

UI/UX Design and Prototype of the IKJ Advertising Mobile App using the User-Centered Design Method

Anggi Tria Amanda Manik¹, Didik Aryanto², Hendri³

^{1,2,3} Informatics Engineering, STMIK TIME, Medan, Indonesia

anggiandamanik@gmail.com^{1*}, didikaryanto@gmail.com², h4ndr7@hotmail.com³

Abstract

Many companies are transforming their systems from *website-based* to *mobile-based* applications. *User Experience* (UX) is a crucial component in user interaction with applications, given that ease of use must be the top priority of technology. This study aims to design the UI/UX and *prototype* of the IKJ Advertising mobile application using the *User-Centered Design* (UCD) method. The design was based on user needs through observation, interviews, and literature review. The resulting *prototype* was then evaluated using *usability* testing with the Think-Aloud method, Performance Measurement, and the *System Usability Scale* (SUS). The evaluation results show that the *prototype* achieved a SUS score of 91.5, which falls into the *Acceptable* category, grade A, and *Best Imaginable*. These results indicate that the application design has an excellent level of *usability* and is capable of providing an effective, efficient, and easy-to-use user experience. This study produced a UI/UX design and *prototype* for the IKJ Advertising mobile application that can be further developed as a reference for corporate application development.

Keywords: *User-Centered Design, UI/UX, System Usability Scale*

1. Introduction

Technological advancements have driven many companies to transition from website-based systems to mobile applications, as they can provide a better and broader user experience[1]. In mobile application development, User Interface (UI) and User Experience (UX) are crucial aspects for creating applications that are easy to understand, comfortable to use, and aligned with user needs[2]. One approach used in UI/UX design is User-Centered Design (UCD), a method that places the user at the center of the system development process to produce designs that are useful and relevant[3].

Previous studies have shown that the UCD method can improve application usability. A study by[4] achieved a System Usability Scale (SUS) score of 84.5. A study by[5] on the MizanStore app achieved an average SUS score of 90, indicating a high level of user satisfaction. Additionally, a study by[6] on the BCA Mobile app yielded an SUS score of 80%, demonstrating that respondents were sufficiently satisfied with the app's design.

2. Theoretical Framework

2.1. Mobile Applications

Mobile applications are software designed to run on smartphones and tablets by utilizing device features such as touchscreens, cameras, GPS, sensors, and internet connections to support user needs in real-time[7]. Mobile applications are characterized by high portability, flexibility, and accessibility, allowing them to be used anytime and anywhere. According to[8], mobile applications are developed to make it easier for users to access digital services through a simpler and more intuitive interface compared to web-based applications, so they are widely used in the business, education, banking, and public service sectors.

2.2. User Interface

The User Interface (UI) is the medium of interaction between the user and the system through visual elements such as icons, menus, buttons, and other graphical indicators. The UI serves as a communication bridge so that users can access information, execute commands, and use the system effectively and easily. Good UI design must align with user needs and usage patterns so that interactions feel more intuitive and comfortable. According to[9], a User Interface is an interaction medium that allows users to access content and enter data through specific commands with the goal of producing a functional and user-friendly product.

2.3. User Experience

User Experience (UX) refers to the user's experience and response when interacting with a product, service, or system. UX encompasses the user's perception of the design, functionality, performance, and ease of use of the application. User experience is a crucial aspect as it aims to create effective, comfortable interactions that provide satisfaction to users[10]. According to ISO 9241-210[11], *User Experience* involves designing an interface that is intuitive, responsive, and visually appealing, while considering the emotional and cognitive aspects of users during product use. Thus, UX focuses not only on system functionality but also on how users perceive the overall user experience.

2.4. IKJ Advertising

IKJ Advertising is a modern printing company specializing in one-stop printing solutions and located at Jalan Perbatasan No. 15 A–B, Pulo Brayan, Medan. The company offers a wide range of printing services, including banners, business cards, brochures, stickers, product packaging, merchandise, and other promotional materials for both individuals and institutions. In conducting its business, IKJ Advertising implements a one-stop solution concept, meaning that the entire production process—from design, material selection, printing, to finishing—is carried out in one location, making the service faster, more efficient, and consistent. As part of its digital transformation, IKJ Advertising also has an official company website used as a platform for company profiles, service catalogs, production portfolios, and sales promotions.

