Enhancing Food Court Experience Through Design Thinking

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Abstract

Despite widespread digital transformation in the food and beverage service industry, food courts in shopping malls largely remain dependent on conventional, queue-based ordering systems. This results in persistent inefficiencies and a diminished customer experience. This study advances existing research by developing and empirically validating a user-centered digital ordering and cashless payment prototype for food court environments. Food courts remain an underexplored service context compared to standalone restaurants and self-service kiosks. Employing a Design Thinking methodology, this qualitative study integrates empathize stage interviews with usability testing to achieve methodological triangulation. This ensures both experiential depth and design validation. Five Generation Z users in Surabaya participated as actual end users. This addresses a key limitation of prior studies that relied primarily on business owners or designers rather than customers. User insights were synthesized into a Point of View (POV) statement that directly informed ideation and iterative prototyping. The resulting prototype prioritizes visual clarity, intuitive navigation, and accessibility. These features are achieved through image-supported menus, readable typography, adequate color contrast, and icon-based interaction. Testing results indicate that the prototype eliminates physical queuing, while users reported enhanced efficiency and greater satisfaction. The study contributes theoretically by extending the application of Design Thinking to shared-service food court systems. Practically, it offers empirically grounded UI/UX design principles for scalable digital ordering solutions in high-traffic service environments.

Keywords: Customer Experience, Design Thinking, Digital Ordering Systems, Mall Food Court, UX/UI Design.

I. INTRODUCTION

A pujasera, or food court, is a shared dining space with multiple vendors in malls and commercial centers [1]. Food courts attract office workers, families, and tourists, serving as dining spots and socio-commercial hubs. Their popularity stems from strategic locations, accessibility, menu variety, and lower prices than those of standalone restaurants. Despite this popularity, challenges remain in their operational models.

Despite their central role in retail environments, many food courts still use conventional, manual ordering and payment systems. Customers usually queue at each vendor to place orders and complete transactions separately. After ordering, they wait for the food to be prepared and collected. This fragmented process often creates operational inefficiencies, such as long, disorganized queues, uneven crowd distribution, and inconsistent table-number assignments [1]. Consequently, these issues lower customer satisfaction and limit vendors' efficiency. To illustrate these challenges, this study examines such conditions at one of the most popular food courts in Surabaya, the empirical context for this research.

Manual ordering and payment processes in food courts persist, even as digital self-service spreads in other food-service settings, such as fast-food chains and quick-service restaurants. Digital ordering improves transaction speed, reduces queuing, and enhances user experience. However, adoption by multi-vendor food courts remains limited. This gap highlights a need for digital solutions tailored to shared spaces with many vendors and users.

Previous research has explored user-centered UI/UX design in service applications. One used User-Centered Design and Design Thinking to develop a mobile app for shoe repair with a loyalty program [2]. However, their study involved only the business owner as an informant, which limited validation from actual users. Another relevant study [3] employed UCD and Human-Computer Interaction (HCI) principles to design self-service kiosks in fast-food restaurants in Taiwan. While the study contributed valuable conceptual insights, its implementation remained at a low-fidelity stage. Essential interaction features were not fully realized. These included real-time stateful user interfaces, error-recovery mechanisms, and adaptive accessibility support.

Taken together, existing studies exhibit two major limitations. First, many rely on indirect or limited user representation, which weakens the validity of user requirements and design decisions. Second, prior implementations often stop at conceptual or low-fidelity prototypes, leaving the practical usability of the proposed systems underexplored, particularly in complex, multi-vendor food court environments. To address these gaps, this study focuses on designing and evaluating a high-fidelity digital ordering application for food court operations in shopping malls. The objectives are: (1) to identify actual customer needs, preferences, and pain points in ordering and payment; (2) to design a high-fidelity UI/UX prototype optimized for efficient food court ordering, payment, and table identification; and (3) to evaluate the usability and user experience of the prototype through user testing with real patrons.

