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UI/UX Design Of Marketplace Service Mobile and Laptop Applications Using Design Thinking Method

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ABSTRACT

Inefficient repair services for damaged smartphones and laptops pose challenges for both users and service providers. This research answers this problem by designing a mobile application marketplace interface for smartphone and laptop repairs by prioritizing usability and user experience (UX). Design thinking methodology guides the development process, which involves user empathy, problem definition, ideation, prototyping, and testing. Iterative evaluation using usability testing and heuristic evaluation refines the design. The evaluation results of the final iteration showed a Learnability score of 96.6%, Efficiency 98.63%, Memorability 95%, Error 0.232, and Satisfaction 83.23 from technicians, as well as Learnability 93.3%, Efficiency 85.23%, Memorability 85%, Error 0.202, and Satisfaction 83.23 from customers, with success and very good qualifications. Heuristic evaluation by UI/UX experts further validates the usability of the design. This research concludes that the design thought approach has succeeded in creating a user-friendly marketplace interface for smartphone and laptop repair services. The app's high usability and positive reception from technicians and customers highlight its potential to simplify the repair process and increase overall customer satisfaction.

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1. INTRODUCTION

The rapid technological advancement in East Java, Indonesia, has led to a significant increase in smartphone and laptop usage. However, the prevalence of hardware and software malfunctions in these devices has created a demand for efficient repair services [1]. Unfortunately, current service options often leave users frustrated with unclear processes and service providers struggling to attract customers [2][3][4]. This has resulted in a fragmented market where finding reliable and convenient repair services remains a challenge.

Existing research highlights the importance of user experience (UX) and usability in digital platforms [5]. Studies have shown that companies prioritizing UX design experience higher revenue growth and improved customer satisfaction [6]. Additionally, the design thinking methodology has emerged as a powerful tool for creating user-centric solutions by emphasizing empathy, problem definition, ideation, prototyping, and testing.

This research addresses the identified challenges by proposing a mobile application marketplace interface for smartphone and laptop repair services. The design thinking methodology is employed to ensure a user

centric approach throughout the development process [7]. The proposed solution aims to streamline the repair process, enhance transparency, and improve overall user satisfaction for both customers and service providers.

The novelty of this research lies in its application of design thinking to a specific and underserved market segment. By focusing on the unique needs of users in East Java, this study aims to develop a tailored solution that addresses the specific challenges faced by both customers and service providers in the region. The resulting mobile application marketplace has the potential to revolutionize the repair service industry by providing a convenient, transparent, and user-friendly platform for all stakeholders.

2. METHOD

Design Thinking is a method that is widely used to solve problems. According to the Interaction Design Foundation, design thinking is an iterative and non-linear process, which means the design team continuously uses the results to review, question and improve initial assumptions, understanding and results so that designers can produce better and more innovative solutions [8]. According to Hwa, the definition of Design Thinking is a human-centered problem solving tool that emphasizes empathy and co-creation [9].

In the design thinking method there are 5 process stages that enable designers to obtain innovative output [10]. Empathize, namely the researcher immerses himself in the user's world to gain a deep understanding of their experiences and perspectives. The next stage is define, namely the problem is clearly articulated based on the insights gathered during the empathy stage. Next is ideate, where the team brainstorms various potential solutions, encouraging creativity and out-of-the-box thinking. Then the prototype is a real representation of the most promising solution created to test and perfect the idea. And the final stage is the testing stage, where the prototype is evaluated with users to collect feedback and iterate on the design.

This cyclical process allows designers to continually refine their understanding of the problem and develop increasingly effective solutions. The flexibility of design thinking means it can be applied in a variety of fields, driving user satisfaction and encouraging the creation of innovative and creative ideas.

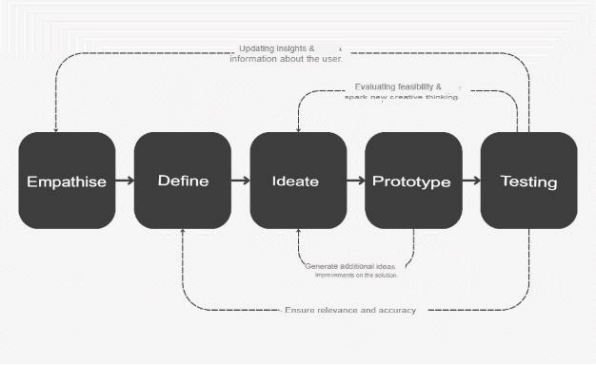

Figure 1. Design Thinking

2.1 Empathize

The Empathize stage involved crucial data collection to inform the success of this research. Through questionnaire and interviews with potential users, insights were gathered regarding their experiences and expectations related to smartphone and laptop repair service applications. This research uses an online questionnaire method which is distributed to potential users to explore experiences regarding cellphone and laptop service services. To test assumptions and identify problems related to research, an online questionnaire was applied to cellphone users and laptop users. Interviews can be carried out by compiling interview questions and then the results of the interviews can be used to create empathy maps, User Personas and pain points.

