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Piloting an Unmanned Smart Store: A Case Study of AFRY's Vantaa Office

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Abstract

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This thesis delves into unmanned store concept. It evaluates this type of retail within AFRY company and its office environment. Interest in this sort of retail relates to reinventing the retail experience, as the case company feels the need to improve internal services and employee convenience toward a modern and more convenient concept. The thesis focused on understanding the perceived value, opportunities, and concerns related to implementing an unmanned store rather than on its technical or digital development.

The theoretical framework examined existing self-service business models with a particular focus on the delivery of internal services user acceptance of unmanned retail formats. Other aspects were also explored. It also factors such as implementation feasibility and potential operational risks. The theoretical framework provided a foundation for analysing and assessing the relevance of unmanned store for a non-retail, office-based context of the case company.

The thesis used qualitative and some elements of quantitative research methods. Data was gathered through an employee survey, as well as interviews with industry experts. The survey assessed employee perceptions, expected advantages, and potential concerns, while interviews gathered insights into operational, organizational, and business-related aspects of unmanned store concepts. The data analysis revealed key value drivers and constraints related to the application of the unmanned store and highlighted key aspects for future improvements.

The results indicated potential value of implementing the unmanned store for providing more convenience and accessibility within the office environment of the case company. Existing challenges related to governance, responsibilities, and user behaviour were also identified. The findings provide AFRY with both strategic direction and practical understanding of the requirements for successfully implementing an unmanned store.

Keywords: Unmanned store, self-service, office Environment, Employee convenience, AFRY (case company), employee perceptions, internal service innovation, Implementation challenges.

The author has employed artificial intelligence as an aid in the thesis and takes full responsibility for the content of the thesis.

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Abbreviations

UMS	Unmanned Store = Cashierless Store = Smart Store
AS	Autonomous Store
TAM	Technology Acceptance Model
HISAM	Hedonic Information Systems Adoption Model
UTAUT	Unified Theory of Acceptance and Use of Technology
ECUS	Experience in Community Unmanned Store

1 Introduction

Rapid economic growth, followed by globalization and the COVID-19 pandemic have significantly impacted consumer behaviour and business operations in the last few years. The pandemic rendered extensive human interaction unnecessary as it became perceived as a health risk, making people turn toward alternate methods mainly online shopping and e-commerce.

Multiple sectors were affected by the pandemic, most importantly Lockdowns, travel restrictions, and social-distance measures affected sectors such as tourism, hospitality, entertainment, and non-essential retail the hardest. This forced multiple enterprises to temporarily close or drastically reduce their operations. These changes were followed by a strong incline towards working remotely which directly caused a decrease in personal consumption expenditure, further hindering economic activity. These changes instigated a shift from in-person shopping towards online shopping and contactless payments.

The end of the epidemic did not reverse this shift as more countries and organizations started to adopt it by integrating mobile payments, digital checkouts and remote services into their systems. The concept of unmanned stores has now become more appealing as it proved to be resilient against COVID-driven economic stress such as labor shortage and excessive human interaction. Perceived benefits consider this method to be more profitable than traditional stores as they could operate 24/7.

It also proved to be more cost friendly thanks to its ease of maintenance where less labor is needed for multiple stores at a time. The use of the Cashier-less concept has also proved to be of great significance thanks to its use of AI and Computer Vision to minimize human interaction. This software proves to be handy to customers by removing the human factor from the equation and making them interact with the store itself. This would in turn reduce any perceived risks or inconveniences they might have towards their health or their overall interaction

with other people. Further benefits include the facilitation of data collection and customer behaviour as well as monitoring sales operations and inventory level information which would potentially enhance sales operations (Shekokar et al., 2020).

Early assessment of this system has also indicated that this environment could prove to be eco-friendly. These perceived benefits attracted big businesses that chose to dive into cashiers' less or unmanned stores concept. Amazon Go, for instance, implemented one of these models under the "Just walk out" technology, which is a recent trend in the concept of cashier-less stores. Despite the novelty of the concept, the global market indicates high potential for future expansion.

Most available literature focuses on public retail environments such as supermarkets, while limiting attention towards unmanned store models, overlooking their potential in corporate environments. Unlike public settings, office-based stores serve employees and visitors alike in a familiar atmosphere where consumption is modest though frequent. In this study, the office environment refers to a workplace setting where employees and visitors of the building act as customers, engaging in regular but low-volume purchases within the company's area.

This thesis focuses on creating and piloting an Unmanned Smart Store inside AFRY's Vantaa office at Jaakonkatu building.

The objective is to test and see how an unmanned store can work within a workplace environment, where employees can buy and pick up everyday products or second-hand items. The study helps to understand challenges of setting up and operating an unmanned store in office. The findings can provide insight and learn from it who wish to implement similar solution in the future.

AFRY has provided its official support for this pilot project during the current year as part of my master's thesis, offering both the physical space and operational environment necessary to test and monitor the store's performance.

1.1 Research Problem

Circular economy framework integrates long term sustainability across product lifecycle from design to disposal, ensuring resource abundance and waste minimization. Figure 1. Below showcased the details starting from design where the product can be created with optimum durability and reprocess ability in mind. Companies prefer circular sourcing by selecting sustainable materials and engaging with suppliers committed to close the loop system.

The main focus of this thesis will be strategic and logistic operations, namely the reuse and reparability of the product while attempting to reach optimal maintenance of product value and reducing overconsumption of new resources. When the product reaches the end of their practical life, discarding it is managed through waste recovery methods, ensuring the integrability of the salvaged materials into the supply chain. These interconnected elements create a system that can eliminate waste and maintain its value. Economic efficiency and environmental factors will also be considered and put into perspective.

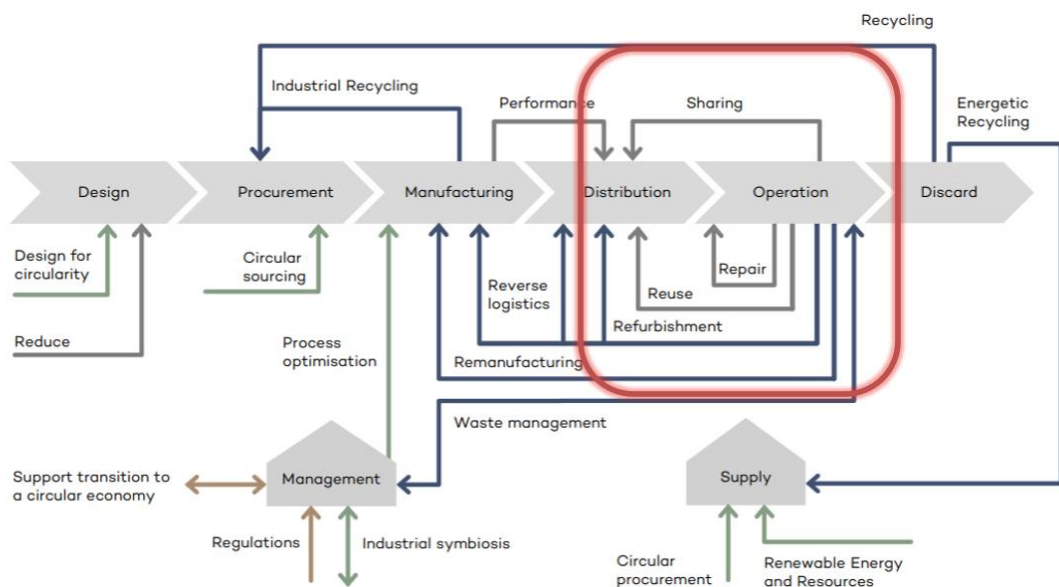


Figure 1 :Framework Circular economy services. (AFRY.,2023).

This economic model aligns with waste management and reverse logistics principles in the framework. It will also reduce unnecessary procurement and extend product lifecycles. Despite the constant effort towards promoting circular economy model, a gap remains in practical application, particularly in redistributing second-hand office supplies and surplus materials. Multiple offices still operate within a linear consumption model which depends on more short-term but high value manufacturing costs, leading to more environmental issues and waste disposal. According to Al-Sinan & Bubshait (2022), This could be tied to lack of knowledge and familiarity with on model over the other. Many people still lack a clear understanding of potential circularity. The latter is not just recycling, it is a holistic approach its main aim to reduce cost in operation, reduce waste, create sustainable business model and optimize resources

Traditional retail models rely heavily on manual operations, resulting in higher costs, source depletion and accessibility issues. There is a necessity for a more automated, unmanned smart store that can facilitate integrated resource circulation. Resulting in cost and waste reduction and having a better environmental impact while it enhances awareness and utilization of circularity principles. The transition to circular economy has become a priority in Europe to achieve sustainable development and reducing environmental impact (Al-Sinan & Bubshait, 2022). The efficiency of this model could no longer be ignored, and further implementation is to be expected.

Many companies in Europe promoted several programs to shift from traditional economy to circular economy. In addition, the traditional Brick and Mortar stores depend mainly on manpower for operations. This raises several challenges, including high labour costs, safety concerns, and high operation costs such as rent and long checkout lines. These inconveniences can prove to be frustrating for consumers and owners as well. The core concept is to rethink product design, business operations and consumption patterns in order to ensure sustainability at every stage of the product life cycle. Without acknowledging the environmental and economic benefits of the circular economy, people may not realize its significance to implement more sustainable approaches.

Digitalization and implementation of new techniques like unmanned smart stores in workplaces could prove its significance in terms of resource management, reducing waste and encouraging recyclability. Nevertheless, these kinds of technologies are still in their early stages, and in need of further research to eliminate any concerns around them.

While it is true that digital retail concepts like unmanned stores can provide strong environmental and operational benefits (Al-Sinan & Bubshait, 2022), many organizations come across some obstacles like investment costs, lack of consumer's awareness, and resistance from employees to act in ways to drive these initiatives.

Figure 1 highlighted circular strategies such as repair, reuse, and refurbishment, suggests that unmanned stores could be a logical retail evolution the key strategies supporting circular economic efforts, particularly in distribution and operation (AFRY.,2023). These concepts are central to the unmanned store concept. The store in this study aligns with the sharing, reuse, and refurbishment aspects highlighted in the framework, as it enables AFRY employees to exchange second-hand items instead of discarding them.

1.2 Objective and Research Questions

This thesis study aims to investigate the benefits and challenges of introducing an unmanned smart store within office settings through development of slogan "Scan, Pay, and Go". The main objective is to create a store that enables employees to sell and exchange products in an easy fashion like second hand clothes, kitchen items, small electronics, bags, office supplies, Yoga mats , board games and other reusable items while studying customer feedback of the store in an office setting. These smart store systems have a high probability of reducing waste, optimizing resource management, and encouraging the reuse of office materials. Despite the potential digital solutions are faced with integration challenges often related to lack of customer awareness and difficulty to adapt and adopt to new systems

To overcome these issues, the study first investigates the current state and the previous research about unmanned stores, and then the study designs and carries out a pilot unmanned store in the AFRY Vantaa building. The store is then used as a controlled environment to monitor customer experiences

The research questions of this study are:

1. What factors influence the customer experience of unmanned smart stores?
2. How should the customer experience of the unmanned store in the AFRY Vantaa Jaakonkatu building be like?
3. How is the customer experience of the unmanned store in the AFRY Vantaa Jaakonkatu building perceived and evaluated by users?

The customer is in this study defined as any individual who interacts with the unmanned smart store, and covers all the different building users, including AFRY employees, tenants from other companies, visitors, and external clients

1.3 Action Plan

The thesis process took ten months, starting from May 2025. The timeline structured to ensure a systematic approach, balancing research and analysis. The plan was designed to provide flexibility and maintaining a clear structure to meet the deadlines in an effective way. The below table explain the structure of the timeline.