The novelty of this study lies in three key aspects, with a clear focus on its scope. First, unlike prior research that relied on business owners or designers, this study directly involves actual food court customers as both informants and usability-testing participants, grounding design decisions in authentic user behavior. Second, it is specifically delimited to a multi-vendor food court environment, examining distinct interaction complexities, vendor selection, order aggregation, table identification, and queue management across multiple stalls. Third, the study implements a high-fidelity UI/UX prototype that incorporates real-time interactions, error-recovery flows, and adaptive accessibility features, thereby supporting realistic usability evaluation and direct applicability.

This study contributes to both theory and practice in the following ways. Theoretically, it extends the application of User-Centered Design and Human-Computer Interaction principles to the context of multi-vendor food courts, a setting that remains underexplored in existing UI/UX research. Methodologically, it demonstrates the importance of engaging actual end-users throughout the design and evaluation process, thereby strengthening the validity and reliability of usability findings. Practically, it delivers a high-fidelity UI/UX design for a food court digital ordering system that can serve as a reference model for shopping mall operators and system developers seeking to improve operational efficiency and customer experience.

Digital transformation in services, especially in restaurants and the wider Food and Beverages (FnB) sector, has become a key issue for business leaders. Digital tools and systems in daily operations now change how people live, what they expect, and how they make choices [3]. As a result, technology is widely used in the FnB industry and shapes how services are offered, used, and judged by customers [4]. Building on this shift toward digital operations, electronic service quality (e-service quality or E-SQ) has become more important. E-SQ is consumers' evaluation of the quality of services delivered through digital platforms [4]. Traditional service quality mainly focuses on interpersonal interactions and physical settings. E-SQ includes technological aspects like system reliability, responsiveness, ease of use, and information quality. Key factors shaping user perception include technological readiness, customer segmentation, perceived usefulness, convenience, and trust in digital systems [5]. For example, QR-based menus demonstrate how digital service applications improve perceived service quality by speeding up ordering, reducing waiting times, and enhancing satisfaction. E-customer satisfaction is closely related to e-service quality and is critical to the success of digital and online services [6]. E-satisfaction measures how well digital restaurant services, such as websites, apps, and online ordering, meet or exceed initial expectations. In digital environments, satisfaction occurs when the perceived performance of online products and services exceeds expectations. E-satisfaction is typically measured by comparing post-usage experience with pre-usage expectations. This makes it a key indicator of system effectiveness and long-term user acceptance [7].

User interface (UI) design shapes how effectively users interact with digital systems. As the main point of contact, the UI determines usability and user experience by guiding users to access information, perform actions, and achieve their goals efficiently. Its impact relies on the deliberate integration of visual and interactive elements such as imagery, typography, color schemes, layout, and button design [8], [9]. Before prototyping, designers must clearly define the UI's purpose and visual palette to promote coherence and consistency during development [10]. A well-organized, visually clear UI allows intuitive navigation, reduces cognitive load, and helps users complete tasks with minimal confusion. Beyond the interface, user experience (UX) covers users' perceptions, emotions, and responses during interactions with a digital product or service [11]. In this context, usability is a core part of UX and is especially important when evaluating digital service systems [12]. Specifically, usability shows how well users can achieve their goals effectively, efficiently, and with satisfaction. It is typically measured in four ways: learnability, which shows how easily users can start using the system; efficiency, which measures how quickly tasks can be completed after becoming familiar with the interface; satisfaction, which describes users' comfort and positive impressions; and effectiveness, or the degree of success in completing intended tasks [12].

The layout design was grounded in Human-Computer Interaction (HCI) principles, particularly Jakob Nielsen's usability heuristics, emphasizing recognition over recall, visibility of system status, consistency and standards, and error prevention to enhance clarity and reduce cognitive load. Paul Fitts's Law informed the enlargement and strategic placement of touch targets to minimize movement time and selection errors, consistent with mobile interaction research [13]. Finally, choices regarding iconography, spacing, and color contrast are based on recent research on visual design and affordance to support quick recognition and consistent aesthetics preferred by Gen-Z users in a food court context, based on participant feedback.

Taken together, digital transformation, e-service quality, e-customer satisfaction, user interface design, and user experience form an interconnected framework for understanding how technology is reshaping service delivery in the FnB industry. By considering these concepts together, it becomes clear that they highlight both the opportunities and

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challenges of implementing digital solutions in service environments and underscore the importance of designing systems that are not only technologically robust but also user-centered, usable, and responsive to diverse customer needs.