In light of the growing use of mobile devices, IKJ Advertising plans to develop a mobile app to make it easier for customers to access product information, view our portfolio, and support a more interactive promotional and ordering process. The development of this app is expected to enhance the user experience and strengthen the company's competitiveness in the printing industry.

2.5. Usability Testing

According to [12], usability testing is a testing method that directly involves users to assess the effectiveness, efficiency, and user satisfaction of a system. Users are asked to complete a series of tasks, and their interactions are then observed and analyzed to identify obstacles and opportunities for design improvements.

Research by [13] explains that usability testing is used to evaluate system performance under real-world conditions. During testing, users complete specific tasks while researchers observe their interactions and collect user feedback as a basis for evaluating and improving the system.

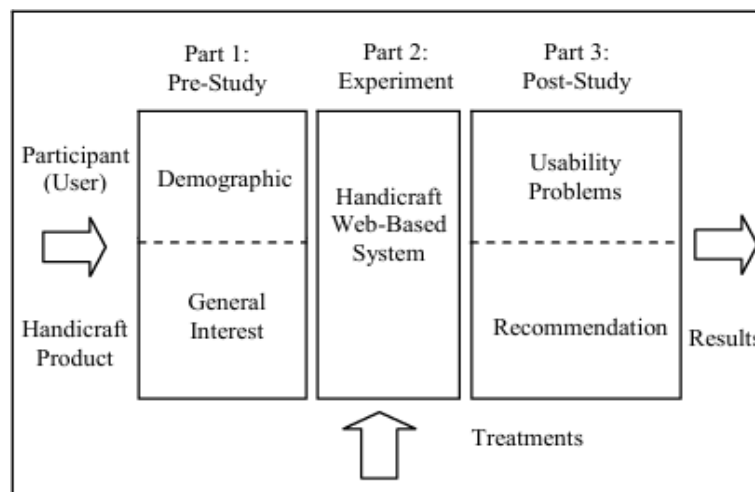


Figure 1: Usability Testing Research Framework

According to [14], the usability testing framework consists of three stages, namely:

1. **Pre-study**
The preparation stage, which includes determining the testing objectives, developing task scenarios, selecting participants, and preparing testing instruments.
2. **Experiment**
The testing phase involves asking participants to complete tasks using the system under test, after which all user interactions are recorded and analyzed.
3. **Post-Study**
The evaluation phase of the test results to identify usability issues and formulate design improvement recommendations so that the system is easier to use and meets user needs.

2.6. User Persona

A user persona is a representation of a user used to understand the user's characteristics, needs, behavior, and goals when using a product[15]. Personas help development teams identify key target users and support the design decision-making process to better align with the needs of real users. Additionally, user personas are used to analyze users' problems, capabilities, and limitations so that designers can create more targeted solutions. Persona descriptions typically focus on user behavior patterns, usage contexts, needs, barriers, and goals to be achieved. Thus, user personas play a crucial role in supporting a more effective and user-centered UI/UX design process.

2.7. Wireframe

A wireframe is a basic design used to illustrate the structure and layout of an application's interface before it progresses to the visual design phase. Wireframes help visualize the arrangement of elements, navigation, and information flow in a simple way, serving as an initial reference in the product design process. According to [16], wireframes are used to determine the placement of information and serve as an initial stage that must be approved by stakeholders before the User Interface (UI) design process begins. Generally, a wireframe is still a simple sketch without color details or complete visual elements. According to [17], a wireframe serves as the framework for the application pages that will be developed into a high-fidelity prototype, thereby simplifying the development process and facilitating changes to the system design.

3. Page style

3.1. Text font of entire document

This study employs a descriptive qualitative method with a User-Centered Design (UCD) approach in the UI/UX design and prototyping process for the IKJ Advertising mobile app. The UCD approach was chosen because it focuses on user needs, characteristics, and goals, resulting in a design that is more relevant and user-friendly.