Table 1 Research and Implementation Plan for the AFRY Unmanned Store Initiative

Time Period	Tasks
May 2025 - October 2025	<ul style="list-style-type: none"> - Built the mock-up of the unmanned store in the AFRY Vantaa Jaakonkatu Building - Investigate research on unmanned

	<p>stores.</p> <ul style="list-style-type: none"> - Review case studies on existing un-manned shops in office buildings and others.
November 2025 – December 2026	<ul style="list-style-type: none"> - Launch interview guides and survey questionnaires. -Interview experts in this field - Distribute and collect surveys.
January 2026 - March 2026	<ul style="list-style-type: none"> -Analyze collected data using thematic analysis and statistical methods. - Interpret results in the context of re-search questions. - Draft the thesis (introduction, literature review, methodology, results, discussion, conclusion).
April 2026	<ul style="list-style-type: none"> - Revise thesis based on feedback - Conduct final review of the thesis - Submit the final document.

2 Methodology

2.1 Action research

Action research, as explained by Lewin (1946) is a research based methodological model that combines systematic investigation and purposeful intervention. Its main implementation lies in its cyclic process of planning, acting, observing and reflecting.

The fundamental purpose of action research is not confined to producing knowledge. It is also utilized to produce practical changes when conducting research as well. This makes it particularly appropriate in research inside organizational settings where the researcher aims to comprehend a phenomenon while also being impactful in the improvement process. Bradbury (2015) contends that a hallmark of action research is this dual functional construction of knowledge and its practical formation.

The study given is grounded in action research. This is due to its objective that aligns with these principles. The research questions will be based on learning about and creating the customer experience of an unmanned smart store located in the AFRY Vantaa Jaakonkatu building. The initial research question explores the factors affecting customer experience, which is the diagnostic step in the process where the current situation and user requirements are investigated systematically. The next question assists in defining what the desired customer experience would be in this context. It refers to the planning and intervention phase of the action research cycle. The third question investigates how users understand and assess the resulting customer experience. This is more of an observing and reflecting phase to evaluate the results of the solution adopted.

The process of collecting data shows that action research is iterative. To begin with, the study will provide a literature review that will later be followed by an explorative review. The next step is content analysis, which will be implemented to identify relevant themes and theoretical perspectives. The findings of these insights led to the construction of a field inquiry in the AFRY unmanned store using post surveys and in-depth interviews within quota sampling. Drawing on Coghlan (2014), this combination of inductive deductive reasoning facilitates a cyclical movement between empirical observation and theoretical interpretation, consistent with the principles of action research models.

2.2 Data collection and Analysis

This study aims to investigate the current state of knowledge regarding unmanned stores. This would be carried out by evaluating their viability, given advantages and potential challenges that may surface any stage of development. To provide a comprehensive understanding of the research problem, a variety of strategies will be employed including surveys, interviews, and literature review. Comprehending consumer attitudes toward this type of retail economy, recent studies on the adoption of cashierless systems highlighted the necessity of a strong theoretical foundation and through empirical investigation. This could be achieved by paying special attention towards well-known technology acceptance

frameworks and Use of Technology. The literature review develops the conceptual framework to synthesise previous research on customer experience, self-service retail, cashless payment systems, and sustainability-oriented store models.

Recent studies on the use of cashierless technology have indicated that a strong theoretical foundation and through empirical research are needed to comprehend consumer attitudes towards this type of retail economy. A conceptual framework is developed through the Literature Review, to synthesize prior research on customer experience, self-service retail, cashless payment systems, and sustainability-oriented store models. This would prove to be useful in examining factors that aid shape behavioral intention towards unmanned store formats. Research applying this model has shown that constructs such as performance expectancy, effort expectancy, social influence, and hedonic motivation exert a strong positive influence on consumers' intention to use cashierless stores. By integrating these theoretical and empirical insights, the literature review would establish a comprehensive foundation for investigating consumer responses to unmanned retail environments.

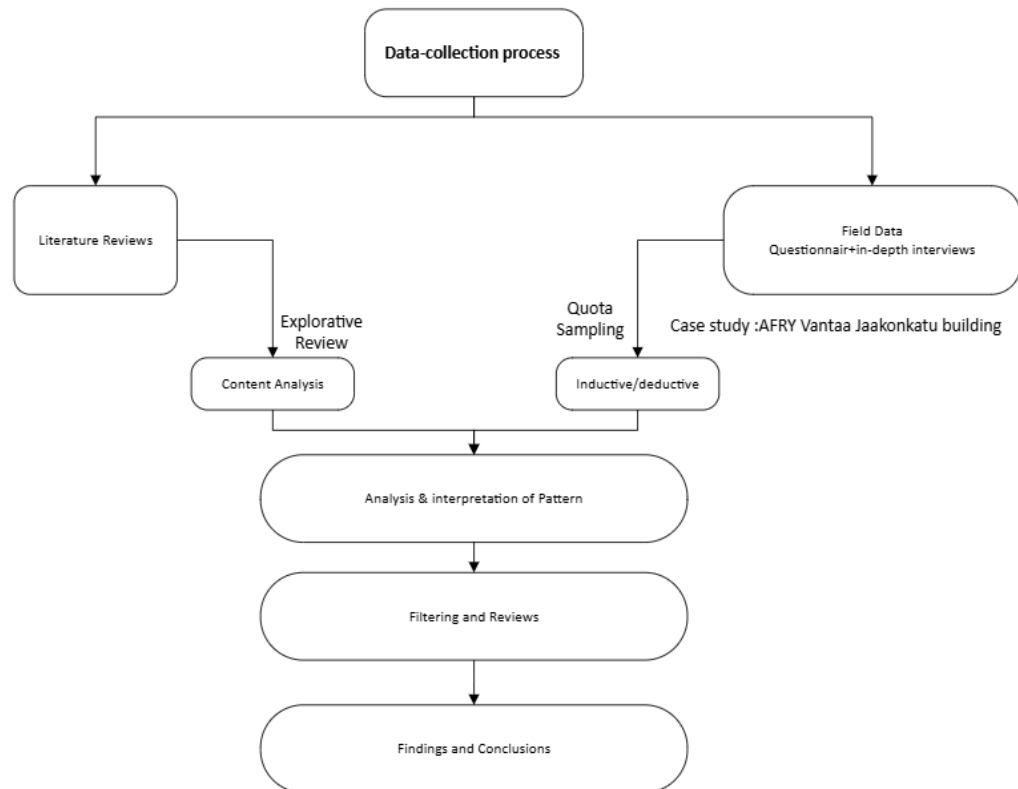


Figure 2 Data-collection process (By Author)

2.2.1 Literature

A literature Review will first be conducted to examine research on customer research and examine the existing research on customer experience within unmanned store environments. This will aid establish the theoretical foundation to comprehend employees' interaction and perception of this concept. The review will attempt to synthesize studies on self-service retail, and cashless payment systems. These aspects are key factors that would aid influence the adoption of QR codes and Mobile Pay technologies in workplace settings. Particular attention will be given to ease of use, convenience, and satisfaction, which are consistently identified as critical determinants of user acceptance in manned and unmanned retail environments. The review also includes research on pilot implementations and small-scale retail experiments to reveal common challenges, success factors, and lessons learned that are applicable to the AFRY unmanned store context.

2.2.2 Field Data

Secondly, field data was collected using a post survey amongst users and non-users of the unmanned store in the AFRY Vantaa Jaakonkatu building. Quota sampling will ensure a wide range of participants' demographic and behavioral profiles relevant to the store context. People who took part in the study were AFRY employees from different departments. The study also included professionals in the domain as well. The participation of people from different backgrounds would provide a more generalized view on opinions of users and their preparedness and willingness to embrace new technologies depending on their experiences and feedback of individuals through their interaction with the unmanned smart store at AFRY's Vantaa Jaakonkatu building.

In order to reflect the entire operational period of the pilot store, the survey was functional until 10th February 2026. This timing in the store mattered to ensure as many interactions as possible and also valuable insights on how customers behave, especially with new technologies coming up. 380 AFRY Vantaa's employees received the questionnaire. It included professionals from engineering, administration, finance, and project management. It was also shared with 40 tenants from other companies located in the same building, as well as regular visitors who were invited through posters with QR codes placed near the store entrance. The use of Microsoft forms provided ease of access to participants and maintain their level of interest in terms of feedback.

There were 84 responses in all, meaning about 22% of people answered. This indicates a strong score for an internal pilot project. Out of these, 62 were employees of AFRY, 18 were tenants from outside the company, and 4 were visitors who chose to take part. There were both closed-ended Likert-scale items and open-ended questions in the post-survey. It was made to get a full picture of people's utilization of the unmanned smart store at AFRY's Vantaa Jaakonkatu building and successfully capture their interaction, thoughts, and attitude towards the store.

The post-survey took place while the pilot store was open, to ensure that participants could interact with the store and give feedback based on their experience. The questionnaire (Appendix 1) had both open-ended and closed-ended Likert-scale questions. This helped to address themes such as ease of use, convenience, trust in the QR-based Mobile Pay system, satisfaction with the product selection, as well as engagement with circular economic practices like reuse and resale of items. The main purpose was quantifying user adoption, satisfaction, and perceived barriers to using the unmanned store, as well as identifying factors that influence the overall customer experience. The collected data provided recommendations to help optimize the store's design, operations, and engagement strategies. This supported the academic objectives of the study and AFRY's practical implementation of sustainable as well as innovative office retail solutions.

Evaluating the effectiveness of unmanned store models in offices to evaluate customer experience was not an easy task. It required a successful metric to evaluate it as professionally and objectively as possible. Table 1 below presents the metrics that will provide qualitative and quantitative insight into the feasibility, adoption and impact of the initiative.

A post survey was designed and conducted using Microsoft Forms to assess the performance, user experience, and sustainability perception of the unmanned smart store in order to allow seamless digital data collection and analysis. The survey base included employees, tenants, and visitors to provide a diverse demographic of the store users. This would play a crucial role in understanding consumer behavior, especially in the context of innovative products and services. Likert-scale items, ranging from "strongly disagree" to "strongly agree", measured experiential aspects such as the store's ease of use, its convenience, and sustainability. Multiple-choice questions assessed respondents' awareness of the store and their usage frequency, whereas open-ended questions solicited qualitative feedback and improvement suggestions. This methodological design facilitated the gathering of insights from both novice and regular users, providing a comprehensive understanding of the store's operational performance, perceived

value, and its prospects for expansion to additional AFRY locations. The results and insights from the post survey will be found in Chapter 5: Unmanned Store Feedback Analysis and Results, alongside the post- survey findings in Section 5.1.

The 11-question framework takes into consideration the principles of service delivery as an exploratory process. It delves into the spirit of research through experimentation to determine the intended functions of the store and its sustainable service overtime. The first five questions are designed to establish user behavior in an autonomous retail environment by observing trust development and common adoption challenges. The approach recognizes the need to balance rigorous requirements of data collection with the practitioner's limited time and need for actionable policy guidance. The remaining questions directly target the core features of the AFRY pilot. They justify for the performance metrics by investigating communication effectiveness, operational scalability, and comparative performance. This ensures that data collection serves to identify problem areas and guide decisions toward service improvement, which would aid pinpoint activity levels and client behavior as well as assess their level of satisfaction with the service provided. The framework allows for future development of the store through customer interactions and feedback that would aid in enhancing future iterations of this retail concept.

Table 2 Performance Metrics for the AFRY Unmanned Smart Store

Category	Metric	Measurement approach	expected impact
Adoption & Employee Engagement	User Adoption Rate	% of employees using the store in the first 3 months (focus on concept testing)	Higher adoption indicates success in user acceptance
Behavioral & Cultural Shift	Attitude Toward Unmanned Store	Pre- & post- surveys on unmanned store	Improved awareness suggests cultural integration

Employee Satisfaction Index	Satisfaction scores on store convenience & impact	Evaluates user experience and acceptance.	Higher satisfaction means better user experience
Surveyed Willingness to Use	Employee feedback via Likert-scale surveys	Understanding employee perception and acceptance levels regarding the unmanned store.	

