UNIVERSITY OF LJUBLJANA
SCHOOL OF ECONOMICS AND BUSINESS

MASTER'S THESIS

DIGITAL TRANSFORMATION IN RESTAURANTS: ORDERING APP EXAMPLE

Ljubljana, January 2026 MARINA GLIGORIĆ

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ABSTRACT

The development of digital technologies is evident across various industries, including hospitality. Yet, digital ordering has not become widespread in restaurants and cafés. The aim of this thesis is to understand why. Using a mixed-methods approach, both demand-side adoption and supply-side operational readiness were analysed. The results show that demand is segmented, consisting of two main user groups, defined in this study as early adopters and late adopters. Early adopters are typically younger individuals who dine out more frequently and feel more comfortable using mobile applications for various services. In contrast, late adopters are generally older, visit restaurants less often, and are less comfortable using their phones for payments, information, communication, and ordering. The results also reveal that early adopters reported a higher perceived usefulness of a universal ordering app compared to late adopters. Their concerns also differed: early adopters expressed worries about app reliability and data privacy, while late adopters were more concerned about the loss of human interaction and interface complexity. On the supply side, the analysis of the attitudes towards technology of restaurant owners and managers in Ljubljana, showed that they would prioritise ease of use and staff training, service level agreement support, and plug-and-play point-of-sale integration with kitchen display systems, inventory, and delivery platforms, when it comes to potential implementation of the universal ordering app. In addition, they reflected on how they currently operate, and what are the challenges they face during busy periods.

This thesis contributes by offering an integrative explanation: standardisation requires a bundle of conditions that rarely co-exist across restaurants and cafés. When this bundle is absent, digital ordering remains useful but conditional, and thus does not become a universal norm. Finally, the thesis provides managerial implications and recommendations for future research, highlighting how both technological design and operational readiness must align to achieve digital-by-default adoption in the hospitality industry.

KEY WORDS: digital ordering, restaurant digitalisation, technology adoption, POS integration, operational readiness and standardisation

SUSTAINABLE DEVELOPMENT GOALS



POVZETEK

Razvoj digitalnih tehnologij je očiten v različnih panogah, vključno z gostinstvom. Kljub temu digitalno naročanje v restavracijah in kavarnah še ni zelo razširjeno. Namen te magistrske naloge je razumeti, zakaj je tako. Z uporabo kombiniranega raziskovalnega pristopa sem analizirala tako povpraševanje (sprejemanje s strani uporabnikov) kot tudi operativno pripravljenost ponudnikov. Rezultati kažejo, da je povpraševanje segmentirano in da ga sestavljata dve glavni skupini uporabnikov, opredeljeni v tej raziskavi kot zgodnji in pozni uporabniki. Zgodnji uporabniki so običajno mlajši posamezniki, ki pogosteje jedo zunaj in se pri uporabi mobilnih aplikacij za različne storitve počutijo bolj udobno. Nasprotno pa so pozni uporabniki večinoma starejši, restavracije obiskujejo redkeje in se pri uporabi telefona za plačila, informacije, komunikacijo in naročanje počutijo manj samozavestno. Rezultati prav tako kažejo, da so zgodnji uporabniki zaznali večjo uporabnost univerzalne aplikacije za naročanje kot pozni uporabniki. Njihove skrbi pa so se razlikovale: zgodnji uporabniki so izražali zaskrbljenost glede zanesljivosti aplikacije in varnosti podatkov, medtem ko so bili pozni uporabniki bolj zaskrbljeni zaradi izgube človeške interakcije in kompleksnosti vmesnika.

Na strani ponudnikov je analiza stališč do tehnologije med lastniki in vodji restavracij v Ljubljani pokazala, da bi pri morebitni uvedbi univerzalne aplikacije za naročanje dali prednost enostavni uporabi in usposabljanju osebja, podpori ponudnika ter integraciji s platformami za zaloge in dostavo. Poleg tega so razmišljali o trenutnem načinu delovanja in o izzivih, s katerimi se soočajo v času največje zasedenosti.

Ta magistrska naloga prispeva z integrativno razlago: standardizacija zahteva skupek pogojev, ki redko sočasno obstajajo v restavracijah in kavarnah. Kadar ta skupek manjka, digitalno naročanje ostaja koristno, vendar pogojno, in zato ne postane univerzalno. Na koncu naloga ponuja tudi priporočila za prakso in za prihodnje raziskave ter poudarja, da morata biti za dosego digitalno privzetega naročanja v gostinski industriji usklajena tako tehnološka zasnova kot operativna pripravljenost.

KLJUČNE BESEDE: digitalno naročanje, digitalizacija restavracij, sprejemanje tehnologije, integracija POS, operativna pripravljenost in standardizacija

CILJI TRAJNOSTNEGA RAZVOJA



TABLE OF CONTENTS

1 INTRODUCTION 1

2 LITERATURE REVIEW 3

2.1 Background on digitalisation 6

2.2 Drivers for digitalisation 12

2.3 Relevant stakeholders 15

3 RESEARCH METHODOLOGY 18

3.1 Semi-structured interviews with restaurant and café owners 18

3.2 Interview guide and key topics 19

3.3 Customer survey on digital ordering preferences 19

3.4 Data analysis and interpretation 20

4 RESULTS AND DISCUSSION 21

4.1 Findings from interviews with restaurant and café owners 21

4.1.1 Current use of technology in daily operations 21

4.1.2 Drivers and barriers 22

4.1.3 Desired functionalities of a universal ordering system 25

4.2 Findings from customer survey on digital ordering preferences 27

4.3 Key findings and implications 32

4.4 Limitations 39

5 CONCLUSION 40

5.1 Managerial implications 40

5.2 Further research 41

LIST OF KEY LITERATURE 42

REFERENCE LIST 42

APPENDICES 46

LIST OF TABLES

Table 1: Areas of digital services in the restaurant industry with examples 5
Table 2: Service provider - customer interaction typology 7
Table 3: Examples of available restaurant data per data source 9
Table 4: PSS Lean Design Methodology internal and external stakeholders 16
Table 5: Overview of interview participants 18
Table 6: Key drivers and barriers to adoption 23
Table 7: Desired functionalities of a universal ordering system 25
Table 8: Sample characteristics 28
Table 9: Keywords to themes mapping 7

LIST OF FIGURES

Figure 1: Overview of restaurant processes 4
Figure 2: The 5-S model of smart service 7
Figure 3: Proposed smart network in restaurant servicescape layer 10
Figure 4: Classification of DRMs 11
Figure 5: Conceptual model 17
Figure 6: Factors influencing adoption of a universal ordering app 24
Figure 7: Dining frequency by age group 28
Figure 8: Comfort with using payment apps by age group 29
Figure 9: Comfort with payment apps by previous digital ordering experience 30
Figure 10: Previous digital ordering experience by dining frequency 31
Figure 11: Willingness to use universal app by age group 31
Figure 12: Digital comfort score by adopter segment 32
Figure 13: Age distribution across adopter segments 33
Figure 14: Dining frequency by adopter segment 34
Figure 15: Spending levels by adopter segment 34
Figure 16: Perceived usefulness of a unified app by adopter segment 35
Figure 17: Perceived importance of a unified app by adopter segment 36
Figure 18: Impact on dining habits by adopter segment 36
Figure 19: Willingness to pay by adopter segment 37
Figure 20: Concerns about using a universal app by adopter segment 38
Figure 21: Perceived benefits of digital ordering by adopter segment 39
Figure 22: Survey questionnaire on digital ordering in restaurants and cafés 1
Figure 23: Interview script read by interviewer 3
Figure 24: Consent form 5
Figure 25: Recruitment email 6

LIST OF APPENDICES

Appendix 1: Survey questionnaire 1
Appendix 2: Interview guide for restaurant and café owners 3
Appendix 3: Consent form for research participation 5
Appendix 4: Interview request email sent to restaurant and café owners 6
Appendix 5: Thematic analysis 7

LIST OF ABBREVIATIONS

sl. - Slovene

AI - (sl. umetna inteligenca); Artificial Intelligence

B2B - (sl. poslovanje med podjetji); Business-to-Business

BI - (sl. poslovna inteligenca); Business Intelligence

BOH - (sl. zaledni del obrata); Back of the House

CRM - (sl. upravljanje odnosov s strankami); Customer Relationship Management

CSR - (sl. družbena odgovornost podjetij); Corporate Social Responsibility

DRM - (sl. digitalni meniji za restavracije in bare); Digital Restaurant/Bar Menus

ESG - (sl. okoljski, družbeni in upravljavski vidiki); Environmental, Social, and Governance

FOH - (sl. sprednji del obrata); Front of the House

H2H - (sl. človek-človek); Human to Human

H2M - (sl. človek-stroj); Human to Machine

IoT - (sl. internet stvari); Internet of Things

KDS - (sl. kuhinjski prikazni sistemi); Kitchen Display Systems

M2M - (sl. stroj-stroj); Machine to Machine

POS - (sl. prodajno mesto); Point of Sale

PSS - (sl. sistem proizvodov in storitev); Product-Service System

QSR - (sl. restavracija hitre prehrane); Quick Service Restaurant

TAM - (sl. model sprejemanja tehnologije); Technology Acceptance Model

UTAUT - (sl. enotna teorija sprejemanja in uporabe tehnologije); Unified Theory of Acceptance and Use of Technology

UX - (sl. uporabniška izkušnja); User Experience

1 INTRODUCTION

Despite the rapid development of technology and its successful integration across various industries, the restaurant and café sector has so far been relatively slow in adopting digital solutions, particularly for ordering and payment. The customer experience in most restaurants has remained almost unchanged for more than 30 years. A guest enters the restaurant, waits for a waiter to arrive, places their order, and later waits again for the bill. And, if change is required, waits once more for the waiter to return. This traditional service model has its own qualities, such as functionality, authenticity, emotionality, engagement, and expressivity, which are especially important in upscale restaurants (Bonfanti et al., 2025).

However, in typical restaurants, waiting can create a perception of wasted time, particularly during busy periods, leading to longer queues, overloaded staff, and potential dissatisfaction among both employees and guests.

Technologies with the potential to solve the problem of waiting and the feeling of "wasted time" have existed for more than 20 years, and the concept of digital ordering is not new. "Smart ordering" has appeared in various student projects and hackathons for many years. However, for some reason, this idea has never truly taken root in restaurants. There are solutions available on the market, but they are mostly developed for specific restaurants or restaurant chains. So far, no system has been developed that could connect different restaurants with one another, which means that consumers still experience different levels of digitalisation and user experience depending on which restaurant they visit.

Digital technologies have significantly transformed operations across many industries. Numerous digital innovations have been introduced in sectors such as sales, banking, transportation, education, healthcare, and public administration. Wang and Wu (2025) explain that service innovation represents the introduction of a new service experience that combines a new service concept, new customer-organisation interaction, and new customer value logic, together with a new technological delivery system. In this sense, innovations already implemented in restaurants include digital Point of Sale (POS) systems and online third-party delivery platforms. However, although many restaurants have adopted digital innovations such as mobile ordering, self-service kiosks, and delivery platforms, in-house dining still largely relies on traditional procedures such as hosts greeting guests, waiters taking orders and serving food, and payments being processed manually (Helal, 2023; Roy et al., 2020; Al-Qadhi et al., 2022).

People today rely heavily on digital tools for communication, managing finances, and shopping. It is therefore reasonable to assume that many customers would appreciate a similar level of efficiency and convenience when dining in restaurants (Helal, 2023; Al-Qadhi et al., 2022).

Therefore, a fundamental research question arises: Why has digital ordering not become a standard in restaurants and cafés, especially when the technology to enable it has existed for years?

The thesis aims to identify what prevents restaurants from adopting new technologies. Operational inefficiencies are common across restaurants and cafés. They usually become most visible during busy periods and relate to long waiting times for ordering, delays in payment processing, and difficulties in maintaining consistent service quality. In some cases, these issues arise from outdated workflows or the absence of digital systems that could automate such processes. Moreover, existing digital solutions are often designed for individual cafés, restaurants, or chains, meaning they are not adaptable or scalable for broader use. Additionally, restaurants may have concerns that make them hesitant to adopt new digital systems. This thesis seeks to understand these barriers and whether they are primarily technological, operational, cultural, or related to customer behaviour.

For that reason, the objective of the research focuses on both the supply side (restaurant owners and managers) and the demand side (customers). The goal is to provide practical insights into how a universal ordering application should be designed to overcome these barriers.

To achieve the purpose, the research uses two types of data collection:

- interviews with restaurant owners in Ljubljana, Slovenia, aiming to gain a deeper understanding of their operational challenges, as well as their attitudes, expectations, and concerns regarding digital solutions.
- survey of people who visit restaurants and cafés. The survey was designed to examine their habits, expectations, and willingness to use a unified application. It also explores how comfortable customers are with mobile apps, what benefits they would expect from such an application, and what concerns they may have.

The first chapter serves as the Introduction, providing an overview of the research background, motivation, research problem, purpose, objectives, and the structure of the thesis. The second chapter, the Literature Review, is divided into three main subchapters addressing the topic of digitalisation in the following context: background, drivers, and relevant stakeholders. The third chapter, Methodology, defines how the research was conducted. It includes a detailed explanation of the methods used for the interviews and survey, as well as the approach to data analysis, interpretation, and the limitations of the research. The fourth chapter, Results and Discussion, presents the findings from the interviews and survey, followed by an analysis and interpretation of the key results. Finally, the Conclusion outlines the managerial implications of the thesis and highlights potential directions for future research.

2 LITERATURE REVIEW

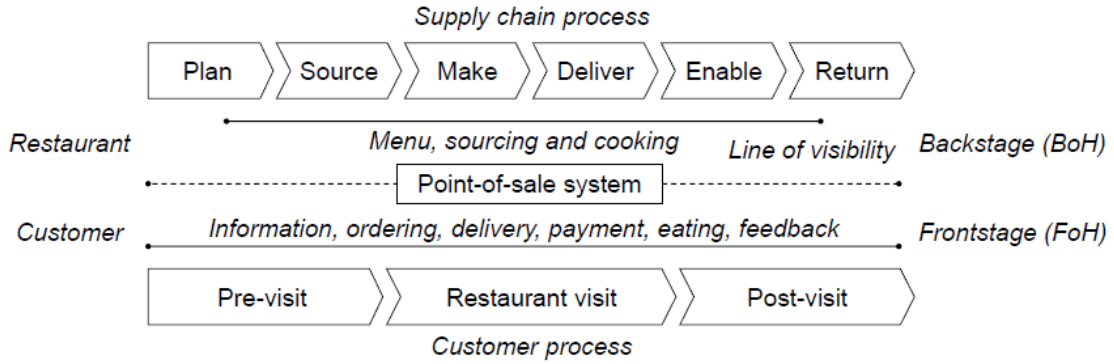
Five macro trend families that shape the restaurant industry are economic, gastronomic, technological/innovation, macroeconomic, and demographic. Understanding them is important because they connect external changes (demand, competition, macro factors) with internal decisions (menu, price, concept, technology) that are made in the restaurant (Yudina et al., 2024). Therefore, it is important to take a structured approach to analysing trends and the current state before making any technological investments.

Nowadays, traditional product or service design is often too slow and inward-facing for customers who are increasingly digitally oriented, with preferences and behaviours that change rapidly in line with trends. There is a need to move from an industrial society to an information society and then to a digital society, as IT (information technology), mobile, IoT (internet of things), and multi-device access have reset consumer expectations. Customers now expect services that are personalised, context-adaptive, real-time, ubiquitous, connected, and enjoyable (Leimeister et al., 2014).