II. RESEARCH METHODOLOGY

A. Research Design

This study employs a qualitative research approach to explore user experiences, service processes, and contextual factors related to food court ordering systems. An inductive, exploratory approach is adopted, beginning with observations of service inefficiencies at the Food Galaxy 1 (Galaxy Mall 1, Surabaya) food court and progressing toward the development of a solution. This approach allows insights to emerge directly from field observations and user interactions rather than from predetermined hypotheses.

The study applies the Design Thinking methodology as a user-centered framework for problem identification and solution development. Design Thinking is conducted iteratively to understand user needs, redefine the problem, and generate design solutions based on user insights [14]. The method is particularly suited for digital system design as it integrates empathy-driven analysis with practical solution development [15].

The findings from the Design Thinking process inform the development of a high-fidelity web-based ordering application prototype. The prototype is evaluated through usability testing with selected food court patrons to assess usability and effectiveness. Feedback from usability testing is used to refine the design prior to finalization. The primary outcome of this study is a user-centered web-application design that addresses service inefficiencies.

Individual interviews are employed as they enable close, targeted interaction with participants and facilitate the collection of rich, user-specific insights compared to other qualitative methods [16]. Open-ended responses are systematically grouped and classified according to recurring problem types to identify key patterns and insights. Participants were recruited using purposive sampling to ensure alignment with the study objectives. Homogeneity was intentionally applied to control for generational differences in digital behavior, focusing exclusively on Generation Z users aged 17–28 years who reside in Surabaya and surrounding areas. All participants reported visiting the mall food court at least twice per month, ensuring sufficient contextual familiarity to provide informed insights. Recruitment was conducted on-site at the food court through direct approach after preliminary screening for eligibility criteria. Additional descriptors were collected to characterize the sample, including primary device usage (all participants were active smartphone users with daily mobile application engagement), frequency of digital payment usage (e.g., e-wallets and QR-based payments), and prior experience with food-ordering or mall-related applications. Data collection continued until thematic saturation was reached, indicated by the repetition of interface usability concerns and diminishing emergence of new themes across successive interviews. Triangulation is employed in this study to enhance the credibility and validity of the research findings. This study uses Figma to support UI/UX design, visualize prototype flows, and adapt to different devices [17].

B. Research Instruments

The following Table 1 are several interview questions that can later be classified into empathy map categories:

Table 1. Empathize Question List

No.	Questions
1.	How old are you?
2.	Do you reside in Surabaya and its surrounding areas? If so, where exactly?
3.	Are you a mall food court customer with a regular visit frequency of at least twice per month?
4.	What is the worst or most frustrating experience you have ever had when ordering at a food court (e.g., incorrect orders, long queues, lack of service staff, etc.)?
5.	What do you imagine or expect from a food court ordering system that uses a mobile application?
6.	What features or menus do you need in a food court ordering application?
7.	What have you heard about mall food courts that are recommended due to unique or innovative ordering systems?
8.	In your opinion, which part of the ordering process takes the most time or makes you feel delayed?
9.	What do you expect from a food court ordering application? What would you like to see and do within the application when placing an order?
10.	When viewing menu images, what immediately attracts your attention? Do the menu titles match the images, and is there a clear caption provided?
11.	How is your experience reading text or information on menus? Are there certain font types or sizes that are difficult to read?
12.	What types of colors or contrast make information clearer or, conversely, more confusing when ordering (e.g., overly bright colors or mismatched tones)?
13.	When ordering via a mobile phone, what type of button design helps you clearly understand that it is a clickable button and allows you to press it accurately? Does size, shape, or other attributes matter?
14.	When searching for menu items or options, which navigation elements are most helpful to you (icons, drop-down menus, pop-ups, or links)?