The results and insights from the post survey are presented in Chapter 5: Unmanned Store Feedback Analysis and Results.

2.2.3 In-depth Interviews

Interviews were conducted with industry experts as an attempt to complement the post survey data and give highly relevant perspectives on the operational and strategic aspects as well as the scalability aspects of unmanned store concepts. Through these interviews, highly relevant Market based insights that could not be captured through user surveys alone were accumulated. This ensured a comprehensive understanding of user experience as well as industry preferences, which allowed for the formation of the foundation of the rest of the analysis.

11 questions were asked for the interview to gather qualitative data on user trust, possible early adoption issues, operational risks, strategies for product assortment, communication suitability and probable factors for repeated usage and scalability. The discussions have also explored common mistakes in pilot launches as well as recommendations to improve the AFRY unmanned store pilot in the future. The full list of interview questions was provided in Appendix 2.

The interviews for this study were conducted with a selected group of industry experts who operated or developed unmanned smart store solutions on the commercial market. These participants were not included because of their use of the

AFRY unmanned store, but also because of their professional experience in designing, operating, and scaling cashierless store concepts. Invitations were sent in December 2025 to individuals who represented leading unmanned store providers in Finland. A total of six experts were invited, and three agreed to participate. The participation rate was 50%. The final interview group consisted of two company owners who represented Block Store and FYGI, as well as one system developer from Shelfy Store.

The interviews were conducted using Microsoft Teams to accommodate participants' schedules. Each session lasted approximately 30–45 minutes. Having conducted the interviews during the AFRY pilot period allowed the discussions to focus on how the AFRY concept compared to established market solutions.

The interviews explored participants' professional experiences with unmanned retail systems using a semi-structured interview format. This included user trust development over time, typical challenges during early adoption, and factors that drive repeated usage and long-term customer engagement. The discussions also covered risk management strategies, such as preventing misuse, incorrect scanning, and shrinkage, as well as the role of product assortment and customer onboarding in successful store operation.

Participants were also inquired about their implementation of reuse, resale and waste reduction were implemented in their own stores and their effect on customer behavior. The interviews provided grounds for comparison between the AFRY unmanned store pilot and other market solutions as well as recommendations for potential improvement before any wider deployment would be considered. The interviews with experts provided qualitative and market-based insights that complemented the user surveys by highlighting best practices, common mistakes and scalability requirements for this type of store. This would in turn support AFRY pilot in a broader store ecosystem. IT also supported evidence-based conclusions concerning refinement and scalability prospects.

Additional questions about operational maturity and large-scale deployment were posed to participants from Block Store, FYGI, and Shelfy Store (Appendix 2). The questions covered the common challenges and obstacles of opening unmanned stores and how the customer trust usually changed over time in unmanned stores, and day to day problems, abuse, or system malfunctions. The main importance is to know significance of communication, pricing tactics, and product assortment for customer sustainability. The results and insights from the interviews are presented in Chapter 5: Unmanned Store Feedback Analysis and Results, alongside the post-post survey findings in Section 5.2.

3 Theoretical framework

3.1 Customer Experience of Stores

Customer experience in retail stores is generally conceptualized from the client's cognitive, emotional, sensory and behaviour during the shopping process. In traditional store settings, this experience is influenced by retailer-controlled elements like the atmosphere of the store, its layout, product assortment, and pricing. Service interactions and situational factors are of equal importance as well. Rather than being limited to transactional outcomes, customer experience spans multiple touchpoints and strongly influences perceived value, satisfaction, and future behavioural intentions, including loyalty and repurchase intention (Verhoef et al., 2009).

Technological advancement through digitalization has incorporated several aspects of self-service and technology-based solutions within stores. Prior literature indicates that technology-enabled retail environments enhance efficiency, convenience, and customer control, which are particularly relevant in automated or unmanned store formats (Dabholkar, 1996). Nevertheless, traditional manned stores do still benefit from the emotional factor that is closely related to human behaviour namely human interaction through emotional engagement which directly affects customer satisfaction. Research suggests that the physical environment and service cues within stores play a critical role in shaping customers'

overall evaluations and behavioural responses, highlighting the importance of balancing functional efficiency with experiential and relational elements (Bitner, 1992).

In the context of unmanned smart stores, customer experience takes on a slightly different form. The shopping process in An Unmanned Smart Store is as follows: Download an application, register, then after registration process, the consumer can simply buy the products and exit the store without needing to traditional check out (Szabó-Szentgróti et al., 2023). Due to the absence of staff members, customer interactions with the store environment and systems become their primary source of experience. Despite their reliance on simple technology like QR-code scanning and Mobile Pay, consumers may still perceive this as an “innovative technology” as it remains to be relatively new to them. This renders understanding customers reach, engagement with, and interpretation of these systems critical to evaluate their acceptance and satisfaction rates.

Self-service technologies are swiftly growing in various business industries nowadays. In this context “technology” is an indicator of the means used to set the retailing environment means of conduct within the store. Technology in this context refers to the QR-code mobile payment and app-based entry system used in unmanned stores. The concept of SSTs consists of the idea of providing service to the customers by themselves with or without any help from a customer service representative, by allowing customers to scan and pay for their purchases independently (Meuter et al., 2000).

Dabholkar (1996) establishes a link between self-service solutions and their role in enhancing customer experience through convenience, speed, and customer control. Despite this innovation, it comes with potential risks. Customer unfamiliarity with the concept can cause hesitation and discomfort due to lack of human interaction and/or support. Functional efficiency bridges this gap by providing convenience through ease of use, speed and most notably convenience.

The unmanned store concept serves two core functions:

1. Facilitating the reuse and redistribution of surplus office materials to minimize waste.
2. Second-Hand Employee Market: Enabling employees to sell, exchange, or donate personal items within a trusted workplace community, fostering sustainability and collaboration.

Customer experience in unmanned stores is to be investigated in this study. The examination of the user experience in the AFRY store is the theoretical foundation it is based on. The model responds to the limited systematic research on customer experience as a distinct construct and provides a theory-driven structure to analyze how customer experience is formed, moderated, and managed over time (Verhoef et al., 2009). Figure 3 illustrates the Conceptual Model of Customer Experience Creation. This would aid provide a holistic understanding to examine the integration of unmanned stores and self-service technologies. An accurate comprehension of these dimensions necessitates the capturing of cognitive, emotional, social, and functional dimensions of the customer experience. This would be conducted by capturing key interactions stages beginning with entry via QR code, product scanning, Mobile Pay payment, and ending with exiting the store. Questions six to eleven will aid frame the analysis and provide accurate results in order to ensure a clear conceptualization of key elements that found customer experience. Findings reported in Chapter 5 are interpreted in relation to this framework.

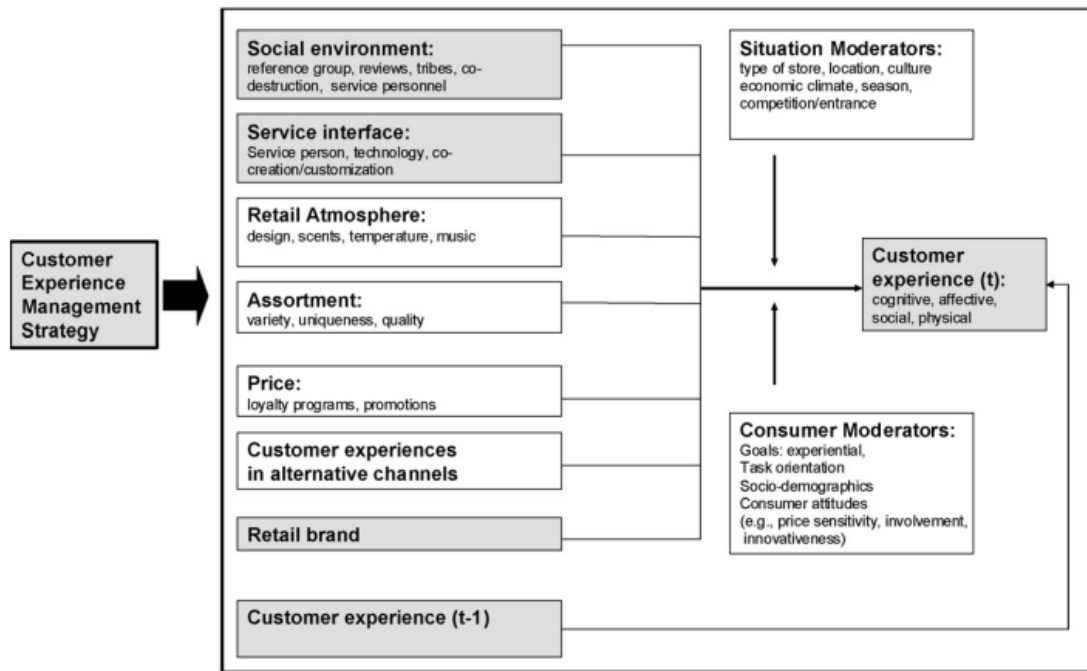


Figure 3 Adapted Conceptual Framework of Customer Experience Creation (Verhoef et al., 2009) for Unmanned Retail Contexts

Historically, marketing and service research has emphasized customer satisfaction and service quality as primary outcome measures (Parasuraman et al., 1988). However, earlier experiential perspectives, however, as argued by Holbrook & Hirschman (1982) points out that consumption is not purely utilitarian, but also experiential in nature, involving emotions, sensations, and symbolic meanings. Building on this view, later scholars conceptualize customer experience as the internal and subjective response that arises from both direct and indirect interactions with a company, its products, or its services (Meyer & Schwager, 2007). This understanding is highly relevant to unmanned retail contexts, where technology-mediated interactions replace traditional face-to-face service encounters. As illustrated in Figure 3, customer experience at time t is shaped by a set of antecedents, that are moderated by situational and consumer characteristics, which are dynamically influenced by prior experiences at time ($t-1$).

For the purposes of this study, some interrelated components of the model are emphasized. First, the service interface becomes the dominant interaction point

in the absence of store personnel, placing self-service very easy and simple such as using Mobile Pay which is trust app in Finland and user-friendly payment system, scanning which is at the centre of experience creation (Dabholkar, 1996). Second, the shop is, represented by the AFRY, plays a critical role in shaping trust, perceived reliability, and acceptance of the unmanned store format among employees (Berry et al., 2002). Third, the social environment differs from traditional retail settings, as the store is used exclusively by colleagues, making peer behaviour, shared norms, and mutual responsibility influential elements of the experience. Fourth, customer experience dynamics denote the effects of repeated exposure to the store. The consequences included but were not limited to reduction of uncertainty, lower perceived complexity, and supported habit formation over time. Finally, customer experience management techniques offered the general reasoning of the design and consequential improvements, which provided a balance between effectiveness and a satisfaction, within a human-centered experience.

grounding the analysis in the conceptual model shown in Figure 3, allowed the study to structure the survey and interview questions around the functional, cognitive, and emotional dimensions of customer experience. Ease of use, speed, and convenience were of equal value, thanks to their representation of functional aspects; the understanding of the shopping process speaks for cognitive aspects; comfort, trust, and overall satisfaction represent emotional aspects. This operational aspect enabled the study to define the desired experience for the AFRY Vantaa unmanned store and evaluate users' perceptions while enabling the assessment of their actual experiences within this organizational context.