2.2 Define

At this stage, the author combines information by grouping data with the aim of understanding insight into the problem to be overcome. The expected result in doing this definition is to get the problem space from various points of view, so that you can determine the right and successful strategy as input at the ideate stage. The output produced from this stage is empathy mapping, User Persona, and pain points.

2.3 Ideate

In the third stage, design thinking is used to brainstorm ideas to create solutions to problems that have been understood and analyzed at the define stage. The ideate stage is divided into several stages, namely How

Might We (HMW), and user flow.

2.4 Prototype

At the prototype stage, an interaction simulation will be created in the visual design which will later be validated through iteration at the testing stage to answer existing problems. This aims to implement the ideas that have been created so that they can communicate them to users and find out their response through the testing stage. At this stage, digital product prototyping will also be produced through images that the author designed himself and shows the product design according to input from user informants.

2.5 Testing

The testing phase involved trials with potential users representing the target audience. This aimed to evaluate the effectiveness of the developed UI/UX design. By observing user interactions with the application, valuable insights were gained regarding their experience and potential areas for improvement. The testing results were crucial for assessing the prototype's success and identifying areas needing further refinement, ultimately enhancing the overall user experience.

3. RESULT AND DISCUSSION

3.1. Empathize

In the Empathize process, researchers distributed questionnaires and conducted interviews with potential users to gain an in-depth understanding of the use of cellphone and laptop service applications.

3.1.1. Questionnaire

The questionnaire is conducted to gather preliminary information from relevant respondents. The data collected through this questionnaire provides an overview of the perspectives, needs, or problems faced by the users. The results of the questionnaire serve as a crucial foundation for the subsequent stages of research, aiding in formulating more accurate strategies and effective solutions.

3.1.2. Interview

Interviews are conducted with 5 technician respondents and 5 customer respondents to gather their views and experiences. The collected information is then used to create an empathy map, which helps in understanding and visualizing user perspectives more comprehensively.

3.2. Define

At this stage, Empathy Mapping, User Personas, and Pain Points are formulated based on the information gathered from the questionnaire and interviews conducted earlier.

3.2.1. Empathy Mapping

After completing the interview stage, the next step involves mapping the experiences of several business services or customers interviewed into four quadrants: Says, Does, Thinks, and Feels in the Empathy Map. This user-centered approach aims to gain a better understanding of individuals by viewing the world from their perspective. Below is the visual representation of the Empathy Map as shown in Figure 2.

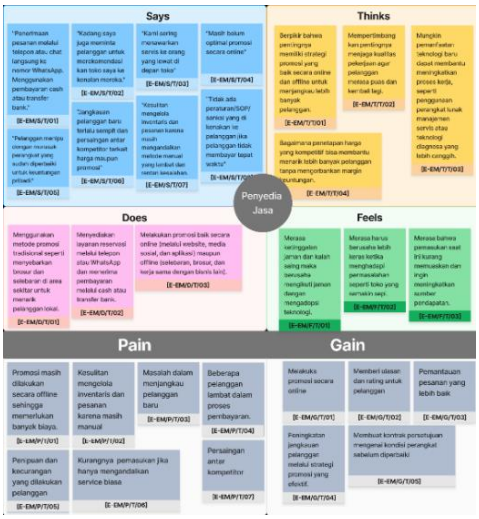

Figure 2. Empathy Mapping

3.2.2. User Persona

User personas are created from observations of behaviors during interviews and aim to represent various types of users who might use the same product or service. This is done to gain a deeper understanding of user needs and preferences so that the development of information and systems can better meet their requirements. The representation of user personas for technician and customer users can be seen in Figure 3.

Figure 3. User Persona

3.2.3. Pain Point

User personas are created from observations of behaviors during interviews and aim to represent various types of users who might use the same product or service. This is done to gain a deeper understanding of user needs and preferences so that the development of information and systems can better meet their requirements. The representation of user personas for technician and customer users can be seen in Figure 4.