Source: [18], [19]

In addition to interviews conducted during the Empathize stage, interviews are also carried out during the Testing phase to evaluate the design outcomes. This is intended to obtain user

feedback on the prototype, which represents the final product, in order to gain a deeper understanding of user needs. Usability testing provides new insights that help further understand users and refine problem definitions or user [20]. Accordingly, the following questions in Table 2 are posed to encourage users to openly share their feedback:

Table 2. Testing Question List

No.	Questions
1.	How comfortable are you with the arrangement of imagery in the application's user interface? Is it consistent?
2.	How comfortable are you with the typefaces and fonts used in the application's user interface? Are they consistent?
3.	How comfortable are you with the color scheme used in the application's user interface? Is it consistent?
4.	How comfortable are you with the buttons used in the application's user interface? Are they consistent?
5.	How easy is it for you to understand the icons used as navigation in the application?
6.	How easy is it for you to understand and learn how to use the application system?
7.	How quickly does the system help you complete tasks or activities within the application?
8.	How satisfied are you with the overall use of the application system?
9.	Were you able to achieve your intended goals related to ordering and payment through the application?
10.	Do you feel that the application helps facilitate the ordering process in a mall food court?

Source: [21]

C. Data Analysis Techniques

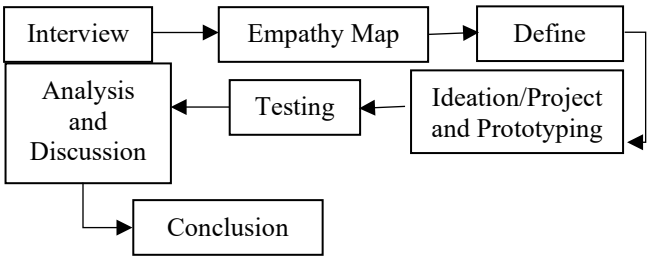

Figure 1. Research Steps

As seen in Figure 1, data analysis in this study followed the stages of the Design Thinking methodology. The process commenced with the empathize stage, during which data were collected through initial semi-structured interviews and synthesized using an empathy map. This approach facilitated a systematic understanding of informants' experiences when ordering food at a mall food court, particularly in identifying user pains and perceived gains.

The analysis then progressed to the define stage, where users, their needs, and key insights were systematically interpreted. The primary outcome of this stage was the formulation of a Point of View (POV), articulated as a problem statement that captured the core issues experienced by the research participants.

In the ideation stage, this process enabled the generation and exploration of multiple design ideas to address users' needs and challenges. The most relevant ideas were subsequently developed into a prototype, resulting in a food-ordering system design intended to resolve the identified problems and align with user expectations.

Following prototyping, the study advanced to the testing stage, which focused on evaluating both system functionality and user experience. Testing assessed the extent to which the proposed design met user needs.

The data obtained from the testing phase were analyzed using thematic analysis. This study adopted the reflective thematic analysis approach proposed by Braun and Clarke, which emphasizes interpretation and meaning making within qualitative research. This method enabled the identification of recurring patterns and themes that reflected users' perceptions, experiences, and evaluations of the prototype [22].

Finally, the study concluded with a synthesis of findings. This stage summarized the main results, assessed how effectively the prototype addressed user problems and fulfilled their needs, and acknowledged the limitations and potential inaccuracies identified during testing.

III. RESULTS AND DISCUSSION

A. Data Analysis Results

This study employed data triangulation to ensure the validity of findings obtained during the empathize stage interviews [23]. Interview data were validated through usability testing conducted during the testing stage, which involved direct user interaction with the prototype. Reliability was ensured through procedural consistency, supported by standardized documentation, including identical interview guides and testing scenarios applied to all respondents. Through triangulation and standardized procedures, the findings are considered valid and reliable, providing a robust foundation for subsequent design stages.

Following empathize interviews, usability testing, and solution validation through application design, the results of the data analysis are presented for each stage of the Design Thinking methodology. Previous studies have applied the same Design Thinking steps consisting of Empathize, Define, Ideate, Prototype, and Test [24], [25].

a) Empathize Stage

During the empathize stage, structured observation and in-depth interviews were conducted to understand users' experiences with food ordering and payment at the mall food court. This study focused on multi-users who fit the category of extreme users, rather than involving multiple stakeholders,

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to obtain in-depth insights from individuals with intensive and repeated engagement in the service context. In line with the Design Thinking approach, extreme users are prioritized because they tend to articulate clearer pain points and unmet needs [14]. Five Gen-Z participants (aged 17-28) residing in Surabaya and surrounding areas were recruited. All reported visiting mall food courts 2-4 times per month. Prior to participation, verbal informed consent was obtained. Participants were assured of voluntary participation, anonymity, and confidential data handling. All data were anonymized and reported in aggregate form.

