. This process led to two changes in the research topic within the same field of investigation—initially focusing on the vandalization of ADR in Finland, subsequently shifting to a comparison of customer attitudes towards ADR and human couriers. Ultimately, the final

topic integrated both academic research interests and the author's personal inclinations, combining two disciplines from the degree curriculum.

One of the most significant challenges encountered during the study was the development of a merged theoretical framework. This task involved connecting previously unrelated theories in a coherent manner, selecting key elements from each to construct a logical, cohesive foundation for the research. The process involved a substantial investment of time in the literature review, which was intellectually enriching and inspiring, enabling the author to deepen expertise in both areas of competence.

The selection of the research methodology, the creation and distribution of a survey, and the subsequent data analysis were among the most significant learning experiences derived from the thesis. As the author's first research project, each stage presented distinct opportunities for learning. This experience was particularly rewarding, as it allowed the author to channel a genuine passion for understanding human behaviour into a practical research application. The study's reception, as evidenced by a high level of participation, was especially gratifying. It was surprising and encouraging to observe the willingness of individuals to share their experiences, despite the overload of feedback requests in contemporary society. Additionally, the realization that participatory design offers a more equitable, enriching and productive process compared to individual design was a truly valuable outcome. If the process were to be started again, a more qualitative approach would likely have been incorporated into the research. Opinions, stories and experiences proved to be far more valuable in this case, where limiting options had the side effect of restricting the creativity that is essential in a design process.

Overall, the thesis writing and research process have been an invaluable source of learning, serving as a final integrative exercise that applied the knowledge acquired throughout the degree program, while simultaneously contributing to current academic research. The deepest gratitude is extended to the thesis supervisor for their unwavering support and guidance throughout this entire journey.

7.5 Conclusion

During the course of this research, the landscape of automated delivery has undergone significant transformation in the Nordic countries, particularly in Finland. In March 2025, Foodora began utilizing Starship delivery robots in Sweden (Starship 2025). Meanwhile, in Finland, one of the market

leaders in food delivery, Wolt, initiated operations employing both Coco and Starship delivery robots in selected areas of Helsinki and started testing drone delivery in the municipality of Espoo (Helsingin Uutiset 2025; Wolt 2025).

A notable trend has been the increased incorporation of experiential elements into automated food delivery. Marketing efforts have employed humorous slogans, such as “I may be autonomous, but I’d follow you anywhere” and “If loving you is wrong, I don’t wanna be reprogrammed,” to promote a special voice message delivery service for Valentine’s Day (Starship s.a. b. 2025). Similarly, aesthetic customizations for holidays like Halloween and Christmas (Sale Nummela s.a.; S-Kaupat 2024), as well as seasonal adjustments to the music played by the delivery robots, have added to the hedonic dimension of the experience.

This hedonic dimension seems to have become an inherent aspect of the offering, as companies increasingly adopt this more experiential approach, which customers appear to expect—or at least readily embrace. Hopefully this study has contributed, in some capacity, to a deeper understanding of attitudes toward ADR and the acceptance of experiential elements that could further enhance the hedonic dimension of their application in food delivery within the Finnish market.

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Appendix 1. Data management plan

This document introduces the Data Management Plan for the survey “Customer Experience with Delivery Robots,” part of the research-based bachelor’s thesis “From Service to Experience Robots: Exploring Customer Acceptance of Automated Delivery Robots in the Hospitality Industry through Experience Design.”

Objective of data collection

This survey aims to gather information about the perceptions and expectations of online food delivery customers and potential customers regarding delivery robots. It also seeks to evaluate certain elements of experience design that could modify the current customer experience and determine if these elements enhance or reduce customers' perceived benefit, likelihood of use and word-of-mouth potential.

No preparation is required to participate in the study, which is conducted via an online survey on the Webropol platform. The survey takes approximately 15 minutes to complete.

The thesis report will be published in the Theseus online library.

Processing, storage, access and disposal of data

The personal data collected has been minimized to the essential information necessary to participate in the research. The survey has been designed with a minimal number of open-ended questions to ensure that participants cannot be identified from their responses. No sensitive personal data will be collected in this research.

The data collected will be anonymized, ensuring that contact information provided for participation in further research will not be linked to the responses. Data from participants who do not wish to be contacted for further research will be automatically anonymous.

The data will be stored in the student’s personal Webropol account. Only the student and the thesis supervisor will have access to it.