The rapid growth of innovative technologies has reshaped these experiences, particularly by influencing how consumers interact with different retail channels, perceive value, and engage socially (Ylilehto, Komulainen, & Ulkuniemi, 2021). Three critical factors have been identified as central to shaping customer experiences: channel choice, value dimensions related to convenience and enjoyment, and social interaction (Ylilehto et al., 2021). The creation of value toward un-

manned stores could be predicted by the practicality and convenience of unmanned stores. Yu et al. (2025) make the link between convenience and value within unmanned store environments, where satisfaction becomes the main stakeholder for a store's value. Value dimensions also play a role in shaping customer experience. Utilitarian value reflects efficiency, ease, and time-saving benefits, whereas hedonic value relates to enjoyment, exploration, and emotional engagement (Batra & Ahtola, 1991; Bradley & Lafleur, 2016). The store's worth can further increase by implementing technologies that provide a unique and more immersive experience that can only be found in unmanned stores. For instance, technologies such as augmented reality (AR) and artificial intelligence (AI) can simultaneously enhance utilitarian and hedonic value by simplifying purchases while providing interactive and enjoyable experiences (Ylilehto et al., 2021).

Studies have also deduced the value of social interaction as an essential factor where social factors play an important role in the shopping experience. Borges et al., (2010) denotes that this is probably because shopping is considered a social experience where a companion can influence a purchase decision, reduce stress levels, and make shopping more enjoyable. Ylilehto et al (2021) share this deduction and contend that human assistance and advice can be a defining factor in a customer's preference of a product and can significantly affect their experience in a positive or negative manner. These aspects depict customer experience as context dependent. Shopping individually can be perceived as convenient, comfortable and self-explanatory while in-store shopping with people involved is often perceived as more trustworthy. Retailers must design store environments and technology interfaces that cater to the dynamic interplay of channel preferences, value perceptions, and social interaction, ensuring that both efficiency and engagement are addressed throughout the shopping journey (Ylilehto et al., 2021).

3.2 Unmanned Smart Stores

This chapter follows the conceptual framework which was created by Verhoef. The model defines customer experience as a complex system which includes three distinct dimensions that represent functional, cognitive and emotional aspects. The framework establishes an organized structure which enables researchers to study how unmanned smart store systems interact with customer perceptions and shopping patterns through their store design and self-service features and digital touchpoints. The framework supports the examination of unmanned stores as technological operational systems. The system enables evaluation of various experiential environments which determine user convenience, trust and overall satisfaction.

The unmanned stores have been one of the significant and popular forms that shift from the traditional store format into a more autonomous and self-serving dynamic. These stores rely on innovations such as IoT-enabled sensors, AI-powered checkout systems, mobile applications, and automated inventory management to deliver value directly to consumers (Ylilehto et al., 2021). Yu et al. (2025) argued that maintaining the sustainable development of this retail form, necessitates knowing the factors that foster the mechanism of the formation of customers' loyalty. These environments as contended by Ylilehto et al., (2021), highly relies on convenience as a dominant factor that is meant to shape customer experience. IoT technologies are one driving factor that is used to track product availability and help consumers to successfully be guided through the store. Other technologies such as Ai-powered voice assistants and automated checkouts have also proven useful in this matter.

Recent literature shows that unmanned stores which operate without any staff members have become the primary research subject of the community. The stores operate from specific locations which include office complexes and residential areas and university campuses. The hybrid digital-physical environments function as hyperlocal nodes which create additional customer touchpoints for their services that include real-time pick-up and supplemental shopping.

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The stores operate logic which delivers constant accessibility through their smart checkout systems as well as their own to enable customers to use self-service without needing to contact staff. The retail environment creates difficulties for the concept, which establishes an unmanned stores operation manned by human staff. The unmanned stores require interactive experience because they need customers to use those products as their primary type of service. The operational logic of these stores is fundamentally centered on providing 24/7 convenience, intelligent checkout, and contactless self-service experiences. The retail industry now transitions into an experienced economy because businesses demand customers to create and gradually build emotional connections through their immersive product interactions. The staff-free environments require businesses to understand customer experience (CX) requirements.

While utilitarian value is critical in unmanned stores, hedonic value should not be overlooked. Technologies such as AR or VR can make shopping interactive and enjoyable, even in the absence of human staff, by creating playful or exploratory experiences that enhance engagement (Ylilehto et al., 2021). Shoppers who have specific shopping goals and those who want to explore different products

need both shopping convenience and shopping enjoyment to create their ideal shopping experience.

Blockstore is one example adopting circular economy and implementation of unmanned retail stores, as it implements a fully autonomous store in Tampere, Finland. This specific location demonstrates that the concept is operationally viable, noting that accommodating 15 people shopping simultaneously did not present issues regarding volume or potential theft. The store itself is 80 m² in size and stocks 800 SKUs. (Blockstore, 2024).

The broader context for Blockstore's approach is the transition of retail spaces into modern service hubs designed to effectively serve omni-channel users. These autonomous stores provide several flexible customer services, including home delivery, Self-service cashiers, and Scan & Go. The commitment to supporting e-commerce is further evidenced by the plan to introduce Click & Collect capabilities at this location in 2024. (Blockstore, 2024). The most significant benefits concerning these stores lie in their efficiency and cost-effective policies. Technology enables checkout-free operations (accounting for 29% of total cost savings) and offering 24/7 store access (accounting for another 29% of total cost savings), both primarily derived from reduced staff costs. Additional savings come from the reduction of shrinkage/food waste (20%), and operational efficiencies gained from using a Smaller Store footprint (11%) and improved Inventory Management. (Blockstore, 2024).

The Blockstore is a prime example on how these modern service hubs are capable of realigning the customer journey while providing tangible evidence of potential image of retail future by utilizing technology to combine convenience, efficiency, and continuous availability.



Figure 4 Example of a refurbished grocery store converted into a fully automated, unmanned retail unit. (Blockstore, 2024)

The Selfly Store concept another example of intelligent retail innovation. It reflects key megatrends shaping the contemporary retail landscape. These megatrends include a growing trend toward fresh, healthy, and prepared meals, a strong preference for cashless and contactless payment methods, and rising consumer demand for self-service solutions. The Selfly Store concept operates yet another demonstration of intelligent retail innovation which has been developed through its existing product design. The retail industry currently experiences its operational development through the emergence of major megatrends which shape its existing market structure. The three main megatrends which drive modern retailing include rising consumer demand for fresh and healthy prepared food and people who prefer to make purchases through cashless contactless payment systems and customers who want to use self-service options. Stora Enso (2011) stated that the intelligent vending market grows at a faster rate than traditional vending machines because of a fundamental move away from traditional vending business models which use standard vending systems. The Selfly Store develops these trends through its continuous operation of a retail system which enables

merchants to run their business while customers enjoy a seamless and interactive shopping process (Selfly Store, n.d.).

The Selfly Store solution uses Radio-Frequency Identification (RFID) technology to track each item with high precision while generating real-time sales data and inventory information. The solution supports the deployment of micro-stores in environments such as hospitals, factories, stadiums, airports, and electric vehicle charging stations, where continuous access to fresh food and rapid transaction times are critical (Selfly Store, n.d.).



Figure 5 Selfly Store: Examples of Unmanned Retail Installations

Customer experience was meant to be simple and low-cost in the AFRY Vantaa Jaakonkatu unmanned smart store to ensure ease of use and optimal convenience. The AFRY concept operates like intelligent vending systems used in Selfly

Store and Blockstore as it establishes smooth shopping processes that enables customers to buy products without using cash while remaining operational at all times. Minimal costs and technological investment were also put into consideration. Instead of advanced RFID-enabled cabinets, the customer experience was intentionally designed to remain simple and accessible. The system used mobile Pay solutions together with physical directions that were displayed on door posters and internal posts of Viva Engage to help users contact their colleagues. The store allowed all staff members to enter because the AFRY office had security cameras installed throughout the building which provided sufficient protection. The system design established direct shopping access for users as it required no complex technology and used basic systems to operate.

Users provided positive feedback about the system thanks to the easy and accessible experience. The store layout matched regular office work patterns which enabled customers to shop easily. The internal platform communication as well as the signage system gave users sufficient direction to navigate the space without experiencing information overload. This example demonstrates that even minimalistic unmanned store designs can deliver a satisfactory customer experience when convenience and clarity are prioritized, especially in controlled environments like an office (Ylilehto et al., 2021). Recent research showed that customer experience in these environments depended on three main factors, namely ease of use, perceived convenience and trust and contextual factors. User experience requires technologies to meet user expectations while their interfaces need to be designed for easy user comprehension. The absence of human staff requires organizations to maintain security and reliability because these factors establish trust with their users.

The study applies its theoretical framework through three dimensions which include functional dimensions and cognitive dimensions and emotional dimensions to analyze unmanned smart store characteristics which the chapter presents. The study aims to develop survey questions and interview themes which will examine three aspects of checkout-free operation through convenience and ease of use

and their connection to the functional dimension and understanding of store processes which connect to the cognitive dimension and trust and comfort and perceived value which connect to the emotional dimension. The framework connects unmanned smart store research with the AFRY unmanned store pilot research through its established logical progression.

3.3 Customer Journey

The Experience in Community Unmanned Store (ECUS) framework developed by Hu et al. (2025) serves as the theoretical foundation for this section which defines customer journey and experience in staff-free retail environments through its three operational dimensions and its spatial elements and social-emotional components. The ECUS framework is complemented by insights from technology adoption literature, particularly the Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT), which explain how perceived usefulness, ease of use, and perceived risks influence customer acceptance of cashierless retail solutions (Hazée et al., 2025). These theoretical viewpoints provide researchers with a systematic framework that would enable them to study consumer perceptions and evaluations and their adoption of unmanned smart stores.

The theoretical framework that the customer journey research uses for the AFRY Vantaa unmanned store study, as Hu et al. (2025) show, uses specialized literature about autonomous retail spaces which operate without staff and function as community unmanned stores. This emerging retail model integrates smart technologies with community-level embeddedness, providing convenient, contactless shopping experiences through hybrid digital–physical interactions (Hu et al., 2025). Within these environments customer experience (CX) exists as an all-encompassing subjective measurement that assesses the complete range of consumer responses during their entire retail shopping process. The lack of human employees creates an environment where customers expect service support to function through the technology that delivers their requested services

To effectively measure this complex experience, research has developed the ECUS-scale (Experience in Community Unmanned Store scale), which identifies nine key dimensions reflecting the technological, spatial, and emotional–social aspects of the journey (Hu et al., 2025). Shin and Kim (2025) investigated the perceived value in unmanned services environment and argued that in order to enhance long-term usage and the related acceptance attitudes, it is crucial to first eliminate any fear associated with using robots and build an image of robots as convenient and safe. The development of robot services which deliver functional advantages will help to enhance customer satisfaction and build positive acceptance attitudes. Hu et al. (2025) share a common ground and identify smooth transaction processes as a primary requirement as these processes depend on complete technological performance together with consistent operation across all essential user activities which include entering, shopping, paying, and leaving the store. Similarly, Secure payment addresses a separate problem which requires assessment of payment technology performance while delivering specific system feedback to users who doubt machine capabilities for detecting errors and fixing them without needing human input.

The research demonstrates that experiential elements which create emotional bonds and security detection between staff members and unmanned facilities serve as fundamental components that control facility operations. The system requires safe operational space because users experience isolation when they enter the 'unmanned and enclosed space. Shin and Kim (2025) explain that organizations must eliminate all robotic usage fears while establishing robots as safe and useful tools to achieve permanent automated service adoption. The researchers defined safety as a fundamental element that contributes to functional value which includes usability and convenience and efficiency at the same time. Other important dimensions include top quality of goods, special pricing scheme (as customers often expect lower prices due to minimized service costs), and comfortable space, which addresses the physical atmosphere, cleanliness, and aesthetic design (Hu et al., 2025). Finally, the smooth development of social and emotional aspects through user-friendly self-service technology as mentioned by Hu et al (2025) enables users to operate the system effortlessly while the store

design creates an atmosphere of belonging which people experience through both human-like machines and their connections to familiar community elements. Shin and Kim (2025) strengthen this argument by showing that usability and convenience function as essential elements of value to customers. Automated services need to deliver the same level of comfort and stability and safety which human staff members provide to gain customer trust and acceptance.