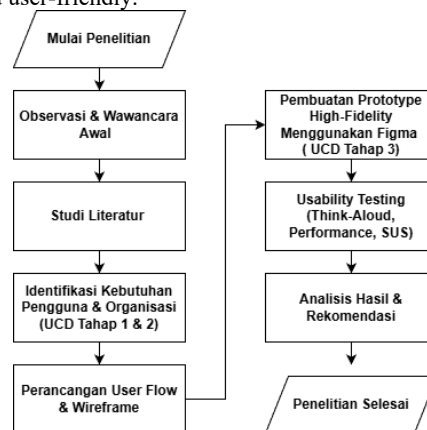


Figure 2: Research Stages

The research process began with data collection through observation, interviews, and literature reviews to understand user needs and the company's challenges. The data obtained was then analyzed to determine system requirements as the basis for designing a solution. The next phase involved creating user flows, wireframes, and high-fidelity prototypes using Figma. The designed prototype is then tested using usability testing methods such as Think-Aloud, Performance Measurement, and the System Usability Scale (SUS). The test results are analyzed to determine the usability level and provide design improvement recommendations to make the application more effective, efficient, and aligned with user needs. The research process is conducted iteratively until the prototype achieves a good level of usability.

3.2. Research Data

Data collection methods in this study were conducted through observation, interviews, literature review, and the distribution of usability questionnaires. Observations were conducted within the operational environment of IKJ Advertising to understand business processes and user needs. Interviews were conducted with the digital marketing team to gather information regarding application requirements, necessary features, and challenges in digital promotion. Literature review was used to strengthen the theoretical foundation regarding UI/UX, mobile applications, User-Centered Design (UCD), and usability testing. Additionally, the System Usability Scale (SUS) questionnaire was used to measure the usability level of the prototype after testing was conducted. Research subjects were selected using purposive sampling and consisted of IKJ Advertising employees with varying levels of technological understanding. The first group comprised employees familiar with the internet and mobile applications, such as the digital marketing and administrative teams, who were expected to provide feedback regarding navigation, features, and interface efficiency. The second group consisted of employees who were less familiar with digital technology to assess the application's ease of use for users with low digital literacy.

This study involved six respondents comprising representatives from both groups and one customer. The number of respondents aligns with Nielsen's recommendation that the first five users are typically able to identify most usability issues, thereby enabling effective and efficient testing [12].

3.3. Research Parameters

Research parameters were used as benchmarks to evaluate the quality of the IKJ Advertising mobile app prototype based on usability aspects. The evaluation was conducted using three main components—effectiveness, efficiency, and satisfaction—through the Performance Measurement method and the System Usability Scale (SUS). Additionally, the Think-Aloud method was employed to gather qualitative data regarding user barriers and experiences while using the prototype.

In this study, the user flow was designed simply because the application is still an interactive prototype without a login system or database. The application's primary focus is on presenting product information, portfolios, as well as ordering and payment features to support the promotional and service needs of IKJ Advertising.

3.4. User-Centered Design Method

The User-Centered Design (UCD) method consists of several iterative stages that focus on user needs and experiences in the system design process. In this study, the UCD stages include understanding the context of use, identifying user and organizational needs, creating design solutions, and evaluating prototype usability. The User-Centered Design (UCD) method in this study consists of the following four main stages.

1. **Specify the Context of Use**

This stage involves understanding user characteristics, the purpose of using the application, and the user's environmental conditions through observation and interviews.

2. **Specify User and Organizational Requirements**

This stage involves identifying user and organizational needs, such as feature requirements, ease of navigation, and the company's objectives in developing the application.

3. **Produce Design Solutions**

The stage of creating design solutions in the form of user flows, wireframes, and high-fidelity prototypes using Figma based on user needs.

4. **Evaluate Designs Against Requirements**

The stage of evaluating prototypes using usability testing with the Think-Aloud method, Performance Measurement, and the System Usability Scale (SUS) to assess the application's usability level.