The data will be processed and analysed using the analysis software provided by Haaga-Helia. The processing of personal data will comply with the current EU General Data Protection Regulation (Regulation (EU) 2016/679 of the European Parliament and of the Council on the protection of

natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC) and the applicable Finnish legislation.

The data will be retained for further academic research and will be destroyed no later than 01.06.2026.

Voluntary participation and withdrawal of consent

Participation in the survey is voluntary. Please note that once the submit button is pressed, consent to participate cannot be withdrawn, as individual responses are anonymized and therefore not identifiable.

Contact Information

For further information regarding this survey, the data management plan or the primary research, please contact Macarena Jiménez Nogales at macarena.jimenez.nogales@myy.haaga-helia.fi.

Appendix 2. Survey video script

Scene 1 Text [white]: Imagine you are hungry at home or work and decide to order food online. You order a ready-to-eat lunch from a nearby supermarket and choose the robot delivery option.

Scene 2 Text [white]: You open an application, select the food items and pay. You receive a delivery confirmation stating that your order will arrive in 34 minutes.

App screenshot: Delivery confirmation.

Scene 3 Text [white]: A few minutes later, you receive a notification that the robot is on its way.

Text [green, italic]: “Your robot is on the way – Time for arrival 11 minutes”.

App screenshot: Notification of the robot’s departure.

Scene 4 Text [white]: You can track the robot’s journey live.

Video: Capture of the robot’s tracking.

Scene 5 Text [white]: The robot is arriving…

Scene 6 Video: The robot arrives to the pick-up point.

Scene 7 Text [white]: You receive a notification that the robot has arrived at the destination.

Text [green, italic]: “Find the robot and open the lock”.

App screenshot: Notification of the robot’s arrival.

Scene 8 Text [white]: You click the authorization button.

Text [green, italic]: “I found the robot – unlock”.

App screenshot: Notification of the robot’s arrival. Animated click on the button.

Scene 9 Text [green, italic]: “Open the lid and retrieve your order. Close the lid and press the button to send the robot away”.

App screenshot: Retrieval instructions.

Scene 10 Video: The customer opens the cargo box and retrieves the order. The robot expresses gratitude.

Scene 11 Text [white]: You press the button to send the robot away.

App screenshot: Retrieval instructions. Animated click on the button.

Scene 12 Text [green, italic]: “Thank you and have a nice day”.

App screenshot: Thank you.

Scene 13 Text [white]: The robot leaves…

Scene 14 Video: The robot has turned around and leaves from the pick-up point.

Appendix 3. Survey transcription

Customer Experience with Delivery Robots

For the past two years, delivery robots have been a notable presence on the streets of Finland. As this service is still relatively new, it is essential to understand customer insights and evaluate the features that could enhance the overall customer experience. If you use or are planning to use online food delivery services such as Wolt or Foodora and reside in Finland, you are an ideal candidate for this study.

On the following pages, you will find four sets of questions concerning your experience with and expectations of food delivery services utilizing robots. In this study, food delivery refers to the transportation of prepared meals from dining establishments to end customers, including ready meals prepared at kitchens within grocery establishments. Regular grocery delivery is excluded from the scope of this research.

Participation in this survey is voluntary and should take no more than 10-15 minutes. Your responses will remain confidential and will be used solely for academic purposes. For detailed information on data policies, please refer to the Data Management Plan provided. For any questions regarding this study, please contact Macarena Jiménez at macarena.jimenez.nogales@myy.haaga-helia.fi.

Thank you for taking the time to participate in this research. Your insights are invaluable for advancing our understanding and enhancing the service of delivery robots.

Do you agree to take part in this research? *
Yes
No

To begin, we'd like to gather some information about you.

Where do you live? *
Helsinki Metropolitan Area
Rest of Uusimaa
Ahvenanmaa
Etelä-Karjala
Etelä-Pohjanmaa
Etelä-Savo
Kainuu
Kanta-Häme
Keski-Pohjanmaa
Keski-Suomi
Kymenlaakso
Lappi
Pirkanmaa
Pohjanmaa
Pohjois-Karjala
Pohjois-Pohjanmaa
Pohjois-Savo
Päijät-Häme
Satakunta
Varsinais-Suomi

How old are you? *
18-24
25-34
35-44
45-54
55-64
65+

What is your gender? *
Female
Male
Non-binary
Other, please specify

What is your highest level of education? *
Highschool
College or vocational school
Bachelor's degree
Master's degree
Doctoral degree
Other, please specify

Which of the following best describes your household? *
Single occupant
Couple without children
Couple with children
Single parent with children
Extended family (including grandparents, aunts, uncles, etc.)
Shared living with roommates
Other, please specify