The Vantaa office smart store design through AFRY created an economical solution that was able to meet the essential customer journey requirements through their theoretical mapping process (User Query). The approach specifically tackles important aspects that the ECUS-scale measurement system identifies, while showing how it has been modified to fit circumstances.

The operational setup strongly validates the importance of convenient service and smooth transaction (Hu et al., 2025). The store's location within the AFRY's Vantaa office complex ensured instantaneous access and convenience for all employees, meeting the theoretical requirement of proximity (User Query). Furthermore, the entire customer experience was intentionally streamlined to prioritize ease of use and speed. This enabled users to shop quickly and without unnecessary complication (User Query). This aligns with the vital need for a frictionless transaction, which is critical with independent shopping experiences. (Hu et al., 2025). The necessary guidance information, which is a key component of a smooth transaction, was provided through door posters and online posts on Viva Engage, which offered a clear shopping guide without requiring complex digital interfaces (User Query). Payments were securely handled through the mobile payment systems, which offered a familiar interface for customers (User Query).

A vital consideration for the AFRY Vantaa project was addressing the Safe Environment Dimension, which is critical in staff-free retail (Hu et al., 2025). This was achieved by leveraging the office's existing surveillance system, to effectively ensure safety and overcome the assumed vulnerability associated with unmanned spaces without incurring the additional cost of new security measures (User Query). Lastly, the store design prioritized social and emotional dimensions,

namely friendliness and comfortable interaction by attempting to minimize complex technology (User Query). These connections were instead managed through the internal platform of the office (Viva Exchange) which encouraged coworker engagement (User Query). This represents an adaptation where the existing "social familiarity" of the closed office community substituted the need for complex "friendly technology" or anthropomorphic digital systems to build an emotional connection (Hu et al., 2025). The implementation of the Mobile Pay system in the AFRY Vantaa smart store, utilizing a QR code scan, pay and go process, as mentioned by Hu et al., (2025), directly addressed two fundamental dimensions of the customer journey defined in unmanned retail theory: secure payment and smooth transaction.

This strategic choice of technology fulfilled the crucial need for a secure payment system by choosing a trusted, established mobile financial technology within the Finnish context, which is easily verified and dependable for the customer (User Query). In the literature, secure payment is a crucial experiential dimension, specifically because in staff-free environments may have doubts about the accuracy of biometric technologies and errors like miscalculations or inability to revoke inaccurate payments (Hu et al., 2025). By using a transparent and established mobile payment interface, the concept mitigates these concerns, offering reliability and accuracy in price calculation, alongside clear feedback on the shopping list, ensuring the process is secure (Hu et al., 2025). The availability of a clear mechanism to potentially submit a complaint or recover lost money through the mobile platform's provider, is essential in reinforcing this sense of payment security (Hu et al., 2025).

Furthermore, the design goal to "remove payment hassle" by the simple QR code, pay and go system ensured a smooth transaction (User Query). Theoretical concepts stress that unmanned stores, the process must be coherent, automatic, and integrated; Moving ahead traditional sequential steps like queuing to embrace the concepts of "quick checkout" and "grab and go" (Hu et al., 2025). The use of a fast, single-action mobile scan payment system provides the highly demanded fast and secure transaction, reducing the time customers spend on the

administrative part of the shopping journey, thus enhancing the speed and overall efficiency of the experience (Hu et al., 2025). This analysis confirmed that AFRY's Vantaa office concept made ease of use and convenience in transaction processing a priority, which ensured that the payment system contributed positively to the experiential dimensions the essential elements for automated staffless retail environments. (User Query)

Understanding customer responses to innovative retail technologies such as Just Walk Out stores is considered a major research priority in modern retail and service research. Earlier studies grounded in established technology adoption theories have investigated various factors influencing consumers' attitudes and intentions towards such stores. (Hazée et al., 2025). Research drawing on the Technology Acceptance Model (TAM) and Hedonic Information Systems Adoption Model (HISAM) highlights the importance of perceived usefulness (PU), perceived ease of use (PEOU), and perceived enjoyment in determining customer's full acceptance of Just Walk Out stores. Similarly, studies utilizing the Unified Theory of Acceptance and Use of Technology (UTAUT) demonstrate that performance expectancy and effort expectancy play a significant role in shaping customers' tendencies to use cashier-less retail solutions. (Hazée et al., 2025)

However, previous literature has paid comparatively limited attention to factors that inhibit adoption. Emerging findings suggest that perceived risks, concerns related to artificial intelligence like some algorithmic errors or bias, privacy issues like misuse of data, and perceived inconvenience may negatively influence customer acceptance of Just Walk Out stores (Hazée et al., 2025). These challenges are quite relevant when assessing customer experience and trust in automated retail environments.

The research site for this study exists in Jaakonkatu property which contains multiple tenants who include AFRY and Comatec and Med Group. The building functions as a shared space which AFRY uses to operate its business activities while maintaining a restaurant area that serves both its guests and outside visitors. The building experiences weekly traffic of over 1000 people who either work there or

visit, which creates sufficient flow to help attract maximum attendance. The unmanned store functions as an ideal testing site because it enables researchers to study store operations in an actual business environment.

The analysis of the AFRY Vantaa unmanned store customer journey together with the empirical data collection process of the study is structured through the application of the ECUS framework together with technology acceptance theories. The survey questions and interview themes of the study use ECUS dimensions which include convenient service and smooth transactions and secure payment to evaluate user satisfaction and payment trust and user comfort. The study uses TAM and UTAUT constructs to evaluate how users perceive the store's usefulness and usability and their intent to continue using the store and recommend it to others. By applying these frameworks, the study systematically evaluates how theoretical customer journey dimensions manifest in the AFRY context and how they influence user perceptions and behavioral intentions.

4 The proposal

4.1 The AFRY Unmanned Smart Store Concept

The study took place in the Jaakonkatu building as it hosted several groups including AFRY, Comatec and Med group that share one large restaurant located in the same building. This provided a good number of potential customers for the store. Retail innovation research emphasizes that environments with frequent but diverse users provide particularly valuable insights into technology application, formation of trust, and usage routines (Pantano & Viassone, 2015). The Jaakonkatu building supplied a consistent flow of employees and irregular external visitors, which it offered an ideal real-world laboratory to aid observe and extend an unmanned store performance beyond a controlled pilot group.

The visibility and customer flow created by the shared restaurant and multi-tenant structure further enhanced the relevance of this location. The unmanned store has therefore become part of everyday work life, allowing customer experience

to be shaped by both technological interaction and social observation. This aligns with Verhoef et al.'s (2009) argument that customer experience is formed through the interaction of retail environment, social context, and service interface rather than through technology alone.

As illustrated in Figure 6 below (adapted from Verhoef et al., 2009), the service interface was central to this model, where the "Scan, Pay, and Go" system would human staff with QR-based technology. The success of this interface was heavily influenced by consumer moderators, most notably the user friendliness and user's trust in the Mobile Pay platform. The social environment within the Jaakonkatu building further distinguished this model; the shared organizational norms and high visibility among the 1,000 weekly visitors had direct bearing on the study.

The retail atmosphere is mainly redefined by circular economy principles, shifting the store from a transactional retail outlet to a platform for pro-environmental habits. This creates a specific effective and cognitive experience where value is co-created through the reuse of surplus items. The model accounts for a temporal feedback loop, where positive past experiences ($t-1$) serve as the foundation for current trust and adoption. Hence, the reliance on this path ensured that each interaction would reduce the consumer's estimated risk and increase adaptation, which would emphasize the feeling of familiarity in the long term. This would aid the store as a safe and stable innovation.

The design of the AFRY unmanned store is grounded in customer experience and self-service technology theory. According to Verhoef et al. (2009), customer experience emerges from a combination of retail atmosphere, service interface, product assortment, pricing, social environment, and situational and consumer-related moderators. These elements became even more critical in cashier-less retail where technology replaces employees. This environment shifts responsibility of utilization, payment, and interaction to the system and the customer, effectively removing the mediator that was formerly represented in the employees.

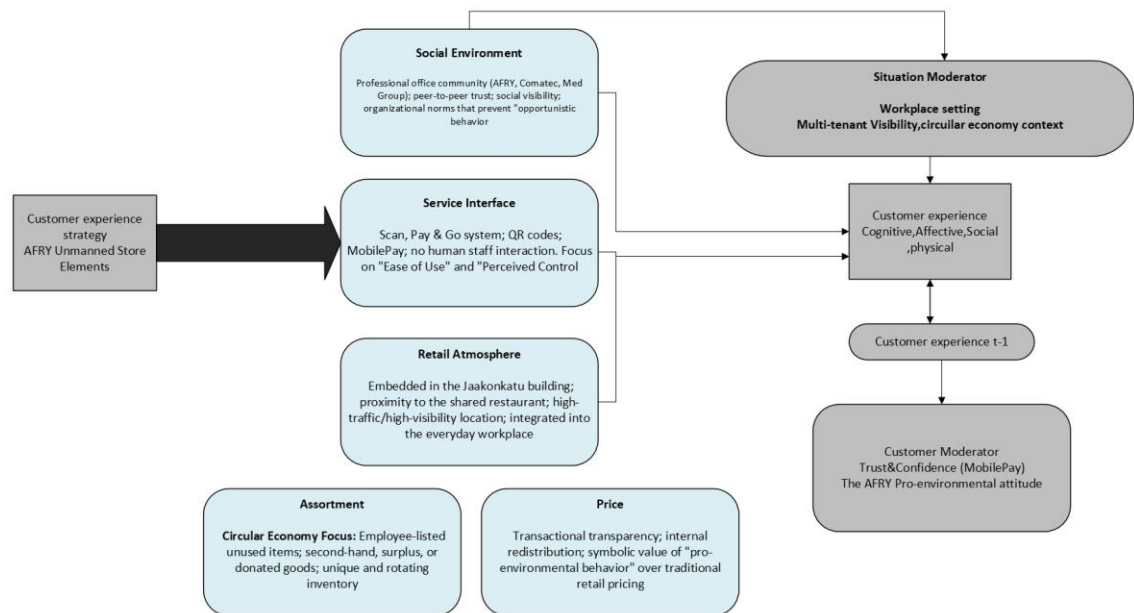


Figure 6 Adapted Customer Experience Management Framework for the AFRY Unmanned Store (Verhoef et al., 2009)

In addition, sustainability and circular economy principles are core concepts that are increasingly integrated into modern retail concepts. Research suggests that when concepts like recyclability, re-selling, and waste minimization are visible and easy to participate in, customers experience higher emotional and moral engagement with the store (Wünderlich et al., 2013). This means that the AFRY store is not only a transactional space but also a platform for pro-environmental behavior. Together, these theoretical insights shaped the design of the AFRY unmanned store as a system that must deliver functional efficiency with trust, and while offering a symbolic value that is linked to its feasibility and sustainability.

4.2 Running the store

The AFRY unmanned store built around simple idea as a **Scan, Pay, and Go exchange micro-store** embedded in the daily routines of the Jaakonkatu office. The store allowed employees to list their items for sale or donation, while other employees would be able to browse, scan a QR code, and finalize a transaction using Mobile Pay without any extra hassle or mandatory interactions. The AFRY

unmanned store is designed as a Scan, Pay, and Go exchange micro-store embedded in the daily routines of the Jaakonkatu office. The store allowed employees to list their own surplus items for sale or donation, while other employees would be able to browse, scan a QR code, and finalize a transaction using Mobile Pay without any extra hassle or mandatory interactions

Unlike conventional convenience-based unmanned stores, the AFRY store operated as a circular economy marketplace instead of a retail outlet. Employees act as internal vendors, by putting their second-hand, extra, or donated items for sale. This operation encouraged waste minimization, and product recycling while encouraging internal redistribution of goods. By applying circular practices into everyday office routines, the store enabled what Wunderlich et al. (2013) described as value-in-use, where value is created through continued use and shared access rather than through recurring purchases.