It is useful to consider the technology journey and how it has transformed from early point solutions to integrated, cloud-based ecosystems spanning Front-of-House (FoH) and Back-of-House (BoH) operations. One of the first types of restaurants that switched to digital ordering instead of paper used RF/GSM/Bluetooth for waiter-kitchen communication and keypad/graphical displays or touchscreen terminals (often PDAs or kiosks). As Android touch interfaces matured, projects standardised on touchscreen menus and table-booking modules, which further accelerated the arrival of this technology in restaurants. The technology stack then shifted from on-premise point-to-point links to cloud architectures, enabling real-time feedback, menu updates from a manager portal, and lower-cost central databases (e.g., cloud POS/back-office). Broader industry reviews show that FoH and BoH operations are moving towards cloud-based applications, Kitchen Display Systems (KDS), Customer Relationship Management (CRM), and integrated POS solutions, all of which can be implemented on a chain-wide scale (Gupta et al., 2020).

Building on this, Alt (2021) shows in Figure 1 that restaurants have two lanes divided by a “line of visibility”. The section above the line contains everything related to FoH. This is based on what a guest believes they are doing before, during, and after their visit: looking for information, making reservations or planning, arrival, ordering and paying, receiving the delivery, and providing feedback. The section below the line contains everything related to BoH, including behind-the-scenes supply-chain activities that enable service: planning the offer, sourcing, preparation and cooking, delivery, enabling activities through systems, and returns. The POS is placed along that boundary as the translator or integrator: a tap to order becomes a KDS ticket in the kitchen, stock counts change in inventory, labour and accounting are updated, and the final receipt updates CRM and analytics. Thus, the POS connects what a guest wants to do with what the operation has to do and updates this in real time.

Figure 1: Overview of restaurant processes



Source: Alt (2021).

Alt (2021) continues by breaking down the FoH/BoH journey into specific service areas (14 in total) that digital tools plug into: reservations/booking, ordering and payment on the guest side, delivery and collection, kitchen automation and KDS, sourcing and supply, hygiene and compliance, staffing and training, operations and analytics behind the scenes, and so on. For each area, Alt notes typical examples such as QR/app menus and wallets, KDS and smart kitchen sensors, supplier portals and inventory systems, Learning Management Systems and rostering, and dashboards (Table 1).

Table 1: Areas of digital services in the restaurant industry with examples

Service area	Description of service area and examples	Main coverage	
		FoH	BoH
Accounting and controlling	Services for accounts payable and receivable, the creation of tax reports, financial statements and cash flow analysis		●
Comforting and entertainment	Services that contribute to "feeling good" in the restaurant, e.g. charging stations, smart tables, guest Wi-Fi systems	●	
Delivery	Services that provide digital platforms with coordination of the pick-up and delivery of meals	●	●
Digital signage	Services that provide menu and marketing information on specific devices, e.g. stand-up displays, interactive displays	●	
Food and beverage preparation	Services that aim at applying robotics in the kitchen, e.g. for the preparation of food components		●
Hygiene	Services that monitor hygiene regulations and the planning and documentation of appropriate measures, e.g. cleaning scheduling and checklists		●
Information and marketing	Services that provide customers with general information prior and after the visit, e.g. campaigns and reward programs	●	
Kitchen automation	Services for managing activities in the kitchen, e.g. ticketing systems, kitchen display systems, sourcing functions		●
Operational restaurant management	Services that support managers and employees in the daily process by analysing service data		●
Ordering	Services for (self) ordering in the restaurant, e.g. waitlists, table management, digital menus and payment	●	●
Payment and transaction	Services that support diverse means of digital payments, e.g. credit card, smartphone payments	●	●
Reservation and booking	Services for booking seats in the restaurant, e.g. online reservation platforms and digital waitlist management	●	
Sourcing and supply	Services for the procurement, e.g. vendor selection, order placement, tracking and tracing to origin		●
Staffing and employee education	Services for hiring and assigning staff based on seasonal needs and digital schooling for training new staff		●

Source: Alt (2021).

With the operational terrain mapped, the next consideration is how restaurants can sustain relevance and continuously improve and adapt over time. This process is described as the ABCD framework, which guides restaurants in balancing tradition and innovation:

- Add - introduce new elements that increase customer value or utility (for instance, adding delivery or loyalty apps).
- Bone - streamline or remove elements that no longer add value, such as outdated menu items or manual booking steps.

- Couple/Recouple - combine or reconnect complementary offerings (e.g., pairing online reservations with personalised promotions).
- Decouple - separate activities that can function independently to improve efficiency or target different customer segments.

The recommendation for restaurants is that they should not cancel existing offerings. Instead, they should recompose recipes, ingredients, and services using the ABCD approach. Additionally, they should collaborate with ecosystem partners to expand customer options and adopt a mindset of piloting and iterating (Yun et al., 2024).

Finally, an important reason why digitalisation in restaurants matters is its connection to Corporate Social Responsibility (CSR) practices. According to Cantele et al. (2024), CSR in restaurants typically addresses issues such as food waste, resource consumption and the use of renewables, local and seasonal sourcing, employee care, inclusiveness, collaboration with schools, and charitable initiatives. Digitalisation helps to operationalise CSR by equipping each of these practices with data capture and feedback mechanisms. For example, smart scales and KDS can track food waste, IoT sub-metering can monitor energy and water use, supplier portals and traceability systems can support local sourcing, learning management systems and human resources information systems can enhance employee care and inclusiveness, CRM tools and event trackers can strengthen community engagement, and ESG (environmental, social and governance) data marts with dashboards can ensure transparent disclosure.

2.1 Background on digitalisation

Digital technologies have long been present in the hospitality sector and have fundamentally shaped how hospitality services are designed, delivered, and perceived. The presence of these technologies has not only introduced new tools into existing operations but has also transformed the very nature of the service itself. This can be described as the digitalisation of services (Romero et al., 2019). This transformation requires a reorganisation of the service delivery process, as digital tools influence how employees, guests, and resources are interconnected. To capture these changes, services can be analysed through the classic five I's of services: intangibility, inseparability, inconsistency (or variability), inventory (or perishability), and involvement. For example, digitalisation can make intangible services visible through data and interfaces, and it can reduce inseparability by enabling remote interactions. Romero et al. (2019) further categorised service providers into four groups (Table 2).

Table 2: Service provider - customer interaction typology

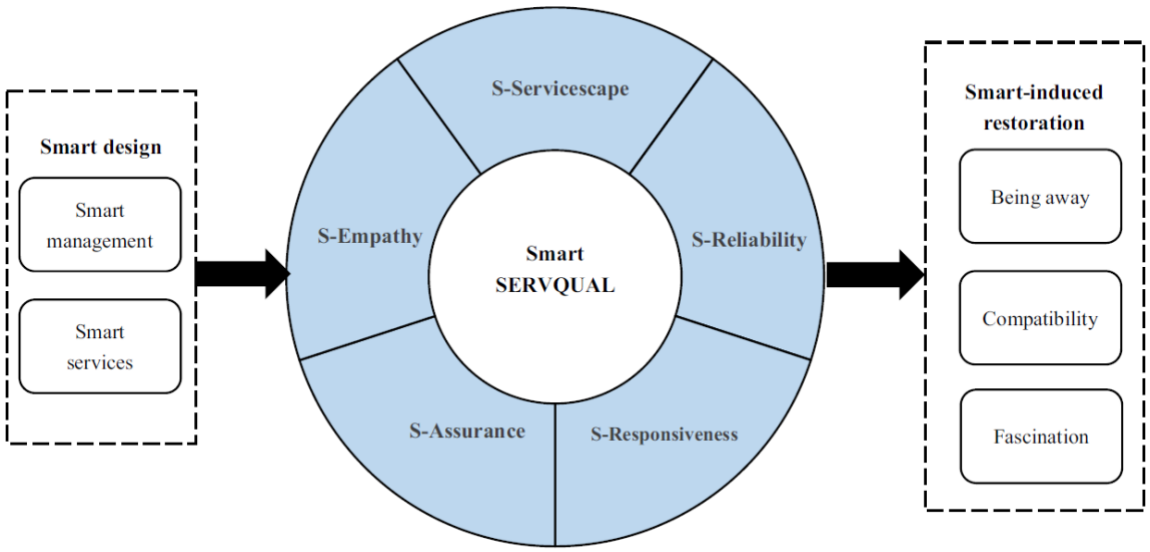
	Passive	Active
Passive	Machine to Machine - M2M (autonomous-service)	Human to Machine - H2M (super-service)
Active	Human to Machine - H2M (self-service)	Human to Human - H2H (human-service)

Source: Romero et al. (2019).

Their research showed that machine-to-machine (M2M) interactions lead to high intangibility and low variability, while human-to-human (H2H) interactions lead to low intangibility and high variability. This means that when restaurants push towards M2M, autonomous or self-running flows, they achieve very predictable and standardised delivery, but customers do not necessarily see or feel the service being delivered. On the other hand, if restaurants rely on H2H interactions, their services are tangible and vivid but highly dependent on staff, shifts, and time. Another approach is to build hybrid human-to-machine (H2M) configurations where it matters. These have medium intangibility and variability. Restaurants of this type offer, for example, QR ordering or human remote assistance for issues.

The move towards digital transformation in restaurants has also required the development of frameworks and systems to define what "smart service" actually means. One widely discussed framework is the "5-S Model of Smart Service" (Wong et al., 2022), shown in Figure 2:

Figure 2: The 5-S model of smart service



Source: Wong et al. (2022).

This model connects smart design with the smart Service Gap Model, which ultimately aims to produce a digitalised restaurant. The 5-S SSQ model contains five dimensions:

1. s-Servicescape - introduces a “smart” version into every tangible part of the restaurant.
2. s-Reliability - accuracy and consistency of digital processes.
3. s-Responsiveness - quick response through smart systems.
4. s-Assurance - employees must convey a sense of confidence and professionalism.
5. s-Empathy - the feeling of warmth must not be absent. Each customer must be approached individually.

This model explains how technology can change the meaning of “quality” in the context of restaurants. The authors suggest that digitalisation is not only about increasing efficiency, but also about the overall experience and human well-being.

Building on this understanding of smart service, another practical approach focuses on replacing paper-based tasks with fully digital workflows. An end-to-end online ordering, billing, and sales-performance system was developed to automate order management, billing (including PayPal and cash-on-delivery options), performance analytics, and delivery tracking (Maurat & Romano, 2025). The aim of such a system is to replace pen-and-paper processes in restaurants, which often lead to lost orders, slow service, and data errors. In this system, the authors propose the introduction of two different dashboards: one for customers (web and mobile apps) and another for managers (administrators). The admin dashboard is backed by an application server and a database, including modules such as Order Management, Billing (PayPal/Cash-on-Delivery), Sales Performance Analytics, and Shipping/Delivery integration. This system achieved an overall evaluation of “Very Satisfied” in a survey of 100 stakeholders (IT specialists, administrators, and end-users).

The authors emphasise that such an architecture and data flow allow information to move in real time, while operational capabilities such as self-service ordering, multi-method payments (PayPal/cash-on-delivery), automatic status updates, and admin reporting by day, week, month, and year lead to high stakeholder satisfaction. Their recommendation is to optimise algorithms for reduced lag, add features in line with user feedback, invest in training users for effective adoption, and implement real-time performance monitoring.

Egigogo et al. (2024) also state that it is necessary to design a two-role application (user and admin), which supports checking availability, making reservations, and monitoring the status of a customer’s table, while also including a back-office management app (approve/reject bookings, add/delete tables, manage sub-admins). In their web-based table reservation system for small restaurants, they present a minimalist architecture with:

- Two-sided roles (user and admin)
- A simple CRUD (create, read, update, delete) system for tables and reservations
- Status checking for guests.

The authors claim that a minimal web-based reservation stack (PHP-MySQL/Apache + Bootstrap) with user and admin roles and an entity relationship diagram backing bookings and tables can eliminate manual errors and provide real-time availability for guests.

Smart technologies and abundant data can and should be key enablers of informed and efficient decision-making in restaurants. They enable decisions on location choice, reservations and table assignment, queue and wait-time management, menu engineering and personalisation, as well as multi-channel capacity allocation between dine-in and delivery (Roy et al., 2022).

These technologies and data systems work together through data sources, analytical methods, and managerial levers for each of these decision areas. At the centre of this ecosystem is the POS system, while reservations, customer feedback, loyalty programmes, KDS, delivery platforms, and external data (such as weather, traffic, demographics, and reviews) feed into analytics (Table 3). However, data ownership carries risks when it depends on third-party platforms, making it crucial for restaurants to retain control and integration of their data (Roy et al., 2022).

Table 3: Examples of available restaurant data per data source

Valet management	Reservation system	POS system	Feedback system	Loyalty program	Kitchen system
Car type	Visit number	Order type	Customer feedback	Loyalty points	Current quantity
Billing to valet time	Visit recency	Order items	Birthday	Redemption frequency	Reordering point
	Visit day and time	Order value	Gender	Redemption quantity	Recipes
	Visits per outlet	Discount	Age		Preparation time
	Waiting time	Table types			Wastage source
	Seating time	Table count			Wastage quantity
	Group size				

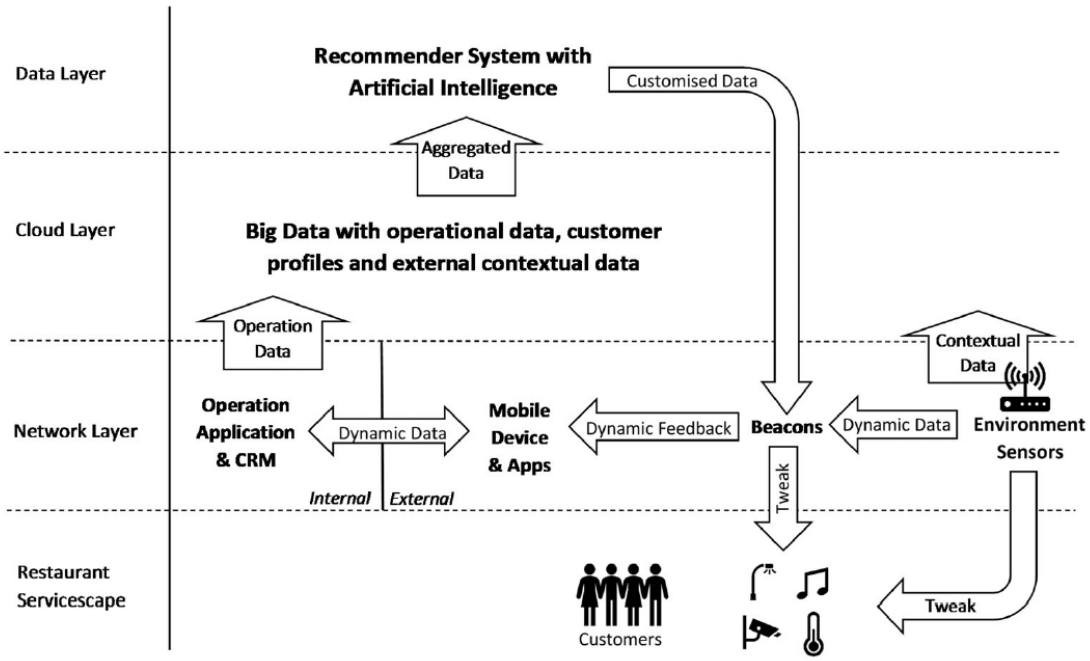
Source: Roy et al. (2022).

The evolution of digitalisation in restaurants shows how the industry has shifted from using basic POS systems to adopting fully integrated smart systems. In the mid-2010s, restaurants in the United States were strongly focused on investing in POS terminals and BoH core systems, while on the FoH side they only had the basics. At that time, they were just planning to introduce mobile bill-pay, social-POS integration, real-time web reporting, and business intelligence (BI). Limited budgets, the challenge of selecting the right technology, and a lack of trained staff prevented them from implementing these solutions (Cavusoglu, 2015). Today, digital transformation in the US remains uneven, as many organisations lag behind due to limited resources and skills (Faisal et al., 2023).