4. Research Findings

4.1. Specify the Context of Use

This stage was conducted to understand user characteristics, system requirements, and the operational conditions of IKJ Advertising in the process of digital promotion and services. Data collection was conducted through interviews with 6 participants consisting of 5 members of the IKJ Advertising marketing team and 1 customer. The interview results indicated that promotional and customer service processes still rely heavily on social media and the company's website. Users require a mobile application capable of providing product information, service catalogs, portfolios of completed work, as well as more practical and user-friendly ordering features.

The interview results were analyzed using the think-aloud method to understand the context of app usage at IKJ Advertising. This analysis covered user characteristics, work activities, communication channels used, system requirements, interface preferences, and challenges in the promotion and customer service processes.

The analysis results indicate that users require a mobile app with simple navigation, easily accessible information, and a design that supports promotional and service activities more effectively. These findings form the basis for UI/UX design to ensure the developed app aligns with user needs and real-world working conditions at IKJ Advertising.

4.2. Specifying User and Organizational Requirements

Based on the results of interviews and think-aloud analyses, information was obtained regarding the characteristics, needs, goals, and challenges users face when using IKJ Advertising's digital services. This information was then used to create user personas as representations of potential mobile app users.

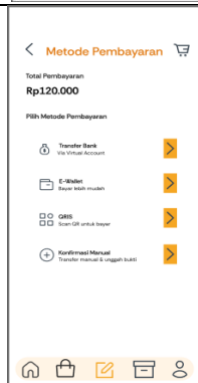
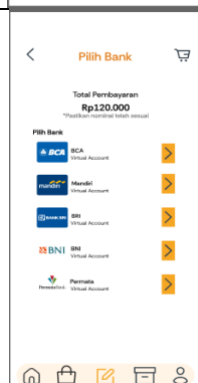
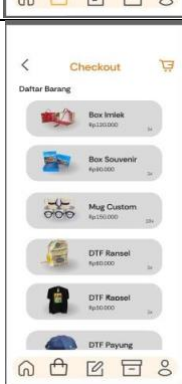
User personas assist the UI/UX design process to ensure the application design aligns with user needs, particularly in promotional activities, product information searches, viewing portfolios, and the service ordering process. With user personas in place, the design development process becomes more focused and centered on the user experience.

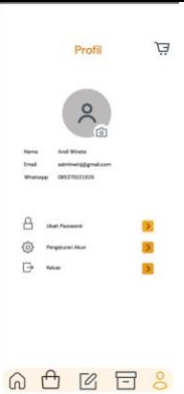
4.3. Produce Design Solutions

In this phase, design solutions are developed based on the user and organizational needs analyzed earlier. The design process focuses on usability, comfort, and the user experience when using e app.

The design was carried out using a User-Centered Design (UCD) approach, involving the creation of storyboards, wireframes, and high-fidelity prototypes using Figma. The developed design features key elements such as a product catalog, product details, portfolio, company information, shopping cart, and ordering features. The outcome of this stage is a prototype of the IKJ Advertising mobile app, which serves as a tool for simulation and usability evaluation in the subsequent testing phase. The prototype results are shown below.

Table 1: Parameter Settings

View	Description	View	Description
	User login Page Function: The admin <i>login</i> page for accessing the IKJ Advertising application management system. Usage Steps: The user enters their username and password, then clicks the <i>login</i> button to access the user dashboard.		Payment Details: Page Function: Displays transaction details and the user's total payment. Usage Steps: Users click the "Continue Payment" button to proceed to the payment method page
	Dashboard (user): Page Function: The main page displaying products, promotions, and the app's main navigation. Usage Steps: Users can view promotional pop-ups, select products by category, or tap on a product such as the Lunar New Year Box to view product details.		Payment Methods: Page Function: Provides a list of available payment methods within the app. Usage Steps: Users select a payment method via bank or e-wallet.
	Product Details: Page Function: Displays product details such as images, descriptions, and ordering information. Usage Steps: Users click the "Order Now" button to proceed to the checkout page.		Select Bank: Page Function: Provides information on payment via bank transfer. Usage Steps: Users view account details and payment instructions, then click the "I've paid" button to proceed to the payment proof upload page.
	Checkout (Cart): Page Function: Displays a summary of selected products before payment. Usage Steps: Users click on the selected product, such as the Lunar New Year Box, to go to the payment details page.		Payment Details (Bank): Page Function: Provides payment information via bank transfer. Usage Steps: The user views the account details and payment instructions, then clicks the "I've paid" button to go to the payment proof upload page.