As the store is fully autonomous, its functionality depends on the interaction between the technological interface and the social environment around it. In professional office settings, social visibility, peer relationships, and organizational norms are considered to be informal governance mechanisms that serve to reduce opportunistic behavior and increase honest participation. Previous research on self-service and cashier-less retail shows that such social and institutional contexts significantly overcome risks related to misuse, scanning errors, and payment evasion (Orel & Kara, 2014).

This type of technology-based store requires its clients' trust in order to maintain their existence and provide proof of their efficiency. This buildup is of great value as argued by Orel & Kara. They argue that "Self-service technology research shows that trust, perceived ease of use, and perceived control are critical for applying such technology" (Dabholkar, 1996; Orel & Kara, 2014). While reliance on technology for payments has already been integrated into everyday life, the lack of accountability through manned assistance can present a problem for new users who are yet to become more familiar with the concept. customers "may have

doubts about the accuracy of these technologies" and "fear machine recognition errors that could result in the loss of personal property" (Hu et al., 2025, p. 8).

The emotional factor also plays a part as it is one factor in the customer-store equation where more comfort prevents any hesitation or friction that could discourage the adoption of technology. "At the same time, perceived convenience and speed are major drivers of satisfaction in technology-based retail, particularly in workplace settings where users value efficiency" (Pantano & Viassone, 2015).

4.3 Evaluation of the store

The purpose of creating unmanned store is to create a minimal discrepancy between the expected value and the experienced value received by the receiving end (the user). A reiteration of traditional stores or at the very least providing an alternative with its own unique features requires a replacement of replacement of conventional staff roles such as product identification and tracking, payments, and providing an overall sense of transparency. This is made possible by using QR codes and Mobile Pay to handle product identification and transaction processes, while system logs and transaction roles stood as the means for technical control of the store. However, the literature shows that technical controls alone are not sufficient; social context and perceived fairness are equally important in shaping user behavior (Verhoef et al., 2009; Orel & Kara, 2014).

Customer interactions with the store allowed trust to develop gradually. Every successful transaction and interaction translated into positive reviews and trust buildup and more frequent visits overtime. This was facilitated by "At the same time, clear communication and onboarding are essential in the early stages, as first impressions strongly influence long-term adoption of self-service technologies" (Dabholkar, 1996).

The sustainability dimension of the store also required active communication. For circular economy practices to drive behavioral change, users need to be aware of the rationale behind encouraging the reuse and exchange of produces. Once

the meaning becomes clear, sustainability would become a part of the customer experience that they could relate to rather than an abstract organizational goal.

User surveys serve as a measurement to employees, tenants, and visitors' perception of the store. It gives access to their level of confidence towards Mobile Pay's QR system and their willingness to participate in reuse and exchange. These factors would aid in determining whether the store could integrate into daily office life or not. The survey in the next chapter results indicate that the unmanned smart store concept is well received by employees, with positive feedback on ease of use, convenience, and sustainability.

5 Unmanned store feedback analysis and results

5.1 Post survey analysis and results

Post Survey data Analysis revealed the majority of respondents to be AFRY employees, among other groups of tenants and visitors. The findings mainly showed the experiences of employees who used the store services and familiarized themselves with it. Most participants reported daily or weekly visits to the building which meant that the feedback was largely based on frequent users who would be able to provide informed opinions about the store's usefulness and overall experience. Approximately two-thirds of respondents have already used the unmanned store. Building occupants demonstrated high adoption rates because first-time users created an opportunity to expand their knowledge and increase participation.

Most respondents reported moderate familiarity with cashierless stores, while others expressed a very high familiarity or minimal prior knowledge. The actual store experience serves as the main factor that develops customer perceptions as it affects although their earlier experiences shape their first impression on the store itself. According to respondents, word of mouth from colleagues and in building signs were the most common channels that informed them about the

store. Internal communication platforms, including Viva Engage, and email systems, were the least used communication methods. The store was able to gain recognition through direct word-of-mouth communication and through its observable physical presence.

The store provided intuitive, convenient, and user-friendly experiences as reflected in its customers' experience. The technology and store interface permitted inexperienced users to access the system without encountering major obstacles according to user testing results. Most respondents confirmed that the store practices operate according to environmentally responsible standards thanks to employees' recognition of sustainable operational methods. The organization received strong approval from 65% of participants who supported unstaffed store expansion to all AFRY locations, showing that the concept can be successfully implemented throughout the company. The open-ended responses identified three specific areas for improvement which included product range expansion needs and time-saving solutions for after-hours shopping and better item availability confirmation. The user satisfaction insights provided specific recommendations which would help increase user satisfaction and drive user adoption. Participants showed strong willingness to recommend the store to their colleagues because they found the service trustworthy and they experienced complete satisfaction. The unmanned store provides users with an excellent shopping experience which matches their expectations according to overall satisfaction ratings.

Data Analysis and Interpretation of Question 1: The majority of respondents in the Jaakonkatu building (AFRY employees) accounted for most responses, while a smaller proportion represented various building occupants and visitors. The demographic distribution shows how unmanned retail operates in office spaces. This reflects the fixed passenger flow patterns that exist within office space and exemplifies how new retail formats emerge to serve customers who are near their location. The store operates within a community of building occupants who use the space repeatedly to create user feedback which helps evaluate the pilot program and find areas for improvement.

1. Your role in the Jaakonkatu building



Figure 7 distribution of respondents in the Jaakonkatu building

Question 2: How often do you visit the Jaakonkatu building: Most participants reported visiting the building on a daily or weekly basis. Feedback showed that most users who spent time at the unmanned store created accurate assessments of their service usage. The extensive building visits of the respondents established a strong basis which researchers could use to examine adoption practices. Customers need to experience cashierless systems multiple times before they can build trust in these systems which depend on system reliability. The process of assessing usability and adoption potential requires users to interact with the system frequently so that they can experience more than the initial novelty.

2. How often do you visit the Jaakonkatu building?



Figure 8 Frequency of Visits to the Jaakonkatu building

Question 3: Have you previously used the unmanned smart store: About two-thirds of the respondents mentioned that they had previously visited the store while the rest of the respondents were first timers. The building occupants

showed actual usage of the system. The two-thirds adoption rate represents a significant achievement in technology diffusion. The initial adoption phase shows high importance for interpersonal connections because only a few initial users share their experiences with others. The high adoption rate shows that initial users operate as opinion leaders who create peer relationships which lead to greater product acceptance

3. Have you used the unmanned smart store?

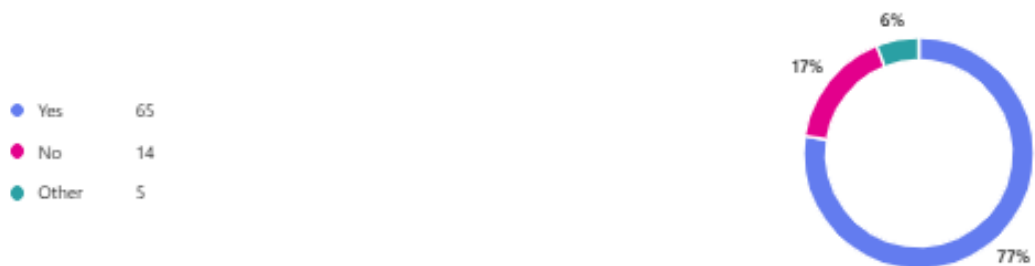


Figure 9 Store usage among respondents

. Question 4: Familiarity with unmanned/cashierless stores before this pilot; Most respondents reported moderate familiarity with unmanned stores. A smaller percentage were fully aware or unfamiliar with the concept or of its application. Word of mouth in this context can aid shape personal preferences through recommendations that create peer influence to encourage technology acceptance.

4. Before this pilot, how familiar were you with unmanned/cashierless stores?



Figure 10 Means respondents learned about the store from

Question 5: How did you hear about the unmanned store; Most respondents learned about the store through colleagues and in-building signage, while email and Viva Engage were fewer effective advertisements. This highlighted the significance of internal communication and visible store presence to provide a clearer pathway onto the store shows that colleague recommendations and physical signage are the most important ways people communicate with each other and their surroundings in workplace environments. Further research is also needed to substantiate these findings in other environments.

5. How did you hear about the unmanned store at Jaakonkatu building (AFRY vantaa office)



Figure 11 Ratings on customer experience and ease of use

Question 6: Customer Experience & Ease of Use; Likert-scale analysis demonstrated that participants mostly agreed or strongly agreed that the store was intuitive, convenient, and user-friendly. These reviews offered a positive user experience. First-time users have also reported minimal difficulties and shared positive feedback on ease of use and convenience. According to a Likert-scale analysis, demonstrated that the positive reviews can be traced back to convenience and ease to use. first-time users encountering few problems further proves the technology's friendliness to new users and familiarity to them.

According to a Likert-scale analysis, Customer Experience and Ease demonstrated that the positive reviews can be traced back to the convenience and ease to use. First-time users encountering few problems further proves the technology's friendliness to new users and familiarity to them.

6. Customer Experience & Ease of Use

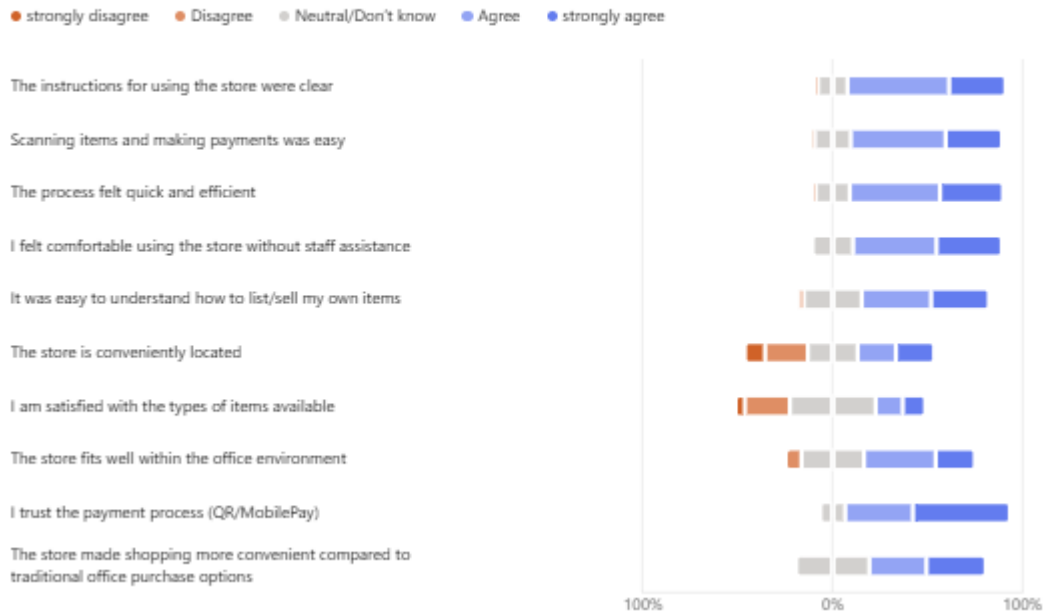


Figure 12 User ratings on customer experience and ease of use

Question 7: Sustainability & Circular Economy Perception: The result suggests that colleague recommendations and physical signage are the most important ways people communicate with each other and their surroundings in workplace environments. The robustness of the information implies that sustainability considerations are likely to be perceived as an additional source of motivation for actors in an organizational context in which environmental concern conveys high value.

7. Sustainability & Circular Economy Perception



Figure 13 perceptions of the store's alignment with sustainability

Question 8: Should unmanned stores be expanded to other AFRY offices!