In contrast, East Asian markets have advanced rapidly, especially in robotics. Restaurants in China and Japan have implemented robots across multiple functions, resulting in shorter waits, fewer human errors, fairer queues, and 24/7 robot availability. A human-less flow like this demonstrates how automation can streamline operations and improve queue fairness (Mishra et al., 2018).

More recent studies have conceptualised the restaurant as an interconnected smart network rather than a single service site. Within this view, the "smart restaurant" functions as a digital ecosystem linking diners, staff, systems, and the broader smart city throughout all dining stages (before, during, and after the meal). The four-layer architecture (Figure 3) consists of a servicescape layer (physical environment), a network layer (sensors and mobile devices exchanging contextual data), a cloud layer (data aggregation), and a data/AI layer. The emphasis is on interoperability among systems, and the goal is to minimise errors and human hand-offs (Leung & Loo, 2022).

Figure 3: Proposed smart network in restaurant servicescape layer



Source: Leung & Loo (2022).

Moving from conceptual models to technical designs, researchers have described an architecture that connects mechanical automation with artificial intelligence. One such example is a mechatronic conveyor system equipped with table-level sensing, where food is delivered directly to the table based on an information-retrieval trigger that coordinates human-to-machine (H2M) and machine-to-machine (M2M) interactions. The result is a semi-automated yet service-oriented model of customer self-service (Gupta et al., 2020)

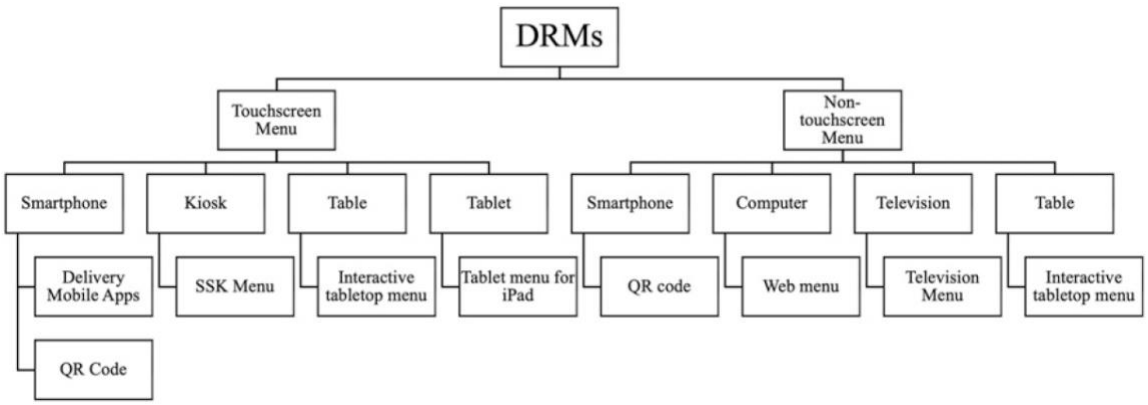
Digitalisation in restaurants can also be observed from the perspective of menu formats. A digital menu is a self-service interface (such as a tablet, kiosk, or QR code) that displays

menu items in the form of text, images, or videos. Such a menu allows users to browse and place orders directly via touchscreen. A video-based menu performed best with customers, while a menu with digital images and text combined with self-ordering actually performed worse than a traditional paper menu with images. This indicates that menu formats influence not only the information provided, but also the perceived quality of food and services and, ultimately, customer behaviour in the restaurant (Lin et al., 2023).

Complementary research highlights how e-menus can evolve into full operational platforms, rather than just being ordering tools. A QR-based menu prototype includes stock-aware displays, reservations, online payments, charity/donation options, item-level comments, and WhatsApp notifications. This system goes beyond ordering and functions as a lightweight business-intelligence layer because of the inclusion of manager analytics and reporting modules. In this way, the restaurant gains insights into revenue, orders, and customer statistics. Future improvements could integrate nutritional information and even live cooking video to further enrich the e-menu experience (Jaiswal et al., 2023).

From a broader perspective, digital restaurants and menus (DRM) can be grouped into touchscreen and non-touchscreen systems (Figure 4). Touchscreen formats dominate, because users experience greater control and enjoyment when using this type of menu. Additionally, for touchscreens to completely replace non-touchscreen menus, it is essential to ensure a responsive user experience (UX), privacy safeguards, and staff training in order to realise the benefits (Silvestre et al., 2025).

Figure 4: Classification of DRMs



Source: Silvestre et al. (2025).

Several prototypes further illustrate how integrated technologies could converge in practice. One mobile-centred ordering system, Foody, connects the customer module and the admin/kitchen module with a cloud database, all integrated with IoT devices that update table status in real time. The goal of this system is to reduce waiting time, misplaced orders, and information uncertainty, while at the same time improving accuracy and customer fit. To make the system more advanced, the authors incorporated several innovative features: table availability sensing (NodeMCU + LEDs), task allocation and order scheduling, a

personalised menu built from Facebook Graph API data, a 3D menu, and ingredient look-ups. This design highlights how combining mobile, IoT, cloud, and AI-driven personalisation can transform restaurant operations and enhance the customer experience (Liyanage et al., 2018). Similarly, the "Smartmenu" links four different modules (customer, waiter, kitchen, and cashier), all connected to a local server plus a cloud menu service. This system enables item browsing with pictures and nutritional information, waiter-call functionality, order grouping and kitchen consolidation, multi-language menus, and remote menu updates. The pilot received positive reviews from users in Finland, but some problems were also identified, such as poor integration and insufficient employee training. The feedback shows that faster menu updates and support for more languages are clear advantages, but integration and staff training are necessary; otherwise, the digital menu can make things more difficult (Pieskä et al., 2013).

The latest developments push digitalisation towards intelligent, emotion-aware solutions. A QR-based restaurant system built on the MERN stack (MongoDB-Express-React-Node) integrates AI-driven mood-based menu recommendations, real-time order orchestration, inventory tracking with low-stock alerts, and integrated payments. Its prototype was tested by users over a two-week period. The results showed notable performance gains: order processing time dropped by 35%, order accuracy reached 98%, recommendation accuracy reached 85%, and overall satisfaction rose by about 20%. One of the most striking elements was the emotion-aware menu: by analysing text, emoji, or audio sentiment, the system suggested items to match the customer's mood. In simulations, this achieved an approximately 85% success rate, with 30% of users willing to try new items. However, since these results are based on simulations, field trials with randomised controls are needed to see whether the system can consistently improve throughput and margins in real-world restaurants (Mahajan et al., 2025).

2.2 Drivers for digitalisation

Understanding what drives and supports digitalisation in restaurants is essential to explain why some operations progress faster than others. Empirical evidence shows that digitalisation in restaurants is strongly connected with labour productivity, particularly when restaurants implement digital tools into both FoH and BoH operations. FoH digitalisation represents the introduction of technologies that directly touch the customer journey, such as online ordering, delivery platforms, self-service kiosks, digital menus, online payment, table and waitlist management, review and feedback systems, Wi-Fi, and apps. By contrast, digitalisation in BoH operations involves the integration of technologies such as POS, inventory and cost tracking, kitchen display systems, robotics for repetitive preparation tasks, analytics, and cloud/big-data solutions. The authors suggest that it is necessary to invest in both sides of the operational process in order to increase productivity and recommend avoiding "single-tech" pilots without considering the broader picture of the company's processes (Lee et al., 2024).

External shocks can also promote digital transformation, as necessity turns into strategy. During the COVID-19 crisis, restaurants managed to cope with the help of template-based ordering websites and eventually integrated digitalisation into their regular processes. Some restaurants managed to achieve 80% of their sales through online ordering at the worst point, when they faced issues such as lockdowns, supply-chain shocks, staffing losses, and technological unpreparedness. This is an example of how a catalyst for digitalisation can be an external factor, which initially pushes a company into survival-driven mode and later into a strategy-driven shift. Additionally, 92% of managers reported that COVID-19 accelerated digitalisation, and the main drivers were safety protocols, continuity under restrictions, and productivity under remote work. Examples of digitalised processes during the pandemic include digital menus, online reservations, and self-service check-in/out adopted to reduce contact, increase speed, and stabilise operations. Therefore, crises have become a digital prerequisite, particularly for restaurants, because the pandemic shock directly influenced the adoption of delivery services, contactless payment, online services and apps, and the redesign of menus and services (Gill, 2020; António & Rita, 2021; Fainshtein et al., 2023).

In addition to responses during times of crisis, digitalisation in restaurants is also influenced by classic drivers and inhibitors, such as convenience, personalisation, direct access to guests, feature bundling, and data insights. These factors are the main reasons why restaurants adopt new technologies. From the customer perspective, this translates into "skip-the-line" convenience, personalised offers after loyalty check-ins, and direct push messaging. From the firm's perspective, it involves feature bundling (such as payments, loyalty, and geolocation), analytics derived from first-party data, and AI-driven productivity. Reportedly, up to half of restaurant sales could become digital, because apps, kiosks, and delivery platforms now actively shape demand patterns and service design (Schalow, 2025). From the user's perspective, what encourages them to adopt and enjoy digital applications in restaurants includes convenience, value (promotions), perceived usefulness, ease of use, personalisation, and AI-enabled support (Al-Qadhi et al., 2024).

However, the level of consumer satisfaction still depends on striking the right balance between humans and machines. Research using attribution theory, as a mechanism that links the design of automation with customer satisfaction, shows that semi-automated processes generally perform better than fully automated processes at the psychological level of the user. This occurs because "internal attribution", or self-credit, is activated when no error occurs in the process, while users tend to tolerate errors if human help is also available. Therefore, it is safer to adopt the hybrid option as the default in terms of process automation. This shows that an automation strategy is not only an operational matter but also part of experience design (Park & Lehto, 2022).

Furthermore, ease of use is also an important driver of digitalisation in restaurants. Studies have found that mobile adoption of restaurant e-services is primarily driven by simplicity and minimal interaction steps, while desktop adoption is influenced more by perceived usefulness. Even mobile transactions depend mostly on simplicity, meaning that one-tap

flows and minimal typing are not just UX improvements but essential requirements for adoption (Mozeik et al., 2009).

Another internal driver is employee readiness. Access to resources, visible leadership, and role models to follow directly increase employees' intention to support digital transformation. This also works indirectly by fostering mindfulness and innovative work behaviour. In addition, standardised Standard Operating Procedures (SOPs) can strengthen the link between innovative behaviour and digital transformation by saving time and attention resources, which employees can then reinvest in innovation (Wang & Wu, 2025).

At a broader level, digitalisation is driven by organisational and contextual factors present within restaurants. The most important determinants for digitalisation are education, ambition and motivation, multi-unit scale, corporate-group membership, an educated workforce, and inland or medium-city context. These can be observed from three perspectives: leader, firm, and location. At the human-capital level, research has shown that managers with a university degree and a higher percentage of educated employees are the strongest and most consistent predictors that a company will adopt information and communications technology (ICT). At the firm level, opportunities, professional development, and growth ambition were identified as key drivers. These factors make firms more aware that they need suitable technical resources, organizational support, and infrastructure in place in order to successfully adopt and use new digital technologies. At the location level, it was found that businesses in inland areas and those located in municipalities with 10,000-100,000 inhabitants have higher levels of digitalisation, while those on the coast lag behind. This also demonstrates that market context shapes the drivers of digitalisation (Martín-Martín et al., 2022).

The way a guest perceives innovation acts as a psychological driver. It is very important what kind of brand image is created through the overall dining experience, since this builds customer loyalty. Adoption of digital tools is largely driven by the innovative or modern image in the eyes of customers, which results in a willingness to pay more. However, such adoption of digital technologies carries risks. It is conditional and must be paired with security, reliability, and clear communication (Thayarnsin, 2025).

Furthermore, financial readiness and the liquidity of a restaurant also influence its digital success. A baseline investment that has a positive effect on profitability is a corporate website, which pays off particularly in times of crisis. Research has shown that restaurants with their own delivery service or platform increase their profitability when sales fall. This demonstrates why it is important for restaurants to adopt and expand their digital channels (González-Morales & Cavero-Rubio, 2023).

Finally, one of the main purposes of digitalisation in restaurants is to create sustainable and dynamic customer value. By using data to capture opportunities, restaurants can move from reactive adoption to proactive adoption of digital technologies (Daradkeh et al., 2023). Key

enablers and barriers that either drive or block adoption align with classic drivers and inhibitors and are divided into two categories by the authors:

1. External triggers - digital competitors, changing consumer behaviours, and disruptive technologies.
2. Internal enablers/barriers - cross-functional teams, fast decision-making, and executive support (enablers), versus rigid planning, resistance to change, and hierarchical structures (inhibitors), which shape the organisational capacity to adopt digitalisation.

Positive aspects of digitalisation include the possibility of personalising the service, the presence of data efficiency and automation, and significant advantages such as adaptability, capacity, and competitive advantage. However, potential downsides include the erosion of personalisation, heavy dependence on technology, and the need for constant upgrades. Internet dependence is a non-trivial risk. Therefore, it is necessary to create a balanced approach which, alongside the introduction of new technologies into processes, simultaneously adapts the company culture and invests in the skills development of employees (Oliinyk et al., 2024).

2.3 Relevant stakeholders

Digital transformation in restaurants depends on collaboration and alignment among all stakeholders involved in the design, implementation, and use of digital services. For it to be successful, every participant (developer, manager, employee, customer) should act as a co-creator, and not merely as a passive informant. This shift from customer-centric to stakeholder-centric thinking is captured in the Product-Service System (PSS) framework (Pezzotta et al., 2017). The authors associate it with the PSS Lean Design Methodology, which is a four-phase process with company and customer “swim lanes”, supported by concrete methods:

1. Customer analysis - feedback mining, persona modelling.
2. Solution concept design - brainstorming, Product-Service Concept Tree design and evaluation.
3. Solution final design - service blueprinting, Wizard-of-Oz and cognitive walkthrough evaluations, product design rules; KPI modelling.
4. Offering analysis - KPI and social sentiment monitoring for continuous improvement.

The authors argue that both internal and external stakeholders (shown in Table 4) must participate in co-creation in order to maintain long-term relationships and to shift from transactional (product-oriented) to relational (result-oriented) business models.

Table 4: PSS Lean Design Methodology internal and external stakeholders

Internal	Marketing
	Manufacturing
	Product R&D
	Frontline employees
	Service management
External	Suppliers
	Dealers
	Competitors
	Service provider
	Public or legal institutions

Source: Pezzotta et al. (2017).

Digitalisation significantly redistributes value, risk, and responsibility among stakeholders. As Khan (2020) argues, digital disruption moves restaurant service through six stages, from face-to-face to technology-dependent delivery. This changes the value and risk for all stakeholders involved. Customers gain more convenience, privacy, and access, but they may also experience a weaker social experience, quality decay in transit, and murkier safety. Operators and managers gain more market reach and lower FoH capital expenditure (pickup/delivery, ghost kitchens), but they have to give up margin, data, and brand control to platforms and redesign menus and packaging. Employees, meanwhile, move from taking orders to handling exceptions, expo, and logistics coordination, which affects their workload and job satisfaction.