Interview questions were structured using the empathy map framework, covering the dimensions of see, hear, say, do, think, and feel. These dimensions explored respondents' observations of their environment, external influences, expressed behaviors, and emotional responses, as well as their expectations for improved ordering experiences. Data saturation was assessed to determine sample adequacy. Saturation occurs when no new insights emerge, and responses become repetitive, indicating that the phenomenon has been sufficiently represented. Prior research indicates that in homogeneous populations, data saturation can be achieved with as few as five interviews [26]. Given the uniformity of respondents' experiences, saturation was considered achieved.

Analysis of the interview data revealed that all respondents identified long queues as the primary issue in the food court ordering process. All participants expressed a need for a more efficient ordering method and indicated a preference for a digital ordering system, either mobile-based or web-based, to reduce waiting time and improve service efficiency. The consistency of problems, needs, and expectations across respondents confirmed data saturation at this stage. Based on the interview findings, all responses to the interview questions were systematically synthesized into pain-and-gain mappings in the form of an empathy map, representing each user's challenges and perceived benefits

b) Define Stage

At this stage, the problem statement was formulated as a Point of View (POV), which serves as the analytical foundation for subsequent Design Thinking phases. The POV synthesizes users' pain and gain into an actionable problem definition, translating empirical findings into a focused design challenge [27]. Drawing on user characteristics, needs, and insights identified during the empathize and testing stages, the POV guides solution development in a user-centered manner.

Analysis of interview data revealed several key user needs that directly influence satisfaction with the food court ordering experience. These needs include a digital ordering and payment system that eliminates physical queuing. Users want menu displays with clear images, prices, and descriptive captions. They also need sufficient color contrast between menu elements and backgrounds, intuitive navigation primarily through icons, and multiple cashless payment options, including debit/credit cards, e-wallets, and QRIS.

Insights from the testing stage further validated these needs. Most users found the prototype intuitive, efficient, and effective at making ordering and payment easy, without having to queue at stalls or counters. However, user feedback also highlighted areas for improvement, such as inadequate color contrast and navigation icons that were too small to select easily.

Combining user data, needs, and findings, a consolidated POV was created to present the main problem from the users' perspective. The POV statement is: *"Generation Z (aged 17–28) in Surabaya, who regularly visit food court malls at least twice per month, need a cashless ordering and payment app in food courts to remove queuing and improve service efficiency."* This POV serves as a key reference for refining and developing the application prototype, ensuring that later design decisions stay aligned with user needs and expectations.

c) Ideation Stage

During the ideation stage, practical and innovative solutions were systematically generated to address the problems identified in the preceding Define stage. Guided by the established Point of View (POV), the ideation process focused on translating user needs into feasible design concepts. The POV clearly indicated that an effective solution would be a digital ordering and payment application that enables users to place orders and complete transactions directly from their seats, thereby eliminating the need to wait in physical queues at food court stalls.

The relevance of this solution was reinforced through preliminary validation during testing, where users reported high levels of satisfaction with the prototype. Respondents indicated that the application effectively addressed their primary pain point, especially long queues during ordering and payment. These findings confirm that the proposed solution aligns closely with users' expectations and operational realities.

From a design and technical perspective, the ideation stage also emphasized interface clarity and usability. Users highlighted that the arrangement of imagery, typefaces, color schemes, and buttons contributed to an intuitive and accessible interface. The simplicity and consistency of the design enabled users to navigate the system easily, complete tasks efficiently, and achieve their intended goals, namely ordering and paying without queuing. Early-stage testing further validated the prototype's effectiveness in resolving the identified user problems.