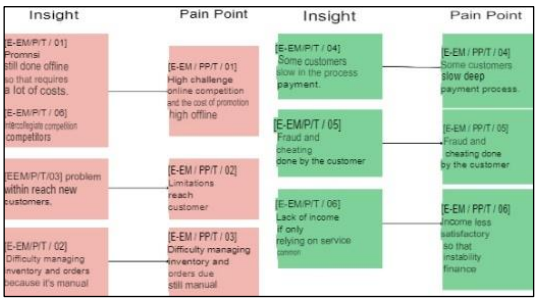

Figure 4. Pain Point

3.3. Ideate

The goal of the Ideate phase is to find solutions to the identified problems by involving both types of respondents. The solutions generated are outlined through the concepts of How Might We and User Flow.

3.3.1. How Might We

The first step in the Ideate phase involves presenting a solution based on the user persona and pain points defined earlier. The resulting How Might We (HMW) statements are shown in Figure 5.

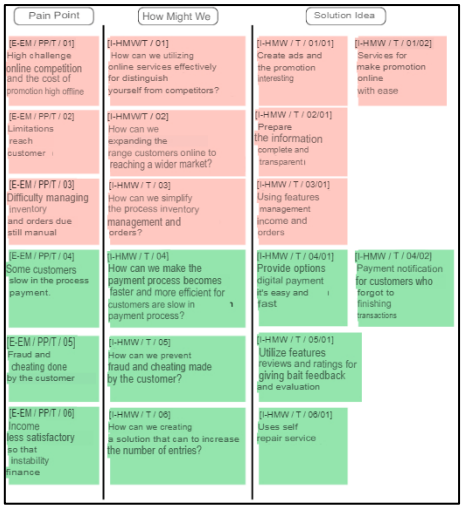

Figure 5. How Might We

3.3.2. User Flow

User flow represents the path of using the application, ensuring that target users, namely technicians and customers, can use the application more easily and efficiently. Figure 6 illustrates the user flow for technicians.

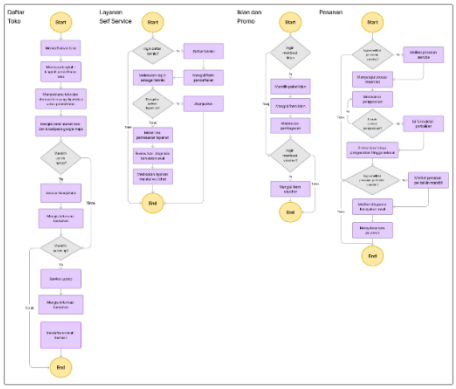

Figure 6. User Flow

3.4. Prototype

The fourth phase of the design thinking process is prototyping, which aims to implement the solutions planned earlier. This phase includes four stages: design system, low-fidelity wireframe, mid-fidelity wireframe, and high-fidelity wireframe.

3.4.1. Design System

The first stage of the prototype is the design system phase, which aims to ensure the design adheres to several design principles such as consistency and similarity. The design system in this research follows the atomic design method, which includes three components: Atoms, Molecules, and Organisms. Below are the results of the design system created:

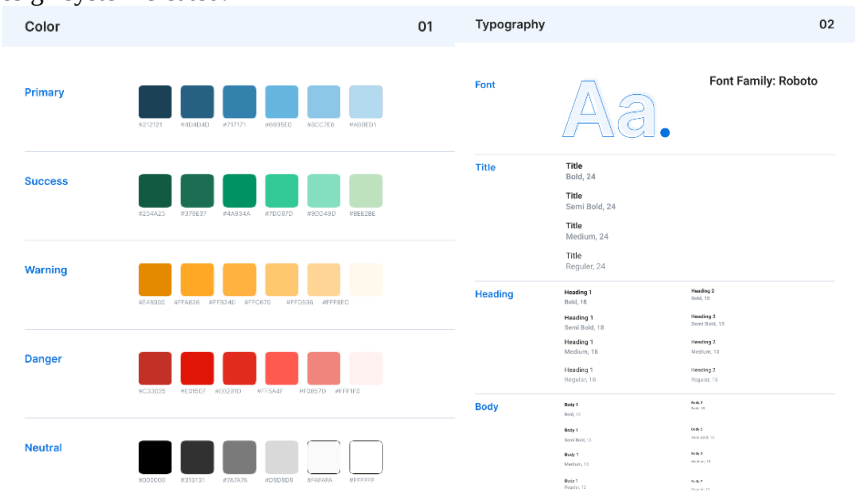

Figure 9. Design System

3.4.2. Low Fidelity Wireframe

The low-fidelity wireframe creation process is done using Figma, with sizes and layouts tailored to user needs and preferences, ensuring satisfaction with the end product.