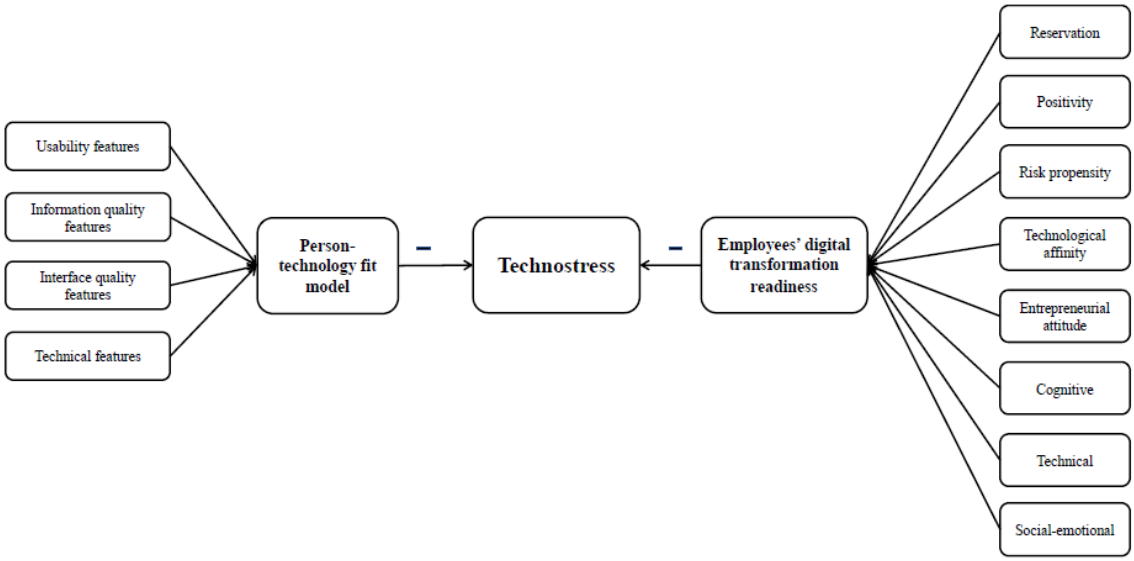
It is important how restaurants establish their organisational structure, as this determines how effective the digital transformation will be. Smaller firms tend to embed digital skills inside delivery teams and pursue innovation through them, while medium and large firms separate the concept of innovation from operations. Effective transformation depends on so-called "stakeholder operationalisation", which means acknowledging not only customers but also partners (through onboarding, portals, and co-creation) and employees (through skills, engagement, and knowledge systems). Therefore, it matters who is responsible, who matters, how, and when in restaurant digital transformation, particularly regarding guests, delivery, logistics, marketplace partners, and staff (Balakrishnan & Das, 2020).

When discussing the barriers to the digitalisation of processes in restaurants, Weerasinghe and Nirere (2022) illustrate stakeholder-specific barriers that separate restaurants from tech-centric work. Restaurant owners pointed to financial and upgrade/maintenance limitations, while employees emphasised adaptation, language, and training gaps.

Employee well-being and digital readiness are equally important in establishing a successful digital transformation. Technostress among employees occurs when they are faced with an excessive workload that places high technological demands on them, ultimately exceeding their personal capacities. Because of this, it is crucial to establish the right fit between people and technology. By expanding the Person-Technology Fit model, recent studies have added technical features as a critical element to ensure that employees have a positive experience

while maintaining efficient and secure restaurant operations (Figure 5). When this model is combined with the concept of employee digital literacy, a conceptual framework emerges that underscores the idea that managers must configure technology not only for efficiency but also for employees' psychological comfort and adaptability (Alfehaid et al., 2024).

Figure 5: Conceptual model



Source: Alfehaid et al. (2024).

Leadership, management, and organisational culture within a restaurant play a crucial role in enabling digitalisation in small and medium enterprises. Ocloo et al. (2024) argue that organisational culture directly promotes digitalisation, whereas a digital strategy and environmental or competitive pressure do not, unless the manager actively works on them. The COVID-19 pandemic further strengthened the links towards digitalisation, making it one of the catalysts for going digital. Consequently, the authors state that it is necessary to invest in the digital skills of the restaurant owner or manager, so that intentions and external pressures can be transformed into actual adoption.

Finally, it is important to define the boundary between self-service and provider-led service. Managers should know when and how to shift the service boundary either towards self-service (where customers take on more tasks) or towards super-service (where providers take on more customer tasks). The value of the service increases when the boundary aligns with where the relevant knowledge and capabilities are located. If the customer has them, the service moves towards self-service. If the provider or partners hold them, it moves towards super-service. Balancing these boundaries helps ensure efficiency without causing erosion in service quality (Campbell et al., 2011).

3 RESEARCH METHODOLOGY

To understand why digital ordering has not yet become a widespread standard in restaurants and cafés, a mixed-methods approach was applied. My research combined qualitative interviews with restaurant and café owners and a quantitative survey with customers. This design was chosen to capture the perspectives of both key stakeholder groups: on the one hand, the business perspective, focused on operational challenges and technological limitations, and on the other, the customer perspective, concerned with habits, expectations, and apprehensions.

Generative artificial intelligence (GAI) tools were used in this thesis exclusively to improve sentence structure and correct grammatical errors. All substantive content was independently produced and verified by the author.

3.1 Semi-structured interviews with restaurant and café owners

The research on operational problems and attitudes toward digital ordering solutions from a business perspective is based on five semi-structured interviews conducted with owners and managers of restaurants and cafés in Ljubljana. The main goal of these interviews was to uncover how they manage their business on a daily basis, which technologies they currently use, how satisfied they are with existing digital solutions (such as QR code menus and delivery platforms), whether they have used them at all, and how open they would be to introducing and using a universal application for ordering and payment in their restaurant.

The participants were selected using purposive sampling to ensure as wide a range as possible in the size and type of restaurants included in the research. Each interview lasted between 20 and 30 minutes, and the conversation followed a guided set of questions (see Appendix 2). A brief overview of the interviewed establishments is provided in the Table 5.

Table 5: Overview of interview participants

Interview ID	Type of establishment	Cuisine type	Size	Years in operation	Ordering type
I1	Restaurant	Mexican	Medium (~20 staff)	24 years	Full-service
I2	Restaurant	American	Medium (12 staff)	3 years	Self-service
I3	Boutique pastry shop	French-style pastries	Medium (~13 staff)	5 years	Counter-service
I4	Restaurant	Mexican street food	Small (7 staff)	7 years	Counter-service
I5	Pizzeria	Italian	Medium (~15 staff)	3 years	Full-service

Source: Own work.

3.2 Interview guide and key topics

I conducted the semi-structured interviews using a predefined guide to ensure both consistency across participants and flexibility for them to elaborate on topics of interest. I began each conversation with general questions about the restaurant and its operations, including information about the background, size, location, number of employees, years in business, and type of cuisine. Once this context was established, I directed the discussion toward identifying operational challenges during peak hours, with focus on issues such as order-taking delays, payment processing bottlenecks, and staff-related problems. Besides, I asked participants about the technologies they use in daily operations, and I encouraged them to share their personal experiences with these tools, highlighting both their advantages and drawbacks. In the second part of the interview, I focused on participants' attitudes toward new technologies related to digital ordering and payment. I asked how they feel about adopting such systems, what these technologies mean to them and their business, and why they believe digital ordering has not yet become a standard practice in restaurants. Finally, we discussed the factors that could potentially influence their decision to adopt a universal digital application. Participants assessed the importance of each factor that affects adoption and shared their concerns or hesitations about certain functionalities that might be essential for a practical and useful unified app. This approach allowed the interviews to maintain structure while still creating space for open discussion, ensuring that both operational and technological aspects were explored in sufficient depth.

3.3 Customer survey on digital ordering preferences

In parallel with the interviews, I conducted a customer survey to better understand dining habits, digital behaviours, and the willingness to adopt a unified app. The purpose of the survey was to identify whether customers would use such an application if it was available, which functionalities they would value most, and what concerns they might have. I created and distributed the survey in May 2025, and it shared through social media platforms (Instagram, LinkedIn, Viber, WhatsApp) to reach a diverse audience. In total, 97 respondents completed the questionnaire. Most respondents were between 25-34 years old (42.3%), followed by 18-24 years (25.8%) and 55+ (20.6%), with smaller representation from other age groups. The majority typically dine out several times per month (34%) or several times per week (25.8%), most often spending €10-20 per meal (49.5%).

The questionnaire consisted of 20 questions, combining multiple-choice, Likert-scale, and open-ended questions. It was divided into three main sections. The first section focused on demographic information and dining habits. The second section explored respondents' general comfort with using mobile applications for different purposes. The final section concentrated specifically on restaurants and cafés, examining respondents' previous experiences with digital ordering, their perceived benefits and drawbacks, as well as their expectations and concerns regarding the potential existence of a unified ordering application.

The full list of survey questions is provided in Appendix 1, while the demographic structure of respondents and detailed findings from the survey are presented in the Results and Discussion chapter.

3.4 Data analysis and interpretation

All interviews were transcribed and then systematically analysed to identify recurring themes and patterns. Special attention was given to mentions of operational challenges during peak hours, the current use of technology and its limitations, attitudes toward digital ordering, and the factors influencing willingness to implement a universal application in their restaurant. Thematic coding (Table 9, Appendix 5) was applied to group together similar responses and highlight the most frequently discussed topics.

The data collected through the survey were analysed using quantitative methods in RStudio. The closed-ended questions were summarised through descriptive statistics, including frequency distributions and percentage breakdowns. These were used to illustrate demographic trends, dining habits, and the level of comfort with using mobile applications. For the questions presented in a Likert-scale format, mean values were calculated to determine the general level of comfort, as well as the perceived importance and usefulness of specific mobile application features.

An additional step was taken during the survey analysis to gain a deeper understanding of differences in customer behaviour. Respondents were categorised based on how comfortable they feel about using mobile technology. The comfort ratings from the following questions:

- How comfortable do you feel using mobile apps to make payments (for example, mobile banking, Google Pay, Apple Pay)?
- How comfortable do you feel using mobile apps to find information (such as Google searches, checking the weather, or reading the news)?
- How comfortable do you feel using mobile apps to communicate with other people (for example, WhatsApp, Messenger, Instagram)?
- How comfortable are you ordering products or services online using mobile apps (such as ordering food, shopping for clothes, or buying event tickets)?

were combined into a single Digital Comfort Score, calculated as the average of all individual comfort ratings.

Based on this Digital Comfort Score, respondents were then divided into two groups, following the common top-two-box approach used in survey analysis. Respondents with an average score of 4.0 or higher were classified as Early Adopters, a group that is more open to technology and more likely to try new digital solutions. Respondents with an average digital comfort score below 4.0 were classified as Late Adopters, a group that is less open and less confident when it comes to using digital tools.

This segmentation enabled meaningful comparisons between the two groups across the remaining survey questions. It became possible to see, for instance, whether Early Adopters believed that a universal app would be more useful, or whether they showed fewer concerns when using such an app, compared to Late Adopters. It was also possible to identify whether people who are already highly engaged with mobile technologies perceive greater benefits from their use.

By combining the qualitative findings from the interviews and the quantitative findings from the survey, the analysis comprehensively covered both the business perspective and the customer perspective on digital ordering in restaurants and cafés. Furthermore, this mixed-methods approach made it possible to interpret not only which functionalities and barriers are most relevant to users, but also which operational and technical constraints influence the feasibility of implementing digital solutions.

4 RESULTS AND DISCUSSION

Drawing on both qualitative and quantitative data, this chapter explores the current state of digital ordering in restaurants, while examining the conditions that support or hinder its adoption. The insights are organised thematically to reflect key patterns that emerged during the analysis. In addition, the survey results are analysed and compared across different customer profiles.

4.1 Findings from interviews with restaurant and café owners

4.1.1 Current use of technology in daily operations

The interviews with restaurant managers showed that technology is directly involved in their everyday work, but unevenly. FoH tools are the most prevalent, such as applications for ordering and payment via QR code, and delivery applications (Wolt, and previously Glovo). BoH tools are used less and are usually based on classic cash-register integration with the kitchen, inventory, and supplier ordering systems. Restaurants use mobile or table-side ordering systems or counter POS terminals to record orders and create tickets, which are displayed in the kitchen.

Managers stated that BoH digitalisation is pragmatic: tasks that were previously handled using Microsoft Office documents now exist within inventory systems, where everything is recorded automatically. On the other hand, they noted that communication with suppliers still takes place mostly via email. Managers also mentioned that the concept of food preparation in their restaurants does not allow complete process automation. These are, for example, pastries made in advance for special orders (birthday cakes) or dishes prepared only when ordered.

Overall, managers value the integration and functionalities offered by a universal ordering application. As the greatest advantages, they cite single-entry product updates, effortless checkout (no need to create an account), business invoicing, and even business-to-business (B2B) supplier ordering within the same ecosystem.

During peak hours, restaurant managers stated that it is most difficult to maintain balance among orders, the kitchen, and the staff. Even a minor issue (e.g. dishwashing delays, weaker roles, or a malfunctioning device) can lead to cascading slowdowns. During busy periods, restaurants often face delivery overloads, and reliance on delivery platforms and their couriers affects restaurants in an uncontrolled way. Factors such as driver shortages, pickup errors, and device outages were highlighted as particularly problematic, and managers pointed out that these issues harm restaurant ratings the most during high-traffic periods. They also added that limited connectivity with delivery platforms and their technical support negatively affects revenue.

Restaurant managers described digital ordering as useful, but only under certain conditions. ID1 expects digital ordering to be adopted in the restaurant, but only if allergy labels are clearly displayed and technical support is available. This person also emphasised that it is very important for such applications to include promotions, as a feature that will attract customers to use the app. ID2 is more sceptical because of the additional costs the application may bring, but appreciates the availability of dish translation in the menu, which would make it easier for foreign guests visiting the restaurant. Additionally, ID2 pointed out that with the app, it would be easier to take personalised orders adjusted to the taste of each customer.

ID3 expressed concern about the human-led experience and supports only the "click-and-collect" option. This participant also raised a question about tipping. ID4 weighed the trade-off between speed of service and cultural warmth, stating that the service in each restaurant must align with the culture of the cuisine being served. This person therefore expressed concern about the concept of self-ordering in a Mexican restaurant, which is naturally very hospitable, and also expressed doubt due to the scarcity of robust local providers. ID5 strongly supports the idea of a universal digital application and added that it should act as a system connected to the restaurant's POS system and stock levels in real time. This person also mentioned that such an application should follow the invoicing rules of the Financial Administration of the Republic of Slovenia (FURS), as well as having a potential B2B ordering option for suppliers.

4.1.2 Drivers and barriers

Table 6 summarises restaurant owners' specific drivers and barriers for digital ordering.

Table 6: Key drivers and barriers to adoption

Person	Concept	Drivers	Barriers
ID1	Mexican, table-service, mobile/table-side POS	• Labour shortages accelerate adoption over time • Promotions and deals increase customer acceptance of apps	• Allergy safety: hidden ingredients must be checked with staff • Device failures, slow replacement/support
ID2	Burger, self-service counter POS	• Multilingual translation would help foreign guests understand and customise orders	• Card fees (banks profit "from both sides") • Implementation cost (rated biggest barrier) • Customisation clearer verbally than written
ID3	Boutique pastry café, pre-produced stock	• Click-and-collect (pre-pay and pickup) fits format • Experience still led by staff, digital complements it	• Human interaction defines experience • Concern that QR-at-table may reduce tips
ID4	Taco bar, exploring QR	• QR order/pay to speed orders and table turnover	• Risk of losing interpersonal "charm" and cultural warmth • Scarcity of local providers/support for these systems
ID5	Pizzeria, POS-kitchen integrated	• Wants smartphone ordering "as soon as possible" for staffing relief/costs • Needs guest checkout (no forced accounts), fast POS sync, rich visuals • FURS invoicing and even B2B supplier ordering in the same system	• Connectivity issues • Account-creation friction on current online channel • Tech support availability/quality is critical

Source: Own work.