In addition, the ideation stage included a comparative review of established online food-ordering platforms, such as GoFood, GrabFood, ShopeeFood, and the McDonald's App. These platforms informed key UI/UX decisions, particularly in navigation flow and transaction structure, ensuring alignment with familiar digital ordering patterns. Through this combination of user-driven ideation and industry benchmarking, the proposed solution was developed as both contextually relevant and practically viable. However, the prototype does not support routing orders to multiple stalls simultaneously, as the study focuses on UI/UX design rather than backend system integration. Moreover, these benchmarked applications generally restrict transactions to a single vendor per order to minimize operational complexity.

Therefore, multi-stall routing is beyond the scope of this research and is proposed for future system-level development.

d) Prototype Stage

At this stage, an experimental model has been developed that is expected to resolve the users' problems. The experimental model was designed as an application user interface prototype, specifically a digital web app, using the UI design application Figma (Figure 2). By using Figma, the type of design or web-app prototype created is high-fidelity, meaning it closely resembles the planned final product and requires only minimal further development, namely backend coding, to be refined into a fully functional final product.

Figure 2. Landing and Home Page Appearance

Starting from the landing page, which features an animation indicating the application's loading process. The main page displays various stalls/stands in Food Galaxy 1 (Galaxy Mall 1, Surabaya) according to user needs, complete with product images. A cart, search bar to find stalls, and order history are also available.

Next as seen in Figure 3, when users click and enter each stall, a variety of food and/or beverage menus will appear, supported with images, menu titles, captions, prices, and buttons to add or reduce the quantity of their orders.

During the ordering process, after users add their orders, they will be directed to the order review page to review them (Figure 4).

Once users have reviewed their orders, they can press the pay button, which then directs them to the payment page with options for card, e-wallet, or QRIS payment methods (Figure 5).

After completing the payment, users will be directed to a payment confirmation page, then returned to the home or main page. In the home page, users can check their orders history (Figure 6).

The ordering process is completed within the prototype, and users are able to repeat the order flow seamlessly (Figure 7). The "real-time" functionality is simulated in a high-fidelity Figma prototype, particularly through interactive transitions between the Order Checkout Page and the Order History Page.