As shown below, 65% of respondents supported expanding the unmanned store concept to other offices, with a smaller percentage expressing their uncertainty or disagreement at such an early stage. The requirements established by this document created an approved method for developing the concept through its future phases. Significant expansion support has shown that a demonstration project has been successful in producing proof-of-concept, rendering the organization ready for the administration of the broader initiative.

8. Do you believe unmanned stores should be expanded to other AFRY offices?



Figure 14 perceptions of the store's alignment with sustainability

Question 9: What improvements would you suggest; The open-ended responses showed that participants wanted two specific things, namely better time-saving products for employees after work and better product options and better information about available products. The responses pinpointed specific areas which needed store improvement and needed to deliver better services to customers. The focus on communication about available items addresses the information gap that exists when there is no staff present to operate physical stores while proving that both digital and physical communication systems need further development. This would provide better feedback on item availability which would improve the general experience of consumers.

9. What improvements would you suggest? Any final comments?

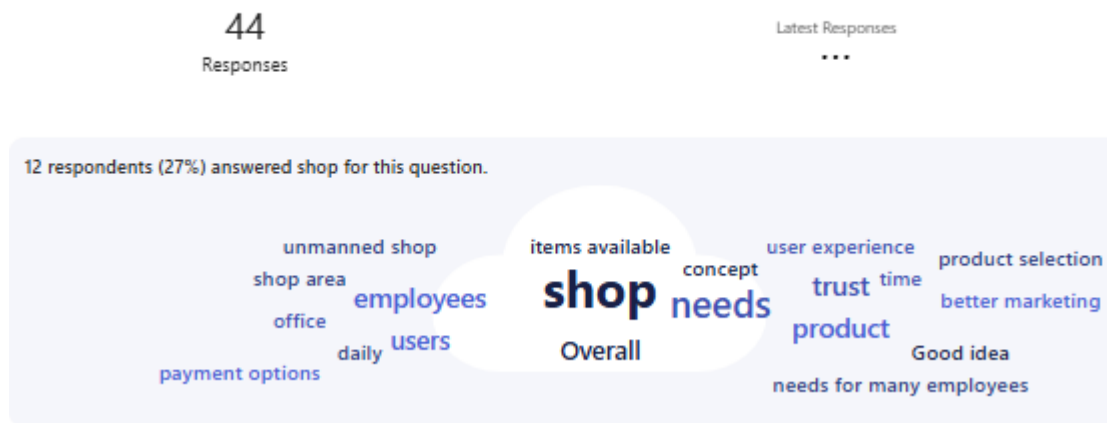


Figure 15 improvement suggestions from open-ended responses

Question 10: Would you recommend the unmanned store to colleagues; The store received positive recommendations from most of its customers. The service delivery system received high customer satisfaction together with their trust in the service. Willingness to recommend represents a powerful form of interpersonal influence that drives ongoing adoption. When colleagues recommend technology to peers, they create social reinforcement that encourages trial and continued use. The advocacy function becomes vital in business settings because organizations use peer networks as their main means of communication.

10. Would you recommend the unmanned store to colleagues?



Figure 16 Willingness to recommend the store to colleagues

Question 11: Overall satisfaction with the unmanned store Overall satisfaction; The survey results showed that people were extremely happy with their experience. Customer expectations were met at the store which led to positive customer

assessments of the store's overall experience. The technological method and its execution established positive results because customers showed their highest satisfaction level. The total satisfaction of users depends on different aspects which include how ease of use, its reliability, and product availability as well as how well user requirements. The positive ratings across these dimensions show that technology successfully meets user expectations.

11. How satisfied are you with the unmanned store overall?

[More details](#)



Figure 17 Overall satisfaction ratings of the unmanned store

The store received its main customer traffic through two channels which included its employees and its external signs. The customers showed two main areas which required better service from the store. The store achieved strong customer satisfaction, which matched high recommendation rates so the store should expand its unmanned store operations to all other AFRY offices during future development phases. The research findings delivered workable solutions which helped design the store layout, choose products and develop advertising methods that matched the primary goals of the pilot research.

5.2 Expert Interviews analysis and results

The results revealed significant positive relationships between the technological characteristics of unmanned stores and consumers' perceived usefulness and ease of use. The analysis of interviews with AFRY employees and tenant company employees reflected a largely positive user experience, with participants consistently highlighting the convenience, ease of use, and time-saving benefits of the unmanned store. The participants reported that their initial expectations

were exceeded because they achieved better results after completing their first successful transaction. Trust in the QR-based mobile payment process was generally high across all users, though several participants noted that their trust increased substantially with repeated use, transforming initial uncertainty into comfortable routine. The pattern demonstrates that people develop better technology adoption skills through ongoing technology use, which helps them to handle new technological systems such as artificial intelligence, the Internet of Things, and computer vision, all of which could be utilized in unmanned stores.

The participants highlighted the role of clear signage together with store layout design as these features helped first-time users who had to explore the store without any staff assistance. The total experience depended on the physical environment because well-designed spatial arrangements helped users complete their unattended operations without any difficulties. The store's strategic location and accessibility during and after working hours emerged as significant factors in meeting daily work-life needs. Employees appreciated the ability to make purchases that fit seamlessly into their work routines. While some users felt comfortable with digital instructions, others wanted better visual support together with complete onboarding materials for their first-time visits. The majority of customer complaints showed greater interest in regular retail issues which included restricted product options combined with doubts about product availability.

The strategic perspective about the AFRY pilot progress emerges from interviews with external operators who work at unmanned stores which include Block Store and FYGE and Shelfy store. The industry experts confirmed that the challenges faced by AFRY users during their initial implementation phase constituted the standard operational difficulties which they should expect to encounter. Their operational expertise showed them that customers build their trust with cashierless systems through a gradual process which requires system reliability, transparent pricing, and effective communication. The researchers established that first-time users experience initial confusion. This becomes an expected pattern during their adoption process because users will eventually overcome this state through successful interactions. The experienced operators confirmed that the AFRY pilot

follows an expected adoption pattern which demonstrates no signs of encountering operational difficulties.

External operators identified product assortment as the essential element that maintains user engagement for extended periods. The operators explained that unmanned stores need to change their product selection according to two different sources of information which include customer usage patterns and customer feedback. The store's assortment planning process uses data analysis to create a system which evolves according to customer behavior changes. From an operational standpoint, external participants acknowledged that shrinkage and misuse represent legitimate concerns that must be addressed proactively. The team considered the risks to be manageable through the implementation of trust-based payment systems and advanced monitoring technologies and the establishment of a strong internal organizational culture. The office environment establishes a shared space among users which results in both reduced space misuse and improved effectiveness of technological controls.

The external operators for sustainability and circular economy practices selected active communication methods which they considered necessary for their operation requirements. The full advantages of sustainability became evident when it combined with either signage or storytelling or digital feedback. The external participants observed that the AFRY pilot maintained its operations according to established standards for early implementation stages. The system demonstrated its most vital function through its main focus on basic design elements and its use of trust-based payment systems and its ability to connect with users' normal activities. The recommended next steps for expansion should include data-driven product development and improved communication methods as essential components for expansion.

5.3 Key Findings and Insights into the feedback survey and interviews

The survey results showed that AFRY employees received the unmanned smart store positively thanks to its ease of use and convenience. They also believed it

operated according to sustainability principles. The store became known to people through two main channels which were their colleagues' recommendations and the building's display signs. Contact with coworkers and building signs proved more effective than online communication methods to assist people in discovering the store. The participants in the study recognized the store's ties to circular economic principles which enhanced the importance of existing sustainability initiatives at the workplace. In a similar vein Lin (2022) investigated factors that could influence consumer behavior in Taiwan and denoted that social influence does indeed represent a critical factor in the success of unmanned stores. Relatedly, the research suggested that encouraging a rate and review system could aid promote stores which would facilitate their acceptance based on existing reviews and reviews the store would receive. This would also provide grounds for sustainability by assuring the store's continuity to provide the aspects it was positively perceived for further reinforcing convenience, attitude and sustainability.

The store's operational model matches the company's core values, which has resulted in increased employee acceptance of the store. These findings align with Huettinger and Cubrinskas' findings in their article named the Impact of Self-Automated Service on Consumer Loyalty. SST users appreciate the convenience of service while non-users believe it is fun. The logical conclusion is that in order to encourage more users to try out the SST, the marketing message should concentrate less on fun and speed, and more on convenience and goal-achievement (Huettinger and Cubrinskas, 2011).

The respondents demonstrated high satisfaction across most assessment areas, but they pointed out areas that needed improvement to enhance their overall experience. The need for greater product variety emerged as a consistent theme, along with requests for more time-saving options that cater specifically to after-work purchasing needs. Participants showed a need to know the currently available products as better product knowledge would help them to better understand their available options. The user base proposes these recommendations because they actively participate with the service while demonstrating a strong interest in

its complete development. The store concept expansion to other AFRY offices received strong support from the majority of voters which combined with high customer satisfaction and store recommendation to colleagues. This created strong business potential for the store beyond its initial testing area.

Making use of the robust features of Microsoft Forms proved to be an effective method for conducting surveys by collecting employee feedback and tracking customer satisfaction. It generated organized data which researchers used to evaluate the pilot and create evidence-based recommendations. The research objectives of this study received direct support from these insights, which researchers could implement to decide about store design and product selection and promotional strategies and store expansion plans.

The user interview results from internal sources, and the expert interview results from external sources showed strong agreement about three main aspects which included perceptions of convenience, usability and the gradual development of trust between users and the system. The internal users in the AFRY building assessed the store based on their personal experiences and their current service requirements by evaluating how well the service matched their daily activities and whether the system fulfilled its commitments. The external operators used their knowledge and expertise of the industry to evaluate their findings through a lifecycle framework. This showed that internal users' reported problems belonged to the standard adoption process instead of being unique issues. The two groups showed matching results when they chose product variety and communication as the main research needs, which supports the study results because it shows that these areas need genuine research attention instead of being single research objects. This observation is of great importance as it indicates that improvements can be applied by testing standard solutions that the unmanned store industry have priorly implemented instead of adopting unique solutions and more research which would consume time and resources. It also showcases the results' alignment with experienced industry experts which further validate the findings.

The combination of user experience feedback and industry expert knowledge creates greater trust in the proposed enhancements. The combined insights from both interview groups demonstrate that the AFRY unmanned smart store pilot aligns well with established industry practices and follows a realistic adoption trajectory consistent with similar implementations elsewhere. The qualitative research outcomes have successfully enhanced the survey findings by providing additional information that deepens our understanding of the quantitative results and enhances the study's empirical strength. The two elements together create an all-inclusive understanding of both present operational strength and upcoming development possibilities. The results' alignment with similar research on unmanned stores further reinforces the research objectives as it proves to be insightful and applicable in

6 Conclusions and Recommendations

6.1 Summary of Findings

The section presents a complete overview of all major results obtained from the analysis of both the survey and the interview data. The research results were structured according to two research objectives and customer experience framework. The study demonstrated how employees at AFRY Vantaa unmanned store pilot program perceived the store operations through their assessment of six different factors which included usability and convenience, trust, satisfaction, engagement with sustainability, and circular economy practices.

The functional dimension of customer experience included three main elements which were ease of use, transaction speed and convenience. The system received positive ratings during the entire testing period. The employees who participated in the survey found the QR-code and Mobile Pay system to be both direct and simple for them to operate. The services delivered operational agility which resulted in quick transactions because there were no lines to serve customers who visited the business. The ECUS framework used the "Smooth Trans-

action" and "Secure Payment" elements to establish this connection. The interviews confirmed these results as they showed that basic guidance combined with visible signs enabled people to successfully and independently use the store.