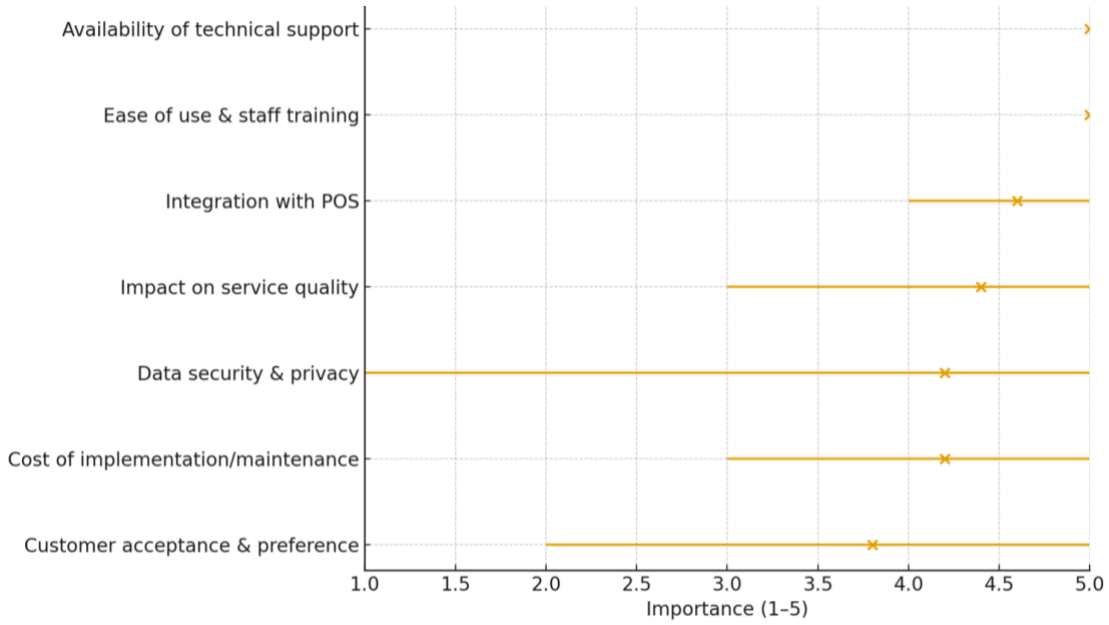
Interview responses show that restaurant owners perceive both demand-side drivers (such as promotions, deals that encourage customers to use the app, multilingual menus for tourists, and click-and-collect options for pre-ordered meals) and operational barriers (such as reliability, costs, and format fit). Al-Qadhi et al. (2024) notes that users who report high enjoyment of coupons tend to repeatedly value and use these features in restaurant apps. On the other hand, in terms of operational barriers, independent venues still face classic obstacles such as implementation costs, limited digital skills, and complex integration. Oliinyk et al. (2022) identify these as primary barriers in hospitality digitalisation studies.

Concerns about "format fit" are also present. This refers to owners' perceptions that self-ordering reduces interpersonal warmth and clarity for customised orders. Lin et al. (2023) further explain that low-touch interactions can hinder empathy and are not always superior to traditional paper-based systems.

Additionally, Figure 6 presents the results of restaurant owners' responses to the question "How important are the following factors to you when deciding whether to adopt such

technology?" For restaurant owners, the two highest-priority factors are ease of use and staff training, and the availability of technical support. This may suggest that a universal application would need to minimise training load (high perceived ease of use) and include reliable, SLA-grade technical assistance (Helal, 2023). The strong emphasis on the POS system reflects its role as the bridge between FoH and BoH operations, and the fact that weak connectivity with the POS system can lead to operational risks, especially during peak hours (Alt, 2021; Roy et al., 2022).

Figure 6: Factors influencing adoption of a universal ordering app



Source: Own work.

4.1.3 Desired functionalities of a universal ordering system

Table 7: Desired functionalities of a universal ordering system

Person	Desired functionality	Representative quote
ID1	- Allergen-safe ordering with instant staff escalation (allergen flags + "call a waiter/ask a chef") - Promotions module (deals, vouchers) - SLA-based device swap and technical support (referring to restaurant-owned devices) - Legally compliant, always available QR menu with visible prices	"Customers with allergies… require direct interaction with waitstaff… even if allergens are listed, there can still be hidden ingredients, like gluten in certain spices." "Customers generally accept any app as long as it offers good deals and promotions." "When a device malfunctions, you wait two weeks for a replacement… during those two weeks, the service isn't operational." "According to local regulations, the menu must always be accessible… If we fail to provide either a physical or QR menu… we risk penalties."
ID2	- Available customisation of orders - Multilingual menu translation - e-receipts with fiscal QR verification	"Many of our customers customise their orders extensively…" "The app could translate menus into their native languages." "QR codes on receipts, enabling customers to verify the validity of their receipts."
ID3	- Click-and-collect - Explicit tipping step - Workflow for customised orders (attachments, colour/style specifications, pro-forma approval before production)	"Click and collect… where customers can order, pay through the app, and pick up at the location." "QR codes on tables might be practical, but servers might lose potential tips." "Custom birthday cakes… processed through email to avoid misunderstandings… prepayments based on a pro-forma invoice."
ID4	- In-app customer service/help - Speed-optimised flow (few steps from browse to pay) - QR order and pay at table with POS link - Guided choices (suggested combos/upsells for unsure guests)	"Good customer service within the app is crucial for me." "We don't yet offer the option to order or pay directly via QR code, but we would like to implement something like that." "The main functionality I would expect is speeding up the entire process… allowing customers to place orders faster and reducing preparation time." "Customers often need guidance in their choices… prefer to be guided by staff."

table continues

continued *Table 7: Desired functionalities of a universal ordering system*

Person	Desired functionality	Representative quote
ID5	- Guest checkout (no forced account creation) - Instant POS sync / single-entry menus (add once, live everywhere) - Rich product visuals (clear photos in menu) - Automated invoicing, direct submission to FURS B2B supplier ordering inside the same app	"People must create an account… some customers find it inconvenient." "Quick integration… when we add a new product, we want a simple and immediate update." "Visually, the application should be attractive, clear, and easy to navigate, including appealing photographs." "It would be beneficial if the application… allowed invoices to be sent directly to FURS and automatically recorded… partners could order supplies directly."

Source: Own work.

From the interview data, the findings can be summarised into six reasons that help answer the question: Why has digital ordering not become a widespread standard in the restaurant and café sector?

1) Uneven digitalisation

Managers emphasised that they make much greater use of FoH technologies (QR order/pay and delivery apps) compared to BoH systems (cash register integrations, inventory modules, and extensive supplier emailing). This aligns with Alt (2021), who positions the POS at the "line of visibility", connecting all customer-facing actions with the back-end processes (kitchen tickets, inventory, staffing, and accounting). This imbalance may explain why digital ordering remains one of several possible solutions rather than becoming an industry standard.

2) Reliability & support

Restaurant managers expressed serious concerns about device failures, slow replacements, and platform outages cascading during peak hours. Schalow (2025) points out that a loss of internet connection can cause the POS system to crash, disable card payments, interrupt advance ordering, and ultimately affect customer loyalty. All of this creates a high degree of system fragility, as the infrastructure is inherently cloud-dependent. This may help explain why digital ordering has not yet become a standard: for it to become one, managers must be able to implement SLA-based arrangements that ensure quick device replacement and responsive technical support.

3) Integration & single-entry updates

As one of the greatest values in a universal ordering app, managers most often mention the "single-entry" feature, meaning that guests can use the app without creating a user account,

while the system ensures instant POS synchronisation, business invoicing, and even B2B ordering within the same ecosystem. Alt (2021) refers to this when identifying 14 FoH and BoH areas in a restaurant, noting that the POS acts as the integrator that enables every change to take effect across the entire system. As long as such an operational burden exists, it effectively blocks standardisation.

4) Peak-load fragility

When a restaurant gets busy, the queue does not always move in a straight, predictable way. Even a small delay can cause a slowdown that may lower the restaurant's perceived quality. Roy et al. (2022) explain that customer arrivals and queues directly affect both customers and staff. They note that when a restaurant uses a POS or KDS system, it can detect bottlenecks, control the flow of orders, and provide more accurate waiting times. However, many independent restaurants do not have connected FoH and BoH systems, which is why the real return on investment from digital-first ordering remains unclear in practice.

5) Platform dependence & delivery overload

Managers reported that delivery spikes, shortages of delivery staff, and limited platform support negatively affect both ratings and revenue, and that recovery from integration failures with these platforms tends to be slow. In addition, Alt (2021) emphasises that restaurants operate within platform or network markets, where the value of the service changes along with the platform and its quality. Without reliable, two-way integration, restaurants bear a significant risk.

6) Adoption is useful but conditional

Finally, managers generally agree that adopting such a universal system would be beneficial, but only if it is easy to use, trustworthy, and a good fit for their operations. This is also discussed by Mozeik et al. (2009), who state that the key prerequisites for mobile adoption are ease of use, usefulness, design, information quality, and privacy. This may represent one of the reasons why digital ordering has not yet become a standard and will not become one until process flows become effortless, trustworthy, well-integrated, and format-fit.

4.2 Findings from customer survey on digital ordering preferences

I conducted a survey in May 2025 to better understand customer habits and attitudes toward digital ordering. I designed the questionnaire using Google Forms and shared it online through social media platforms, like Instagram, Viber, LinkedIn and WhatsApp. I chose this approach with the aim of reaching as widest as possible range of people across different age groups with different dining habits (see Table 8).

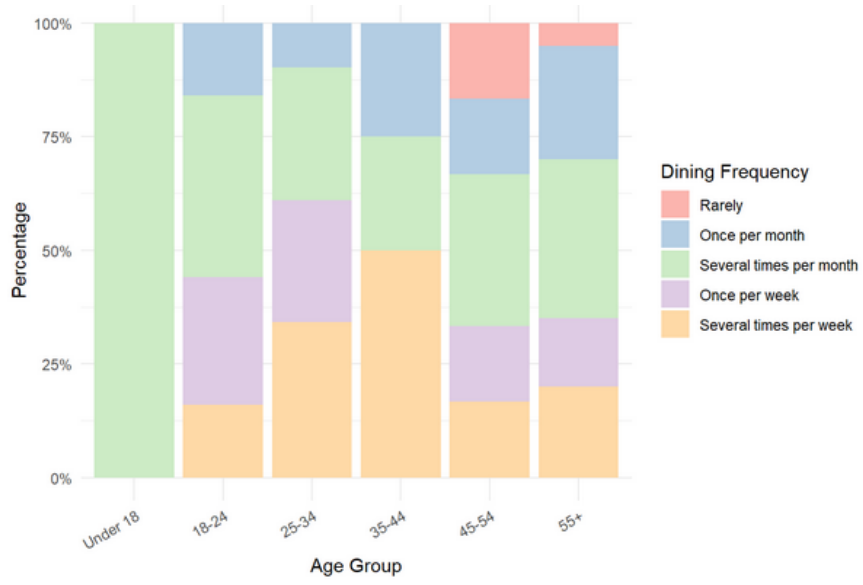
Table 8: Sample characteristics (N=97)

Category	Group	Count	Percentage
Age group	Under 18	1	1.0%
	18-24	25	25.8%
	25-34	41	42.3%
	35-44	3	3.1%
	45-54	5	5.2%
	55+	20	20.6%
Outdoor dining frequency	Several times per week	25	25.8%
	Once per week	22	22.7%
	Several times per month	33	34.0%
	Once per month	15	15.5%
	Rarely	2	2.1%
Used mobile app to order food/drinks	Yes	78	80.4%
	No	19	19.6%

Source: Own work.

The survey showed that the younger population, specifically people up to the age of 34, visit restaurants more frequently compared to other groups (Figure 7). The most active group is between the ages of 25 and 34. The survey also indicates that as age increases, the frequency of visits decreases, especially after the age of 45. In the context of a universal ordering application, this finding can help define which age groups are most frequently present in restaurants where digital tools would be utilised. Mozeik et al. (2009) support this view, explaining that when large segments, such as older generations or those who visit restaurants less frequently, rarely interact with digital ordering, they do not develop the habit of using it. Therefore, this can represent one of the barriers preventing digital ordering from becoming a standard practice.

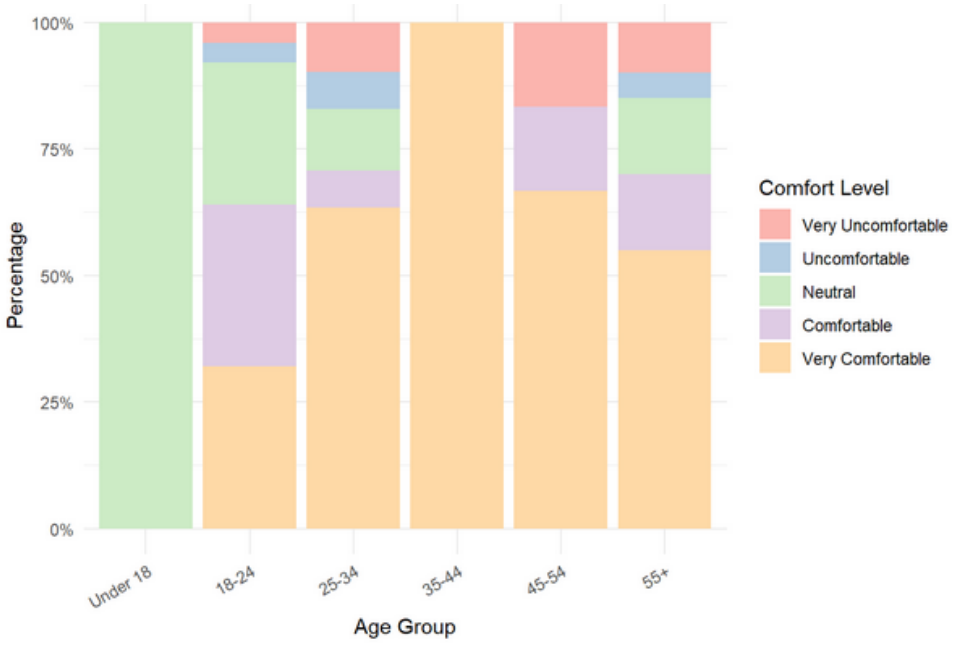
Figure 7: Dining frequency by age group



Source: Own work.

In response to the question “How comfortable do you feel using mobile apps to make payments (for example, mobile banking, Google Pay, Apple Pay)?”, the survey results showed that older generations are generally less comfortable using mobile applications for payment purposes. Approximately 41% of respondents older than 55 years reported being less comfortable with mobile payment systems. Similarly, approximately 36% of respondents aged 25-34 expressed some level of discomfort. Users who feel most comfortable are between 35 and 44 years old (Figure 8). Because payment tasks are high-frequency, utilitarian and typically associated with trusted banks, older users may tend to put less effort and perceive lower risk completing these types of activities (Helal, 2023; Silvestre et al., 2025).

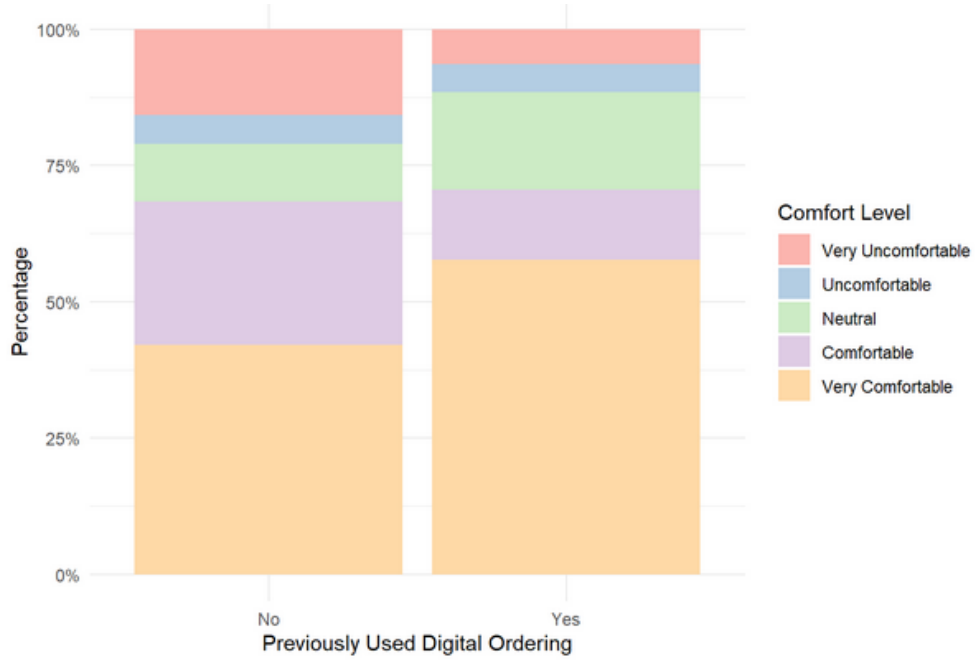
Figure 8: Comfort with using payment apps by age group



Source: Own work.