View	Description	View	Description
	Payment Proof Upload Successful: Page Function: Provides a notification that the payment proof has been successfully sent. Usage Steps: After uploading the payment proof, the user can click the "View Order Status" button.		User Profile: Page Function: Displays user account information and profile settings. Usage Steps: Users tap the profile icon to access the user profile page.

4.4. Evaluate Design Against Requirements

A user usability testing scenario was conducted to evaluate the ease of use of the IKJ Advertising mobile app prototype from the customer's perspective. During this phase, participants were asked to complete several key tasks, ranging from logging in, viewing the product catalog, accessing product details, placing an order, to checking the payment status of their order. During the testing process, researchers observed user interactions using the think-aloud method and performance measurement to determine the level of effectiveness, efficiency, and obstacles experienced by users while using the app. The test results were then analyzed to evaluate the prototype's usability and determine design improvement recommendations.

The usability evaluation of the IKJ Advertising mobile app prototype was conducted using the System Usability Scale (SUS) method. The SUS questionnaire was administered to 6 respondents—comprising 5 marketing team members and 1 customer—to assess the app's ease of use. SUS scores were calculated according to the following rules:

1. Statements with odd numbers were calculated by subtracting 1 from the respondent's answer.
2. Even-numbered statements are calculated by subtracting the respondent's response value from 5.
3. All scores were then summed and multiplied by 2.5 to obtain the SUS score.

Table 2: SUS Calculation Results

No	Statement	Participant's Answer					
		R01	R02	R03	R04	R05	R06
1	I think I'll be using this app's Prototype feature often.	4	4	5	4	4	4
2	I feel that this Prototype interface is too complicated to use.	1	1	2	1	2	2
3	I find this Prototype easy to use.	5	5	5	5	5	5
4	I think I'll need help from an expert to use this Prototype.	1	1	2	1	2	2
5	I feel that the features in this Prototype are well integrated.	5	4	4	5	4	4
6	I feel there are many inconsistencies in this system.	1	1	2	1	2	2
7	I imagine most people will be able to quickly learn how to use this Prototype.	5	5	5	4	4	4
8	I find this Prototype confusing to use.	1	1	2	1	2	2
9	I feel confident using this prototype.	5	4	5	5	5	5
10	I need to learn a lot of things first before I can use this Prototype.	1	2	1	2	2	2
Total		39	36	35	37	32	40
Final Score		97.5	90	87.5	92.5	80	100
Average Score		91.5					

The SUS scores of each respondent were then averaged to obtain the final usability score for the prototype. Based on the test results, the IKJ Advertising mobile app prototype received an SUS score of 91.5, which falls into the *Acceptable*, *Grade A*, and *Best Imaginable* categories. These results indicate that the prototype has an excellent level of usability and is easy for users to use.

5. Conclusion

Based on the results of the UI/UX design and mobile app prototype research for IKJ Advertising using the User-Centered Design (UCD) method, the following conclusions were drawn:

1. The UI/UX design and mobile app prototype for IKJ Advertising were successfully developed using the User-Centered Design (UCD) method through the stages of user needs analysis, design development, and usability evaluation. The prototype was designed using Figma with key features such as a product catalog, promotions, ordering, and payment.
2. The evaluation results using the System Usability Scale (SUS) yielded an average score of 91.5. This score falls into the "Acceptable," "Grade A," and "Best Imaginable" categories, indicating that the prototype has excellent usability and is easy for users to use.
3. The designed prototype met user needs based on the results of observations, interviews, and think-aloud sessions. Users rated the application as having simple navigation, a clear interface, and easy-to-use ordering features.
4. The results of the prototype design can serve as an initial reference for IKJ Advertising in the development of the company's mobile application.

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