The store fulfilled customer needs by establishing trustworthiness and providing customers with complete confidence and a relatively comfortable shopping experience. Staff members showed complete trust in the payment system's dependability while they completed their shopping tasks without needing any help from store personnel. The operational framework proved successful in handling possible issues faced by staff members during their work in the unstaffed operational zone. The process of improvement led to customers receiving faster service through reduced waiting times. Customers will gradually start to understand the value of these technological facilitations once they realize the advantages they receive and inconveniences, they are being relieved of such long queues and lack of machinery such as scanners.

The research also demonstrated that social and community factors which do not involve technology continued to shape customer experience throughout the study period. The Viva Engage internal digital platform created a virtual space where employees could interact with each other and receive informal support that developed social trust in the platform. Regular customers who provided positive reviews through word-of-mouth helped to establish trust, which enhanced the store's credibility and raised customer satisfaction with all services.

The initiatives for sustainability and circular economy implementation received positive reactions from the public. The employees showed greater knowledge about sustainable practices by supporting reuse and donation of items. The workplace culture successfully integrated these principles according to the positive engagement that took place. Sustainability, when viewed from these lenses, was able to contribute to the prolonged availability of services which in turn provided more convenience to customers while offering a rich environment for piloting and refining the technology.

Research results about adoption, engagement, and future use showed that most employees supported store recommendations to their coworkers while they wanted the store to expand into other office locations. The results demonstrated how unmanned smart store technology operated effectively as a valuable solution for office spaces. The research established evidence about design effectiveness through theoretical framework-based design methods. The research results demonstrate how unmanned stores operate successfully in office environments while proving the viability of the thesis theoretical framework.

The results show that the AFRY pilot successfully fulfilled basic requirements, cognitive needs, and emotional aspects of customer experience, which it needed to meet sustainable environmental operations and customer interaction. This demonstrates the effectiveness of the modified framework for directing product development and assessment procedures. The office-based pilot was able to meet its objectives as it proved that the model effectively delivered two critical components: convenience and sustainability.

6.2 Limitations of the Study

The research contains various limitations which create possibilities for upcoming research work. The research team conducted their analysis at one smart unmanned store which exists in the AFRY Jaakonkatu building. The fast growth of this retail model needs researchers to verify its effectiveness across different shopping environments. Future research should test this study in various retail environments to enhance the findings' practical use.

The dimensions of experiential relationship quality in shopping contexts show different patterns of measurement which depend on various demographic factors that include age groups and gender and marital status and education level and professional occupation and income range. Retailers need to understand how these variables impact their business to create better customer recommendations. The proposed research model needs testing with different consumer groups to determine how experiential relationship quality and adoption behaviors

will change. The experiment at AFRY serves as a standard starting point because even industry leaders like JD implemented their unmanned store operations through restricted methods.

The current research study investigates how users experience the store's automated entry and shopping and contactless payment systems during their first visit. The study failed to measure long-term engagement and actual usage patterns and user behavior development because the technology used in the unmanned store allowed users to conduct transactions without their knowledge of the process. The study requires researchers to use longitudinal research methods to investigate these relationships because they will help researchers better understand how people progress from initial acceptance to long-term loyalty.

The specific organizational context of the AFRY Jaakonkatu building suffers from another restriction. The research results showed limited application because office environment conditions and tenant differences and employee digital payment knowledge all impacted on the study results according to the study results which examined workplace and public retail space operational settings. The study investigated how people think about sustainability and circular economy practices, yet it failed to assess the stores' actual environmental effects which include waste reduction and resource efficiency improvements that intelligent unmanned stores use to achieve operational efficiency and environmental protection results.

The research focused on applying QR-code and Mobile Pay system as its complete technological framework. The research results will not apply to unmanned stores which implement different automated systems that include AI-based checkout and advanced IoT technologies. The ongoing development of intelligent unmanned stores through advanced technology requires additional research to establish successful implementation methods for this upcoming technological advancement. The research would gain more strength through multiple store types and wider sample size because autonomous retail technology develops in many different directions.

6.3 Recommendations for Future Research

Based on obtained findings, unmanned stores need to be further endorsed within similar environments in order to tap into their full potential and make use of their unique services through promoting them on a larger scale. Yuan and Jotikasthira (2024) argue that there is an urgent need to promote the advantages, convenience, and safety of unmanned stores through advertising, social media, television, and radio. Emphasize 24-hour convenience, fast payment, and personalized shopping experiences (Yuan and Jotikasthira, 2024). Possible improvement to the study includes but are not limited to expanding the research scope to include diverse age categories and environments in order to generalize the research scope and cultivate a more holistic understanding of the perceived benefits and possible challenges that may not be as apparent in the current study environment. Further, researchers need to use longitudinal research methods to catch people's perceptions with these stores and their use of the existing products and their level of trust and satisfaction and perceived convenience. The research needs to be conducted in various settings in order provide better general results and show how different environmental conditions affect customer experiences.

The study needs more participants from different demographic groups so researchers can study how different factors including age, gender, education level, job type, and income impact customer experience with unmanned stores. Research shows that demographic factors determine how people respond to unmanned retail environments which younger and better educated customers demonstrate as their higher technology acceptance. Research shows that current users belong to certain demographic groups which indicates that upcoming research should include more diverse population groups to develop better recommendations for building unmanned stores that serve multiple user groups with different age ranges and educational levels and work backgrounds.

Future studies would benefit from combining self-reported measures with objective behavioral data, including transaction logs or in-store monitoring of customer interactions. Existing research has demonstrated the value of robust quantitative

methods by employing structural equation modeling to validate the relationships between technological characteristics, perceived usefulness, ease of use, and actual usage behavior. The research methods produced high reliability coefficients which demonstrated that usage intention leads to real-world usage behavior. The combination of direct observation with similar analytical methods would enhance research accuracy while enabling researchers to investigate actual usage behavior and organizational performance. The combination of subjective opinions with measurable consumer behavior data will enable researchers to develop better understanding of how people interact with unmanned retail environments.

On a final note, it is important to acknowledge that the present study did not comprehensively capture sustainability and circular economy related aspects. People who want to donate or sell their belongings do not demonstrate any better environmental responsibility through their actions. Research on consumer acceptance shows that customers will adopt products based on their technological features and perceived value and ease of use, but research has not studied sustainability factors. Research should study total sustainability results which include waste production and resource conservation and long-term impacts of circular methods used in retail operations. The study results indicate that different technological systems affect customer experience and acceptance and sustainable behaviors through their implementation of unmanned store systems which use more advanced technologies than the QR-code and mobile payment method used in this research. The current research demonstrates that users perceive technological elements as factors which determine their product value and operational simplicity thus different technological systems will lead to different environmental results and user adoption rates.

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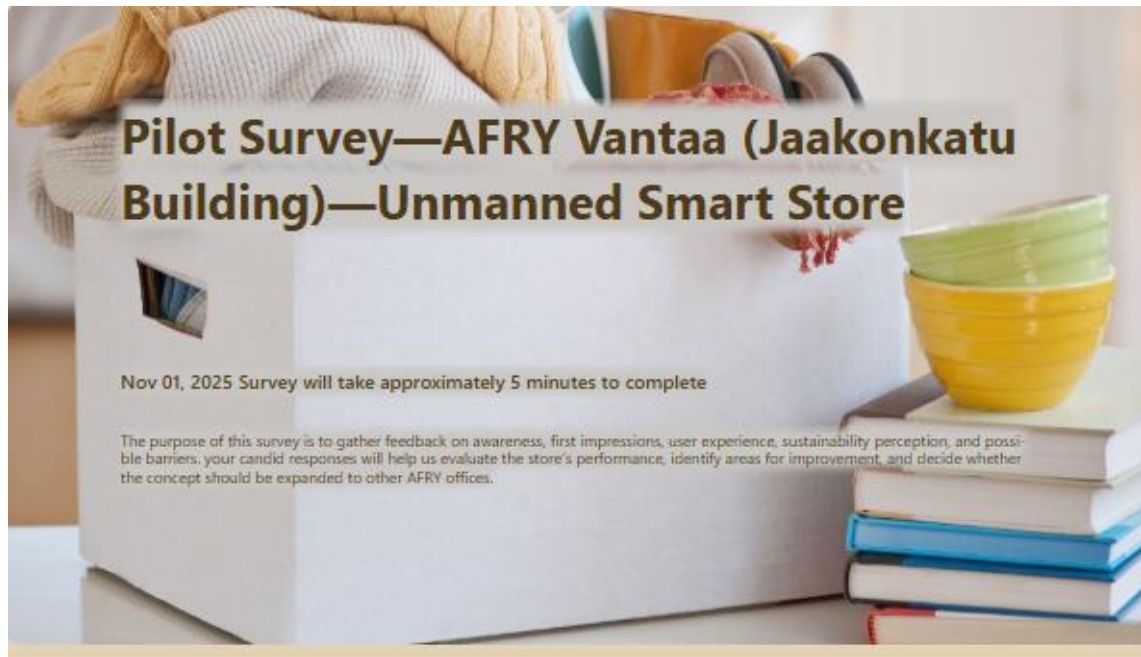
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Appendices



1. Your role in the Jaakonkatu building

- AFRY employee
- Tenant employee (Comatec, Med Group, etc.)
- Visitor
- Other

2. How often do you visit the Jaakonkatu building?

- Daily
- Weekly
- Monthly
- Occasionally
- Other

3. Have you used the unmanned smart store?

- Yes
- No
- Other

4. Before this pilot, how familiar were you with unmanned/cashierless stores?

- Not familiar at all
- Moderately familiar
- Very familiar

5. How did you hear about the unmanned store at Jaakonkatu building (AFRY vantaa office)

- Viva Engage
- Posters/signage
- Colleagues
- Passing by
- Email
- Other

6. Customer Experience & Ease of Use

	strongly disagree	Disagree	Neutral/Don't know	Agree	<u>strongly agree</u>
The instructions for using the store were clear	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scanning items and making payments was easy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The process felt quick and efficient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt comfortable using the store without staff assistance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It was easy to understand how to list/sell my own items	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The store is conveniently located	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am satisfied with the types of items available	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The store fits well within the office environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I trust the payment process (QR/MobilePay)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The store made shopping more convenient compared to traditional office purchase options	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. Sustainability & Circular Economy Perception

	strongly disagree	Disagree	Neutral/Don't know	Agree	<u>strongly agree</u>
The store encourages me to reuse or buy second-hand items	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The store increases my awareness of sustainability and circular economy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would be willing to sell/donate items through the store	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe this concept reduces waste in the office	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. Do you believe unmanned stores should be expanded to other AFRY offices?

- Yes
- No
- Maybe
- Don't know

9. What improvements would you suggest? Any final comments?

Enter your answer

10. Would you recommend the unmanned store to colleagues?

- Yes
- No
- Maybe

11. How satisfied are you with the unmanned store overall?



Expert-Oriented Interview Questions for Unmanned Store Operators

(Block Store, FYGI, Shelfy Store)

1. Based on your experience, how does user trust in unmanned or ~~cashierless~~ stores typically develop over time?
2. What are the most common challenges users face during the early adoption phase of unmanned stores?
3. From an operator's perspective, what are the key factors that influence repeated usage and long-term customer engagement?
4. How do you typically manage risks such as misuse, incorrect scanning, or shrinkage in unmanned store environments?
5. What role does product assortment play in the success of unmanned stores, and how often do you adjust the selection?
6. How important is communication and onboarding for first-time users, and what methods have proven most effective in your experience?
7. In your operations, how are sustainability or circular economy elements communicated to customers, and how do they influence customer behaviour?
8. What operational or technological capabilities are essential when scaling unmanned stores across multiple locations?
9. Based on your experience, what are the most common mistakes organizations make when launching unmanned store pilots?
10. How would you evaluate the AFRY unmanned store pilot compared to similar concepts you operate or have observed?
11. What recommendations would you give to AFRY to improve this pilot before expanding it to other offices?