Figure 9 shows how respondents answered the question “Have you ever used a mobile app to order food or drinks in a restaurant or café?”, together with their level of comfort when using apps for payment purposes. Based on this, it can be concluded that the level of confidence in using payment applications is higher among respondents who have previous experience with digital ordering systems in restaurants. In the context of Figures 6 and 8, Mozeik et al. (2009) also support this finding, describing it as a learning effect consistent with the Technology Acceptance Model (TAM). They note that ease of use is the primary driver of mobile adoption, and that comfort increases with continued use.

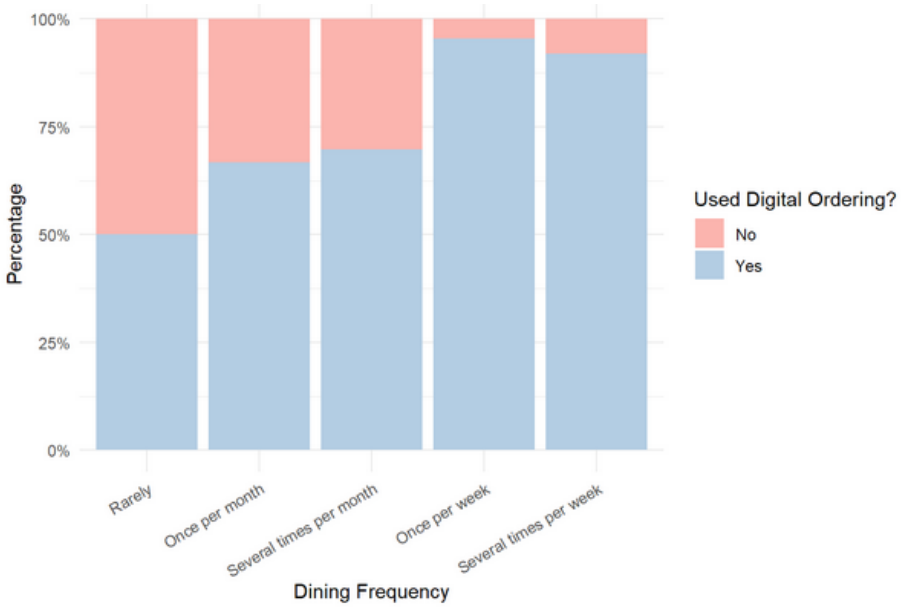
Figure 9: Comfort with payment apps by previous digital ordering experience



Source: Own work.

The survey also showed that digital ordering is more common among people who dine out more frequently. Most respondents who said they had previously used a digital application to order in a restaurant reported eating there at least once or several times a week. In contrast, respondents who dine out less often were found to have significantly less interaction with such ordering systems (Figure 10). The research of Silvestre et al. (2025) also showed that visit frequency acts as a moderator in the adoption of digital menu systems: guests who visit restaurants more frequently are more familiar with the setting and are therefore more likely to adopt and continue using digital tools. Similarly, Roy et al. (2020) treat visit recency and number of visits as core predictors of customer behaviour, noting that those who visit restaurants more often develop different expectations and habits compared to those who dine out less frequently. This may help explain why standardising digital ordering is difficult in low-frequency contexts such as tourist destinations or fine-dining venues, where audiences do not develop comfort and consistent adoption through repeated exposure.

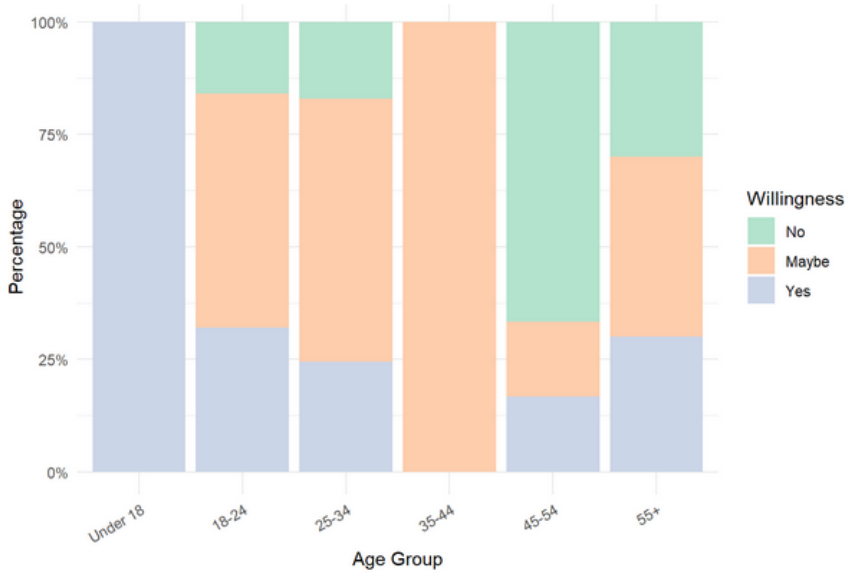
Figure 10: Previous digital ordering experience by dining frequency



Source: Own work.

When asked "Would you be willing to use a universal app for ordering and paying in restaurants or cafés if it were available, even if it required a €1 monthly subscription?", the most sceptical group comprises people aged 45-54, with more than 50% responding "No", while those aged 35-44 appear to be the most uncertain (Figure 11). Silvestre et al. (2025) support this finding, stating that visible prices shape consumer purchase behaviour and explaining that any extra, noticeable charge, such as a subscription fee, is likely to discourage usage.

Figure 11: Willingness to use universal app by age group

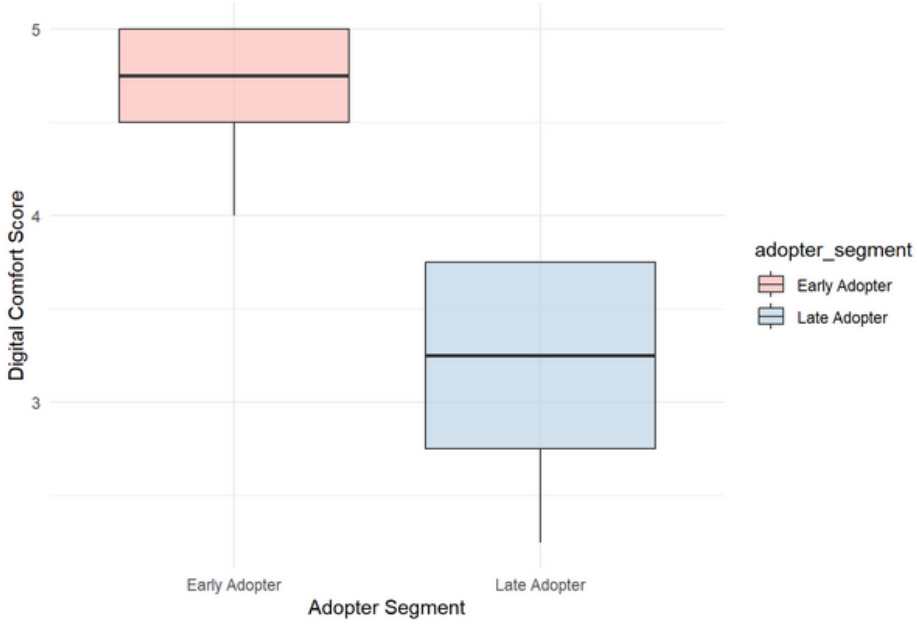


Source: Own work.

4.3 Key findings and implications

Survey respondents were divided into Early and Late adopters. Figure 12 shows that respondents categorised as Early Adopters consistently reported a higher comfort score, indicating greater familiarity and ease with using mobile technologies. In contrast, Late Adopters reported a significantly lower comfort score, a broader spread of responses, and lower median values. This divergence supports the segmentation of respondents based on their average Digital Comfort Score.

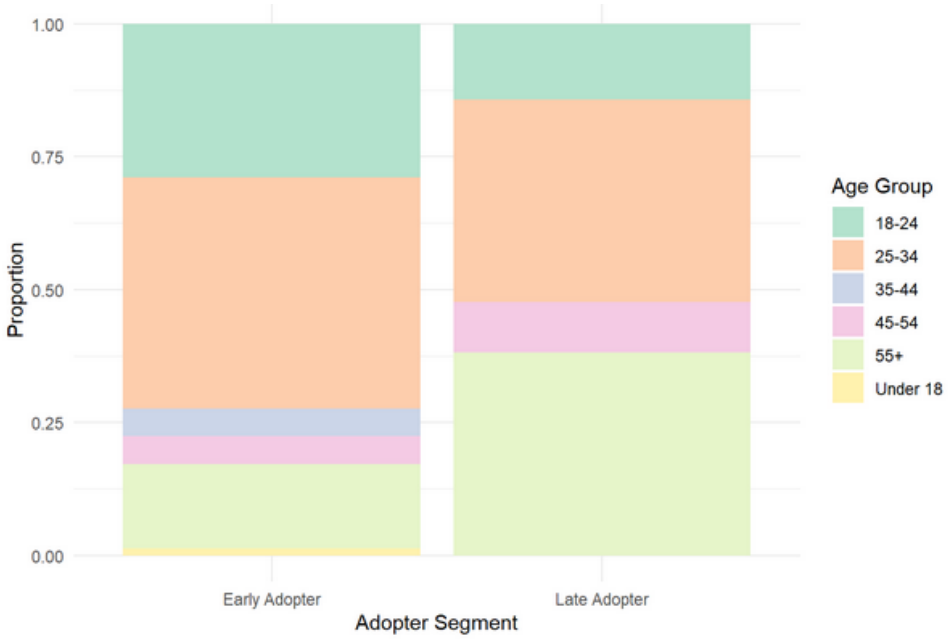
Figure 12: Digital comfort score by adopter segment



Source: Own work.

When examining the two adopter groups, one notable observation is the age-related divide between these segments. As shown in Figure 13, Early Adopters are primarily concentrated within the 18-34 age range, while Late Adopters are more prevalent among respondents aged 45 and above. This generational trend supports the finding that age may be one of the key factors influencing both digital comfort and openness to new technologies. This finding may help explain why digital ordering has not yet become the norm. Supporting this idea, Silvestre et al. (2025) identify demographics as a moderator of adoption, noting that younger and more frequent diners tend to build habits and expect digital touchpoints, while older or less frequent diners generally do not.

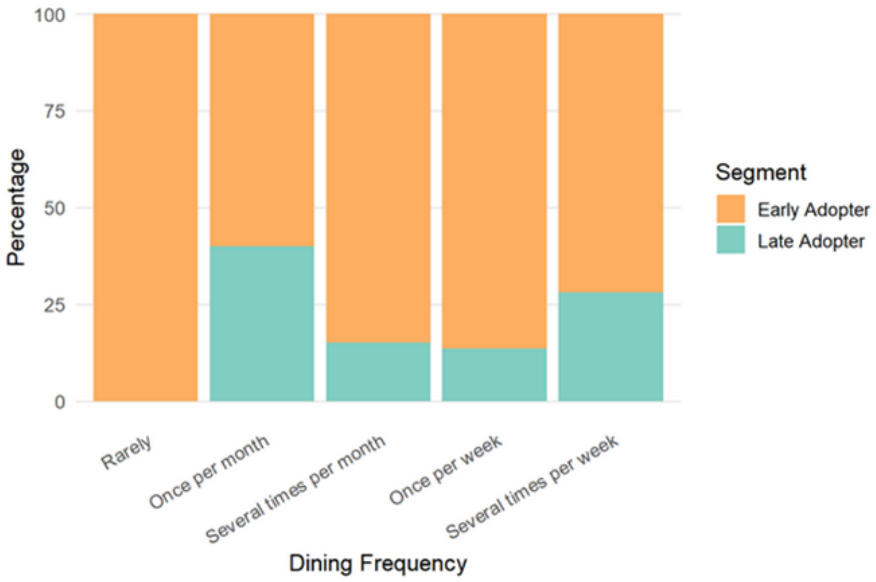
Figure 13: Age distribution across adopter segments



Source: Own work.

For the question "How often do you dine at restaurants or cafés?", the responses varied between Early and Late Adopters. As shown in Figure 14, Early Adopters are represented across all categories of dining frequency, but are especially concentrated in the group that dines out most frequently. In contrast, Late Adopters mainly comprise the group that dines at restaurants less regularly. This finding may provide an answer to the research question of the thesis. The reason might lie in the fact that dining frequency, and consequently digital familiarity, are uneven across the market. Many types of restaurants, such as tourist-oriented, special-occasion, or fine-dining establishments, may have a large number of guests, but those guests are low-frequency visitors per year. Therefore, they do not create enough demand pull for restaurants to introduce digital ordering as a standard practice (Silvestre et al., 2025; Roy et al., 2022; Mozeik et al., 2009). From this, it can be concluded that standardisation may stall when usage is not habitual.

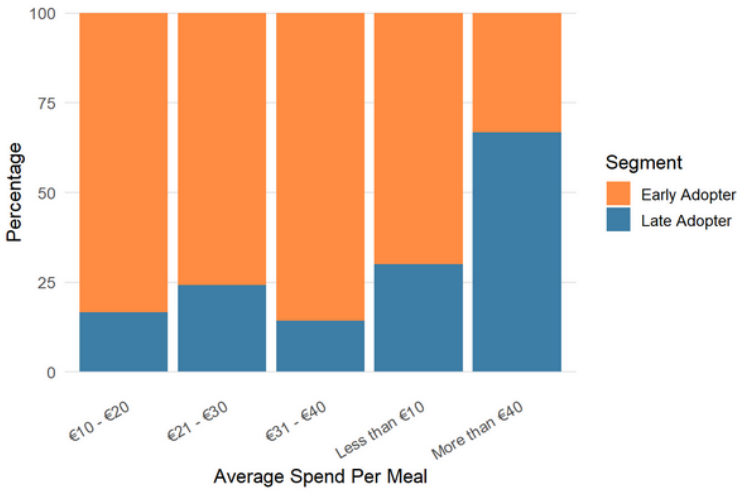
Figure 14: Dining frequency by adopter segment



Source: Own work.

Regarding the average spending per person for a single meal, it was found that Late Adopters tend to have a higher spending level, particularly in the category of those who typically spend over €40. In contrast, Early Adopters dominate the middle-range spending category (Figure 15). In the context of answering the research question, this market heterogeneity may weaken the demand pressure for establishing a universal ordering standard. Spending level may affect the type of dining people choose. People who spend more money in a restaurant may prefer more personal service and therefore see little benefit in using digital ordering. In contrast, there is a segment with clear app-related benefits, namely mid-spend, convenience-driven customers (Chua et al., 2020; Kapoor & Vij, 2018; Roy et al., 2022).