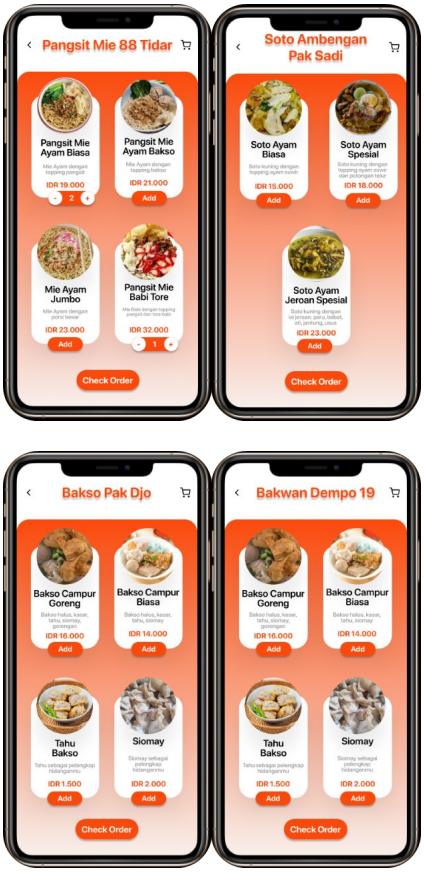

Figure 3. Each Outlet Page Appearance

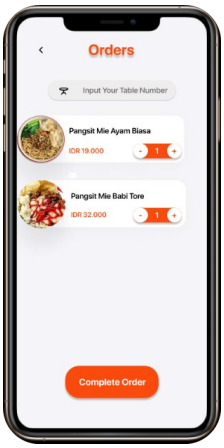

Figure 4. Order Checking Page Appearance

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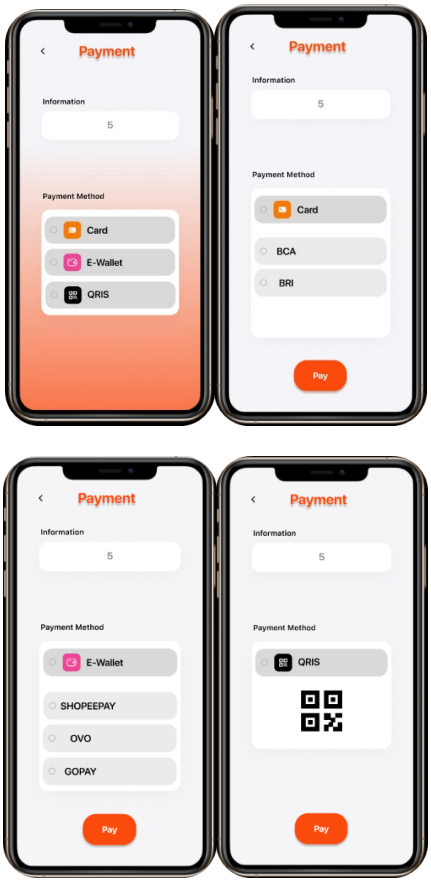

Figure 5. Payment Methods Page Appearance

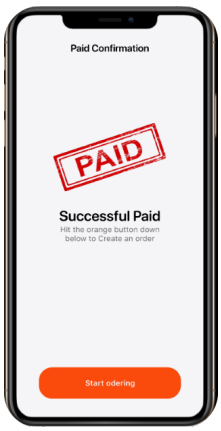

Figure 6. Payment Confirmation Page Appearance

Figure 7. Order History Page Appearance

e) Testing Stage

Usability testing was conducted on the prototype, which was developed based on validated user needs. The testing phase aimed to determine whether the system's functionality and visual design matched user preferences, expectations, and requirements from the empathize stage. Users interacted directly with the prototype to perform ordering and payment tasks. This enabled assessment of both system performance and user experience.

The testing results showed that all respondents were generally satisfied with the prototype as a food court ordering and payment system. Users reported that the application supported their activities and addressed their primary concerns identified earlier. These findings suggest that the prototype met core user requirements and worked as intended to allow a queue-free ordering process.

Despite the positive evaluation, users also provided constructive feedback for improving the application. Suggestions focus mainly on improving visual clarity, accessibility, and interaction elements to make use easier after hands-on experience. This feedback shows opportunities for iterative refinement. It also highlights testing's role in validating design decisions and identifying areas for improvement.

Overall, the testing stage played a critical role in confirming the effectiveness of the proposed solution. The actionable insights gained will directly inform a focused approach to upcoming design enhancements, ensuring that the application continues to evolve in alignment with user needs and project goals.

B. Findings and Discussion

Interviews conducted during the empathize stage with five food court patrons revealed that the primary problem experienced during ordering and payment was long physical queues. These queues were consistently described as uncomfortable, time-consuming, and physically tiring. This finding directly fulfills the first objective by identifying users' core pain points, preferences, and unmet needs. In response, users articulated a clear need for a digital ordering and payment system, either a mobile or web-based application, that would allow them to order and complete transactions directly from

their seats without queuing. This need constituted the central problem addressed in the study and informed the subsequent design process. Although the outcome remains at the prototype stage, the resulting design effectively targets this core user problem.

Further interview analysis using empathy maps revealed specific UI/UX preferences that support usability and satisfaction. Users emphasized the importance of clear food and beverage images accompanied by accurate captions, familiar and readable typography, a consistent neutral color palette with selective contrasting accents, and large, easily identifiable buttons supported by intuitive icons. Overall, users preferred a simple, standard interface that could be understood immediately without additional cognitive effort. These insights informed the second objective by guiding the design of a high-fidelity UI/UX prototype optimized for efficient multi-vendor food court ordering, payment, and navigation within a shared environment.

Based on these identified needs and preferences, a digital ordering application prototype was developed and subsequently evaluated through usability testing with the same target user group. This evaluation addressed the third objective by assessing both system usability and user experience during realistic ordering and payment tasks. Testing results indicated high levels of user satisfaction. Participants highlighted the clarity of images and captions, the use of standard, legible typefaces, sufficient contrast between interface elements and backgrounds, and intuitive navigation via icons and buttons. These features enabled users to complete tasks efficiently and with minimal confusion.