Which of the following best describes your occupation? *
Employee in private sector
Employee in public sector
Self-employed
Retired
Student
Unemployed
Other, please specify

Have you ever ordered food online? *
Yes
No

How often do you order food online? *
Daily
Weekly
Monthly
Rarely
Never

What best describes your primary reason for ordering food online? *
Convenience
Time saving
Price-value
Food quality
Personal treat
Other, please specify

How comfortable are you with using new technologies? *
(0) Not comfortable at all / Very comfortable (5)

Have you ever used a delivery robot before? *
Yes
No

Approximately how many times have you used a delivery robot? *
1-2 times
3-5 times
6-10 times

More than 10 times

How often do you typically use delivery robots? *
Weekly
Monthly
Less often than monthly

What best describes your primary reason for using delivery robots? *
Time saving
Value-price
Reliable service
Entertainment
Social influence
Avoidance of social contact
Other, please specify

Based on your previous experiences, how satisfied are you with delivery robots? *
(0) Not satisfied at all / Very satisfied (5)

Could you please elaborate on the reasons for your satisfaction or dissatisfaction with the delivery robots?

Before proceeding with the next set of questions, please take a moment to watch the following video.

[Survey video]

Please answer the following questions based on the video and your previous experiences with delivery robots.

How likely are you to use the service presented in the video for food delivery? *
(0) Not likely at all / Very likely (5)

How likely would you be to recommend this service for food delivery to a friend or family member? *
(0) Not likely at all / Very likely (5)

How beneficial do you think delivery robots are compared to traditional methods in the context of food delivery? *
(0) Not likely at all / Very likely (5)

Now, we would like to understand how much value you place on certain elements that could modify the experience presented in the video. Please evaluate the following elements based on their value to you, using a scale from 0 to 5, where 0 means "no value at all" and 5 means "very valuable."

The robot has a name. *
(0) No value at all / Very valuable (5)

How would you like the name to be? *
Humanlike, like Aino or Eino.
Robotic, like Siri or R2-D2.
Cute, like Hilla or Manu.
Other, please specify
I would not like this feature to be added.

The robot has facial features, like eyes and mouth. *
(0) No value at all / Very valuable (5)

How would you like these facial features to be? *
Humanlike
Robotic
Cute
Other, please specify
I would not like this feature to be added.

The robot has a voice. *
(0) No value at all / Very valuable (5)

How would you like the voice to sound? *
Humanlike (current)
Robotic
Cute
Other, please specify
I would not like this feature to be added.

The robot has a specific tone of voice. *
(0) No value at all / Very valuable (5)

How would you like the tone to be? *
Casual
Formal
Other, please specify
I would not like this feature to be added.

The robot plays music upon arrival. *
(0) No value at all / Very valuable (5)

Users can select the music played upon arrival. *
(0) No value at all / Very valuable (5)

The robot beeps to show interaction with other robots. *
(0) No value at all / Very valuable (5)

The robot has seasonal decorations (e.g., Easter or Christmas). *
(0) No value at all / Very valuable (5)

Each robot is presented with a personality profile in the application, and users can select a robot for their delivery. *
(0) No value at all / Very valuable (5)

Users are allowed to skip this selection and be assigned a random robot. *
(0) No value at all / Very valuable (5)

Users can contact the Bot Master – a human employee who takes care of robots – in case of need. *
(0) No value at all / Very valuable (5)

Users can communicate with the robots during delivery (e.g., "Are you coming soon?" "I am stuck at a traffic light but on my way!"). *
(0) No value at all / Very valuable (5)

Finally, we would like you to imagine the experience with the delivery robots, modified with the features you just evaluated.

How likely are you to use the modified service for food delivery for the first time? *
(0) Not likely at all / Very likely (5)

How likely would you be to recommend this modified service for food delivery to a friend or family member? *
(0) Not likely at all / Very likely (5)

How beneficial do you think these delivery robots are compared to traditional methods in the context of food delivery? *
(0) Not beneficial at all / Very beneficial (5)

Overall, how valuable would it be to add all or some of the elements discussed above to the experience with delivery robots? *
(0) No value at all / Very valuable (5)

Thank you for participating in this survey. Your contributions are essential to our study.

We would like to retain your contact information for future studies. If you are willing to be contacted for extended research, please indicate your consent below and provide your email address. Your data will be securely stored and used exclusively for research purposes.

Do you consent to being contacted for future research? *
Yes. Email address:
No