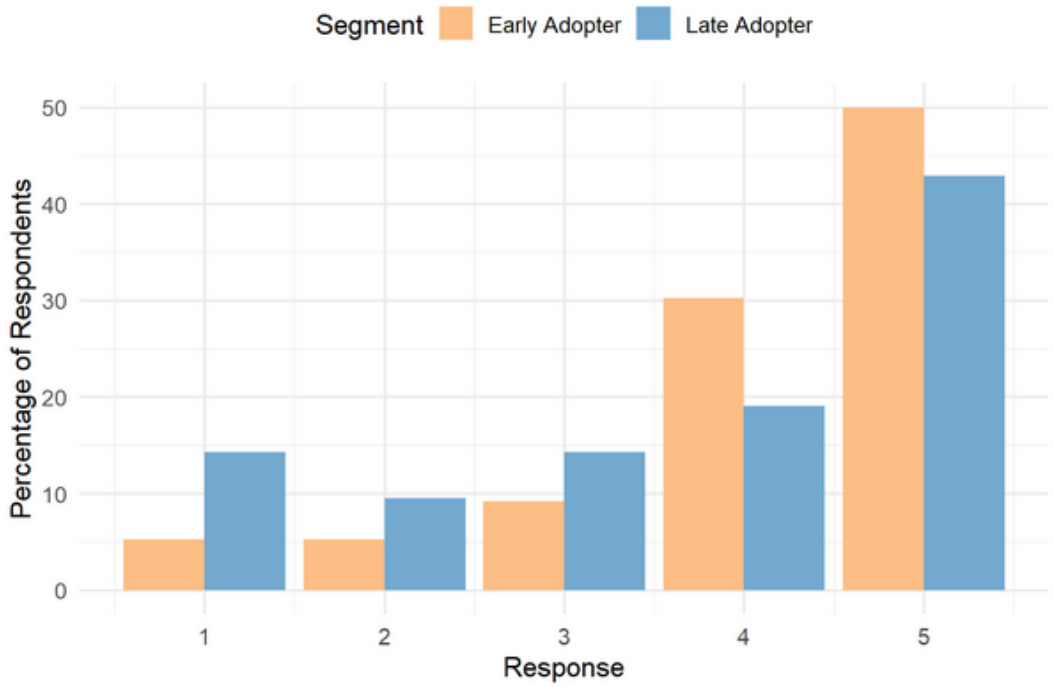
Figure 15: Spending levels by adopter segment



Source: Own work.

One of the main motivations of this research was to understand whether potential customers would see value in a unified mobile application for restaurants that would allow them to order and pay across all restaurants and cafés. When asked "How useful would it be for you to have one single app that works in all restaurants and cafés?", respondents who felt more confident using digital tools, the Early Adopters, responded more positively compared to the Late Adopters (Figure 16). This finding shows that perceived usefulness appears to be concentrated among digitally confident individuals, while Late Adopters tended to give more neutral responses. This is consistent with evidence that digital menus and applications are closely linked to perceived usefulness and ease of use, and that these factors are unevenly distributed across user groups (Silvestre et al., 2025). Furthermore, this skew has also been noted in empirical studies, where the active user base, mostly composed of tech-savvy young adults and students, tends to dominate compared to older or less frequent diners, who may not perceive the same benefits (Al-Qadhi et al., 2024; Sam et al., 2023).

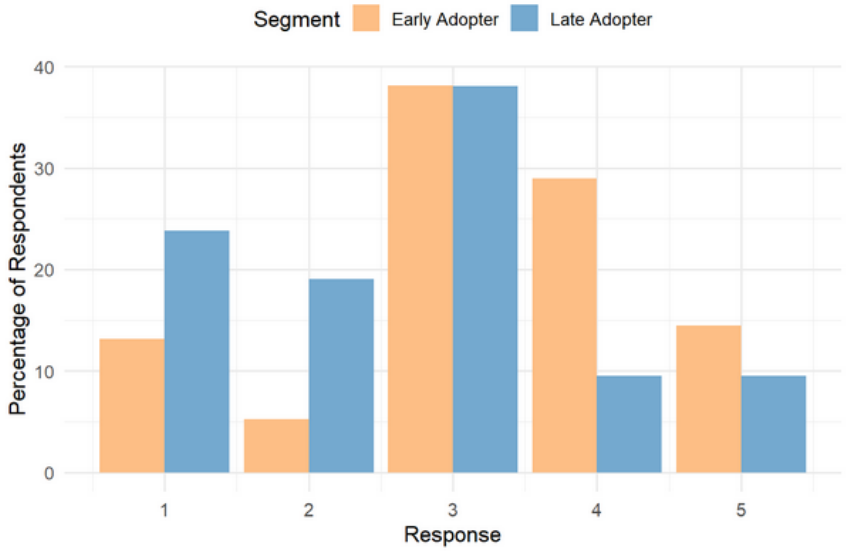
Figure 16: Perceived usefulness of a unified app by adopter segment



Source: Own work.

The results for the question "How important would ordering through a unified app be for you?" were similar. Although both groups gave moderate responses overall, the Early Adopters again responded more positively. This finding, shown in Figure 17, is supported by models demonstrating that technical readiness enhances both perceived ease of use and perceived usefulness, which in turn increases the perceived value of restaurant technologies among digitally confident users (Helal, 2023).

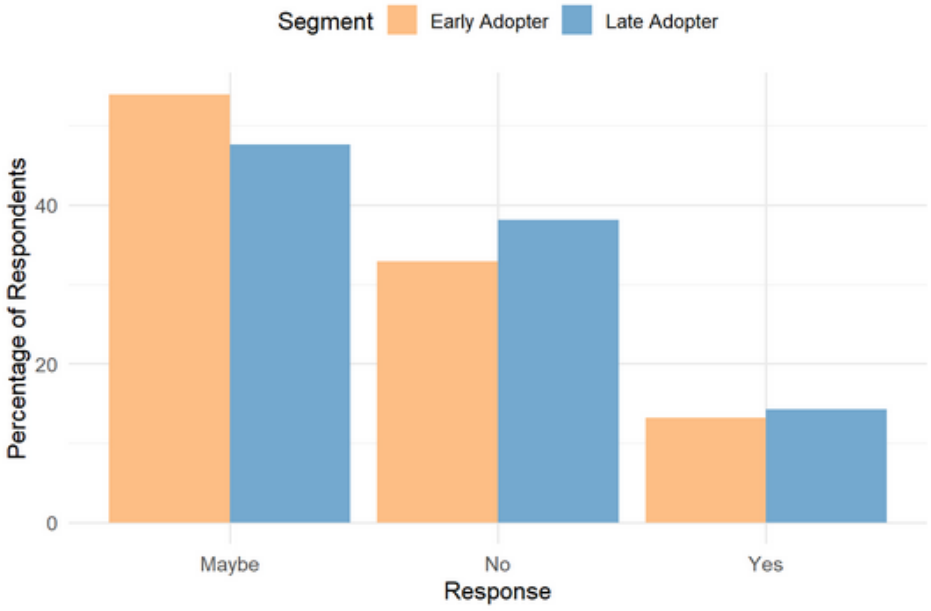
Figure 17: Perceived importance of a unified app by adopter segment



Source: Own work.

When asked "Would having access to a universal ordering and payment app make you more likely to dine out at restaurants in general?", the majority of respondents answered "Maybe". A unified app is thus unlikely to meaningfully increase dining frequency. In practice, restaurants aim to improve process efficiency and enhance perceived value for guests who are already digitally confident, rather than to create new visits themselves (Helal, 2023). Therefore, if a unified app does not increase the number of visits, demand pull for a universal standard may remain weak (Figure 18).

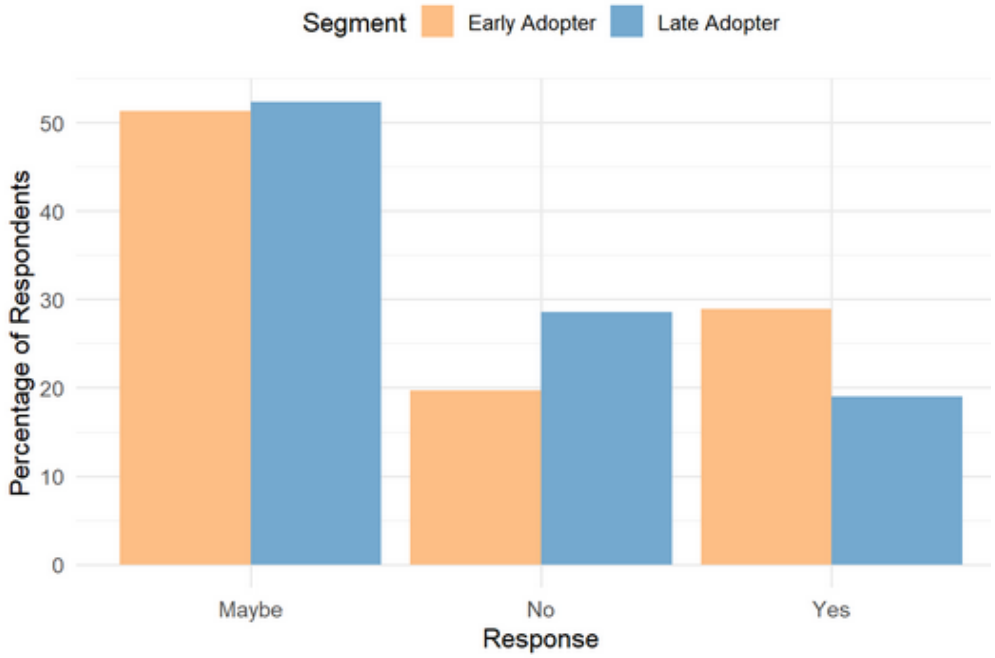
Figure 18: Impact on dining habits by adopter segment



Source: Own work.

Both Early and Late Adopters showed uncertainty about paying a monthly fee of €1. When asked "Would you be willing to use a universal app for ordering and paying in restaurants or cafés if it were available, even if it required a €1 monthly subscription?", the majority of respondents again answered "Maybe". However, Early Adopters were slightly more open to the idea of paying a €1 subscription per month compared to Late Adopters (Figure 19). Because most respondents answered "Maybe", a €1 per month fee may introduce a salient price friction. Supporting this, a restaurant choice study shows that price is the most influential criterion in dining decisions. Therefore, an added subscription would likely considerably reduce adoption. In the context of the research question, the standardisation and introduction of a universal ordering application might therefore require a freemium model.

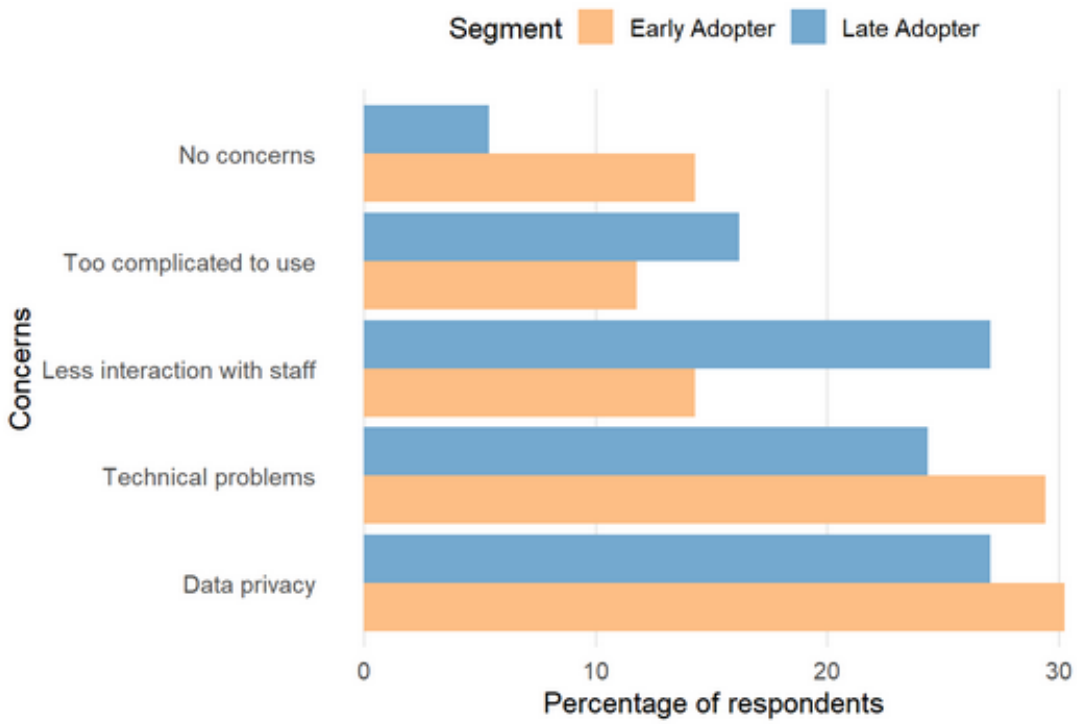
Figure 19: Willingness to pay by adopter segment



Source: Own work.

Concerns regarding the use of a universal ordering and payment application in restaurants were rated differently between the two groups (Figure 20). Late Adopters were more concerned about the potential loss of face-to-face interaction and a complicated interface. In contrast, Early Adopters expressed significantly greater concern about technical issues and data privacy. It is also important to highlight that Early Adopters were more likely to say they had "no concerns". This finding suggests that digital comfort may reduce hesitation toward using a unified app, but does not eliminate it completely.

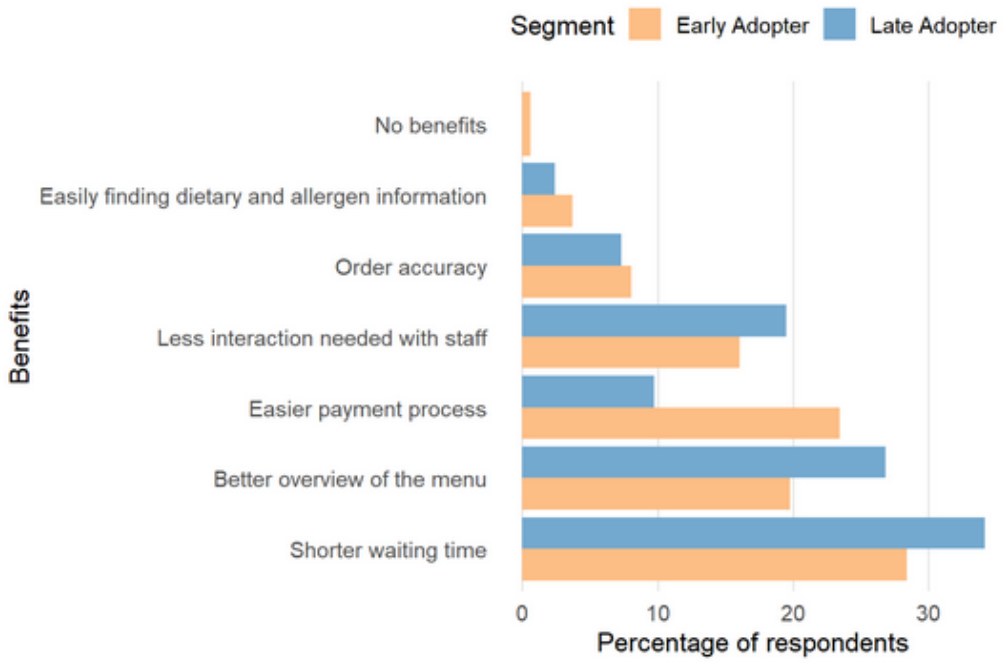
Figure 20: Concerns about using a universal app by adopter segment



Source: Own work.

The results of the survey on benefits and adoption factors among individuals who visit restaurants are presented in Figure 21. The findings show that perceived benefits may mean different things to different users. People who are less familiar with technology tend to value tangible and low-risk gains, such as shorter waiting times and clearer menus. More experienced mobile app users focus more on streamlined processes. They emphasise easier payments, higher order accuracy, and quick access to allergen or dietary information. From this perspective, one of the reasons why a universal ordering application still does not exist is that there is no single, universally compelling value proposition. Different user segments value different benefits, and for that reason, operators may continue to maintain parallel paths (human-led and digital), instead of converging towards a one-size-fits-all standard.

Figure 21: Perceived benefits of digital ordering by adopter segment



Source: Own work.

4.4 Limitations

Although this research provides valuable insights into the potential adoption of a universal ordering application in restaurants and cafés, several limitations should be acknowledged.