Nevertheless, users provided constructive feedback for refinement. They suggested limiting order history and cart access to logged-in users or those with stored cookies. They also requested larger, more widely spaced navigation icons for improved click accuracy. Visual references during order verification could speed confirmation. Varying the background colors between the home and payment pages, and increasing caption brightness, could improve visibility. These insights show that the prototype met core needs, but further iterative enhancements were needed to improve usability and visuals.

In response, minor revisions were made in the final prototype. Navigation icons were enlarged, and images were added to the order-checking page. Background color variation was introduced on the payment methods page. Through this iterative process, the prototype was progressively refined based on user feedback, while consistently maintaining its primary objective of reducing queues and enhancing ordering efficiency. Users reported improved perceived efficiency and overall satisfaction following successive design adjustments.

Compared to prior studies using User-Centered Design (UCD) and Design Thinking that primarily relied on business owners as informants, this study advances by directly involving end-users. Engaging real food court patrons, therefore, strengthens the validity and relevance of the findings. Additionally, the results align with recent studies showing that clear, consistent visual design, with informative imagery, readable typography, strong color contrast, and intuitive button design, enhances decision-making speed, reduces errors, and improves user satisfaction.

This study shows that to develop effective digital ordering systems for food courts, it is essential to identify real user needs, create a high-fidelity prototype, and validate it with real-user testing. Visual clarity and functional simplicity are not just aesthetic choices; they are critical for efficiency, usability, and customer satisfaction.

IV. CONCLUSION

This study examined inefficiencies in ordering and payment processes at the food court using a qualitative Design Thinking framework. Findings from the empathize stage identified long physical queues as the primary user pain point, negatively affecting comfort and overall satisfaction. In response, a digital ordering and cashless payment prototype was designed based on user needs and validated through usability testing. Results demonstrated that the prototype effectively addressed the core problem by enabling users to order and pay directly from their seats. Key UI/UX elements, such as clear menu images with captions, readable typography, adequate color contrast, intuitive icons, and easily clickable buttons, were confirmed to play a critical role in usability and user satisfaction.

From a practical perspective, the findings suggest that implementing a user-centered digital ordering system in food court environments can enhance the overall service experience, as reflected in users' reports of improved perceived efficiency and satisfaction. For mall operators and system developers, the study provides design guidelines emphasizing visual clarity, simple interactions, and accessibility as essential components of effective food-ordering interfaces. From a theoretical standpoint, this study contributes to the literature on Human-Computer Interaction and Design Thinking by extending their application to multi-vendor food court settings, which remain underrepresented in prior UI/UX research. Methodologically, the study reinforces the importance of involving actual end-users, rather than proxies such as business owners, in both problem identification and solution validation.

Several limitations should be acknowledged. First, the study employed a qualitative approach with a small sample of five users, limiting generalizability beyond the specific context. Second, this study focused on UI/UX design and usability testing of a high-fidelity prototype rather than a fully implemented system. Consequently, technical feasibility, backend integration, system performance, and real-world operational impacts were not evaluated. In addition, the study adopted a qualitative Design Thinking approach to explore users' perceptions of visual design and interaction flow, without incorporating quantitative usability metrics or objective performance indicators. Third, this study is limited to a customer-centered UX perspective and does not include input from food vendors or mall management. Therefore, the findings are confined to user experience insights and do not support broader operational or implementation claims.

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Based on the identified limitations, several directions for future research are recommended. First, while this study intentionally employed a homogeneous sample to obtain in-depth insights from a specific user segment, future studies may replicate the design with other homogeneous groups to enable cross-segment comparison while maintaining methodological consistency. Second, future research should move beyond prototype-based evaluation toward full system implementation to assess technical feasibility, backend integration, system reliability, and real-world operational performance. Incorporating System Usability Scale (SUS) and UMUX-Lite, alongside objective performance indicators such as task completion rate, time-on-task, and error frequency would strengthen empirical rigor and increase the study's contribution within the ICT domain. Third, future investigations should integrate perspectives from food vendors and mall management to evaluate workflow implications, implementation constraints, and long-term adoption feasibility. A multi-stakeholder approach would enable a more comprehensive assessment of operational sustainability and shared-service coordination within food court environments.

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