First, the interviews included five restaurant owners and managers. Although the selection covered restaurants of different sizes, concepts, and years in operation, the findings cannot be said to represent the entire restaurant sector. Additionally, the thesis is limited to establishments in Ljubljana, which may not reflect the conditions, challenges, and attitudes present in other regions or countries.

Second, the survey was conducted via social media, which means that a convenience sampling method was used. As a result, responses may be biased toward a younger, more technologically literate and active population, over-representing those already comfortable with mobile applications. Furthermore, the survey measured self-reported intentions and preferences, which may not necessarily correspond to actual behaviour in real-world settings. Bilynets et al. (2024), for example, showed that once users are asked to pay for a virtual experience, participation rates drop significantly and strong behavioural intentions are not good predictors of actual behaviour.

Third, the research focused on perceptions and attitudes rather than on conducting a practical test of a universal ordering solution. Consequently, the results represent perceived benefits

and concerns, but they cannot fully demonstrate how such a system would perform in practice.

5 CONCLUSION

This thesis has shown that digital ordering has not become the norm because it is difficult to create a standard solution that fits all restaurant types and all customer groups. On the demand side, usefulness and ease of use are perceived differently among guests. Younger individuals, who visit restaurants more frequently, reported feeling more comfortable and seeing greater added value in a universal ordering application, compared with older individuals who dine out less often (Silvestre et al., 2025; Mozeik et al., 2009).

The survey results illustrate this user segmentation, showing that younger people and those who eat out more often tend to feel more comfortable using mobile apps, which influences how they perceive a universal ordering system. The interviews with restaurant owners, in turn, explain the underlying causes of guest behaviour. Guests seek low-friction flows (self-checkout, translations, and guided choices) and clear privacy assurances. On the supply side, there are still many independent, POS-centred integration problems, along with concerns about SLA-grade reliability (device replacement and offline alternatives), which must be addressed in order for a universal ordering app to succeed. As a result, the operational risk associated with introducing a universal application remains noticeable (Alt, 2021; Roy et al., 2022). Moreover, even a €1 monthly subscription reduces intention to use among price-sensitive categories.

This thesis fills the existing research gap by explaining that the adoption of digital ordering solutions is not solely a user issue (as framed by TAM/UTAUT) or an integration issue, but rather a problem of heterogeneous demand and supply frictions operating in parallel. This issue can therefore be operationalised as a bundle of conditions required for achieving “digital by default”. This helps explain why strong pilot projects exist, yet industry-wide convergence does not (Silvestre et al., 2025; Roy et al., 2022; Alt, 2021).

5.1 Managerial implications

Throughout the thesis, it has been shown that digital ordering has not become a universal norm because its adoption depends on a bundle of conditions that rarely co-exist. Some of these conditions include a frictionless, low-effort user experience for Late Adopters, reliable systems that do not fail during peak hours, POS-centred integration enabling an “add once and live everywhere” functionality, trust and privacy transparency, and pricing that does not create friction. In practice, managers can turn these findings into actionable decisions. By implementing these elements, they can increase the digital share of their operations while still preserving the essence of hospitality.

i. Integrate around the POS (single-entry truth)

Managers should position the POS system as the central hub that synchronises menus, prices, KDS updates, inventory, delivery platforms, and receipts. This integration has the potential to reduce error rates and support the creation of an "add once and live everywhere" system.

ii. Design for effortless use

The design of a universal ordering application should be simple and intuitive, incorporating a guest-checkout option so that customers are not required to create an account. Ideally, it should take only three to five clicks for users to view menu images and descriptions, see allergen flags, access a "Call staff" button, and complete payment.

iii. Peak-time reliability

Restaurant managers should define in advance how they expect the SLA-based device swap process to work, whether they require an offline mode, how on-site troubleshooting will be handled, and who will be responsible for each specific issue. In other words, they need to establish a "peak incident" SOP, clearly outlining roles, communication flows, and recovery protocols during high-demand periods.

5.2 Further research

Future research should expand sampling beyond Ljubljana to other types of restaurants, such as QSR (Quick Service Restaurants), coffee shops, and fine-dining establishments, in order to improve the generalisability of the findings. It should also employ longitudinal, field-experimental, or quasi-experimental research designs (e.g. staged rollouts, A/B tests, or interrupted time-series designs) to strengthen the identification of causal relationships. Moreover, surveys combined with behavioural data, mobile app logs, and observational time-use studies would be useful to help mitigate self-reporting bias.

In addition, the Digital Comfort Score could be refined and tested using confirmatory factor analysis (CFA) and item response theory (IRT), along with reliability analysis and measurement invariance tests (across age, gender, and experience with technology), as the current findings depend on a single cut-off. Future multi-stakeholder investigations should examine staff perspectives and explore moderators of the benefits associated with their adoption of a universal ordering application.

Finally, future research should evaluate adoption using hard outcomes (such as wait time, table turnover, basket size, tip amount, and revisit intention) and examine cost-benefit trade-offs and accessibility.

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APPENDICES

Appendix 1: Survey questionnaire

Dear participant,

My name is Marina Gligorić and I am a Master's student researching digital transformation in the restaurant industry. This survey wants to understand how customers feel about using mobile apps for ordering and paying in restaurants and cafes. Your answers are anonymous and will be used for academic purposes only.

If you have any questions or comments, please feel free to contact me at XXXX.

Thank you for your time and input!

Q1: How often do you dine at restaurants or cafes?

- o Several times per week
- o Once per week
- o Several times per month
- o Once per month
- o Rarely

Q2: What age group do you belong to?

- o Under 18
- o 18–24
- o 25–34
- o 35–44
- o 45–54
- o 55+

Q3: With whom do you usually dine out? (Select all that apply)

- ☐ Alone
- ☐ With one friend or partner
- ☐ With several friends
- ☐ With family
- ☐ With colleagues

Q4: On average, how much do you typically spend per person on a single meal when dining out (lunch or dinner)?

- o Less than €10
- o €10–€20
- o €21–€30
- o €31–€40
- o More than €40

Q5: What type of dining establishments do you usually visit? (Select all that apply)

- ☐ Fast food restaurants
- ☐ Casual dining restaurants
- ☐ Cafés or coffee shops
- ☐ Fine dining establishments
- ☐ Takeaway or food stands
- ☐ Other: _____

Q6: How comfortable do you feel using mobile apps to find information (such as Google searches, checking the weather, or reading the news)?

Not comfortable at all 1 2 3 4 5 Very comfortable

Q7: How comfortable do you feel using mobile apps to communicate with other people (for example, WhatsApp, Messenger, Instagram)?

Not comfortable at all 1 2 3 4 5 Very comfortable

Q8: How comfortable are you ordering products or services online using mobile apps (such as ordering food, shopping for clothes, or buying event tickets)?

Not comfortable at all 1 2 3 4 5 Very comfortable

Q9: How comfortable do you feel using mobile apps to make payments (for example, mobile banking, Google Pay, Apple Pay)?

Not comfortable at all 1 2 3 4 5 Very comfortable

Q10: How comfortable do you feel using mobile apps for entertainment purposes (such as streaming videos, listening to music, or playing games)?

Not comfortable at all 1 2 3 4 5 Very comfortable

Q11: Have you ever used a mobile app to order food or drinks in a restaurant or cafe?

- o Yes
- o No

Q12: If yes, how would you rate your experience?

Very bad 1 2 3 4 5 Excellent

Q13: What benefits did you notice when using a digital ordering app?

- ☐ Shorter waiting time
- ☐ Easier payment process
- ☐ Less interaction needed with staff
- ☐ Better overview of the menu
- ☐ Easily finding dietary and allergen information
- ☐ Order accuracy
- ☐ Other: _____

Q14: Did you experience any problems with digital ordering?

_____

Q15: How useful would it be for you to have one single app that works in all restaurants and cafes?

Not useful at all 1 2 3 4 5 Extremely useful

Q16: How important would ordering through unified app be for you?

Not important at all 1 2 3 4 5 Extremely important

Q17: Would having access to a universal ordering and payment app make you more likely to dine out at restaurants in general?

- o Yes
- o Maybe
- o No

Q18: What concerns would you have about using such an app?

- ☐ Data privacy
- ☐ Technical problems
- ☐ Less interaction with staff
- ☐ Too complicated to use
- ☐ No concerns

Q19: Would you be willing to use a universal app for ordering and paying in restaurants or cafes if it were available, even if it required a €1 monthly subscription?

- o Yes
- o Maybe
- o No

Q20: Any additional comments or suggestions about using a digital ordering app in restaurants or cafes?

_____

Figure 22: Survey questionnaire on digital ordering in restaurants and cafés

Source: Google Forms, 2025.

Appendix 2: Interview guide for restaurant and café owners

[If needed] Hello! My name is Marina Gligorić. Thank you so much for taking the time to talk with me today. Before we begin, I'd like to briefly explain what we'll be doing during this interview.

I'm currently completing my master's degree in Business Informatics at the School of Economics and Business, University of Ljubljana. My thesis focuses on the digital transformation in restaurants and cafés—specifically, exploring restaurant owners' and managers' willingness to adopt a universal digital ordering and payment application.

In this interview, I'd like to hear your perspectives about the challenges you face in daily operations, your experiences with digital tools, and your thoughts on introducing such digital ordering solutions in your establishment. There are a few main questions, each with some follow-up questions. The interview will take approximately 20–30 minutes. Feel free to speak openly—there are no right or wrong answers. I'm interested in your honest views, experiences, and the challenges you face.

I will record this interview to assist me in accurately transcribing your responses. Once transcription is complete, the audio recordings will be deleted. All transcripts will be anonymized, and no personally identifiable information will be included in the final document. You may choose to stop this interview or skip any question at any time without consequence.

Do you have any questions before we begin?

Great! If you agree, I'll now start recording and we'll begin with the first question.

1. Background Information

6. Could you briefly describe your restaurant/café? (Type, size, location, target customers, cuisine type.)
7. How long have you been operating this business?
8. How would you describe your current use of technology in daily operations?

2. Current Operational Challenges

1. What are your main operational challenges during peak hours or busy periods?
2. How do you currently manage orders and payments?
3. What problems, if any, do you experience with your current ordering and payment processes?

3. Experience and Attitude Towards Digital Ordering

1. Have you previously used digital ordering or payment solutions (e.g., QR-code menus, online ordering platforms)?
   - If yes, could you briefly describe your experience?
   - If no, is there a particular reason why you haven't adopted such solutions?
2. How do you feel about customers placing orders and paying directly via their smartphones?
3. In your opinion, why has digital ordering not become standard practice in restaurants?

4. Factors Influencing Adoption of Digital Solutions

1. What specific benefits would motivate you to adopt a universal ordering and payment app for your restaurant?
2. What would your main concerns or hesitations be regarding implementing a digital ordering system?
3. How important are the following factors to you when deciding whether to adopt such technology? (Rate each factor from 1 to 5, where 1 = Not important at all, and 5 = Very important.)
   - Cost of implementation and maintenance
   - Ease of use and staff training
   - Customer acceptance and preference
   - Impact on service quality and customer experience
   - Integration with your existing systems (e.g., POS system)
   - Data security and privacy
   - Availability of technical support and assistance

4. Which of these factors do you consider the biggest barrier to adopting a universal ordering system?

5. Desired Functionalities of a Universal Ordering System

1. If you were to adopt such an app, what key features would you require to ensure it fits your business?
2. Are there any specific functionalities or customization options you believe would be essential for your restaurant?

6. Closing Remarks

1. Is there anything else you would like to add regarding your willingness to adopt a universal ordering and payment system that we haven't covered yet?

Figure 23: Interview script read by interviewer

Highlighted parts are asked verbatim.

Appendix 3: Consent form for research participation

Description: You are invited to participate in a master's thesis research study exploring the potential for digital transformation in restaurants and cafés, focusing specifically on restaurant owners' and managers' willingness to adopt a universal digital ordering and payment system. The purpose of this study is to better understand the operational challenges you face, your experiences with digital technologies, and your perspectives on implementing such digital solutions in your establishment.

Your participation involves engaging in a semi-structured interview, where you will be asked questions regarding your experiences, operational practices, and views about digital ordering applications.

Time involvement: Your participation will take approximately 20-30 minutes.

Risks and benefits: The risks associated with this study are minimal. Participation involves responding to interview questions about your professional experiences and opinions. All collected data will be stored securely, ensuring confidentiality and minimizing any privacy risks. Your identity and responses will remain anonymous in all reports and publications related to this research.

There are no guaranteed direct personal benefits from participating in this study. However, your valuable input may help develop practical digital solutions designed to improve operational efficiency and customer satisfaction in restaurants and cafés.

Participant's rights: Your participation is entirely voluntary. You have the right to withdraw your consent or discontinue participation at any time, without any penalty or negative consequences. You may also refuse to answer any question you feel uncomfortable with.

The results of this study may be presented in master's thesis presentations, academic conferences, or published in academic papers and reports. Your individual privacy will be fully protected, and no personally identifiable information will appear in any public reports or publications.

In line with standard academic practice, data from this study may be shared for future academic research purposes (with all identifying information removed) without additional consent.

Contact information: If you have any questions, concerns, or complaints regarding this research study or your participation, please contact the researcher: XXX

Independent Contact: For additional questions or concerns about this research or your rights as a participant, you may also contact the Faculty Advisor supervising this thesis research at: XXX

Figure 24: Consent form

Appendix 4: Interview request email sent to restaurant and café owners

Subject: Interview Request - Master's Thesis on Digital Ordering in Restaurants and Cafés

Body: Dear [intended participant],

My name is Marina Gligorić, and I am a master's student in Business Informatics at the School of Economics and Business, University of Ljubljana. I am currently working on my master's thesis, which focuses on the digital transformation of restaurants and cafés, particularly the idea of a universal mobile application that would allow guests to order and pay for their meals directly from their table.

As part of my research, I am conducting short interviews with restaurant and café owners or managers to better understand the daily challenges in the hospitality industry, your experience with digital tools, and your opinion on introducing solutions such as digital ordering systems.

The interview would take approximately 20-30 minutes and can be conducted in person, over the phone, or via video call, whichever is most convenient for you. Your insights would be highly valuable for my research, and all information will be treated confidentially and used solely for academic purposes.

To give you a better idea, the interview includes simple and straightforward questions, for example:

- What are the biggest challenges you face during peak hours?
- Have you already used any digital tools in your restaurant (e.g., online reservations, ordering systems, QR codes)?
- What are your thoughts on guests ordering and paying directly via a smartphone app at the table?
- What concerns would you have about using such a system?
- What features would be most useful for you in such an application?

If you would be willing to participate, I would be very grateful for your time and contribution to my research. I look forward to your reply and a suggested time that would be convenient for you.

Thank you very much for your time and consideration.

Figure 25: Recruitment email

Appendix 5: Thematic analysis

Table 9: Keywords to themes mapping

Keyword	Code	Theme	Quote
staff shortage	staffing challenges	reliability & support gaps in technology ecosystem	*„It is increasingly challenging to find reliable staff.“*
technical support	technology unreliability	reliability & support gaps in technology ecosystem	*„When a device malfunctions, you wait two weeks for a replacement...“*
bank fees	financial barriers	financial and operational costs as adoption barriers	*„For a 10 EUR order paid by card, customers pay 10,35 EUR, I get 9,85 EUR - the banks profit from both sides.“*
human interaction	customer interaction & personalization	cultural and experiential value of human service	*„The overall customer experience is defined by the person who serves them...“*
food allergies	customization complexity	customization & complexity of food ordering	*„Customers with allergies require direct interaction with waitstaff...“*
lack of providers	market ecosystem gaps	reliability & support gaps in technology ecosystem	*„The biggest barrier in Slovenia is the lack of providers offering these technologies...“*
promotions	incremental acceptance	evolving customer behaviour and market transition pace	*„Customers generally accept any app as long as it offers good deals and promotions.“*
customization	customization complexity	customization & complexity of food ordering	*„Customers frequently add, remove, or modify ingredients... It’s simpler when they speak.“*

Source: Own work.