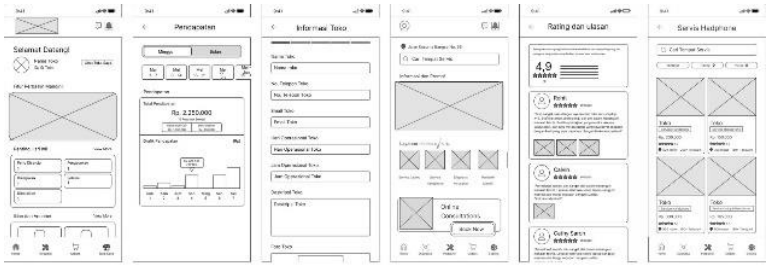

Figure 10. Low Fidelity Wireframe

3.4.3. High Fidelity Wireframe

The high-fidelity wireframe is a more detailed version of the low-fidelity wireframe. It adds higher visual detail and clarity, making it easier for users to see how the product will look and function.

Figure 11. High Fidelity Wireframe

3.5. Testing

The fifth stage in the design thinking approach is testing the prototype of the previously planned solution. Testing is crucial to ensure the designed solution meets user needs and expectations. Usability testing and heuristic evaluation will be conducted in this phase.

3.5.1. Usability Testing

a. Learnability

This stage tests the learnability aspect to evaluate how easily and intuitively users can use the Perbaikin application design. The learnability score for technicians was 70%, indicating success with good qualifications. The learnability score for customers was 66.67%, also indicating success with good qualifications.

b. Efficiency

Data were collected from tests conducted on the maze.co platform using the Overall Relative Efficiency formula. The following are the results of the Efficiency test:

$$Overall\ Relative\ Efficiency\ Technician = \frac{1322.13}{1734.31} x\ 100\% = 78{,}21\%$$

$$Overall\ Relative\ Efficiency\ Technician = \frac{973.335}{1635.92} x\ 100\% = 59{,}49\%$$

c. Memorability

This stage tests how well users remember information from the Perbaikin application design. The memorability score for technicians was 80%, indicating success with good qualifications. The memorability score for customers was 65%, also indicating success with good qualifications.

d. Error

Error test data were collected from the Maze.co platform. The error assessment results are shown in Tables 1 and Table 2.

Table 1. Error Technician

Task Code	Technician					Errors
	T1	T2	T3	T4	T5	
TT1	4	2	4	2	1	13
TT2	8	7	4	4	2	25
TT3	0	1	0	0	3	4
TT4	4	5	0	3	4	16
TT5	2	5	2	2	3	14
TT6	0	0	0	0	3	3
TT7	4	5	5	2	6	22
TT8	4	1	0	0	0	5
					Total	**102**

$$Defactive\ Rate = \frac{102}{50\ \text{x}\ 5} = \mathbf{0{,}408}$$

Table 1. Error Customer

Task Code	Customer					Errors
	T1	T2	T3	T4	T5	
TP1	4	2	0	2	5	13
TP2	5	3	3	7	1	19
TP3	2	10	1	4	4	21
TP4	4	4	5	7	9	29
TP5	3	4	7	5	8	27
TP6	0	0	0	1	1	2
TP7	0	1	0	0	0	1
TP8	0	1	0	0	2	3
TP9	0	1	0	3	1	5
					Total	**120**

$$Defactive\ Rate = \frac{120}{70\ \text{x}\ 5} = \mathbf{0{,}342}$$

e. Satisfaction

In this aspect, 30 respondents will be asked about their satisfaction. After completing the evaluation, they will be asked to provide ratings using the System Usability Scale (SUS) method. The satisfaction assessment results can be seen in Table 3.

Table 3. System Usability Testing

Respondent	SUS Questions										Mark (Amount* 2,5)
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	
R1	4	3	3	2	4	3	4	4	4	1	**80**
R2	4	4	3	3	4	4	2	3	3	1	**78**
R3	4	3	3	3	4	4	3	3	4	2	**83**
R4	3	3	4	4	4	2	3	3	3	3	**80**
R5	4	4	3	2	4	4	3	4	3	2	**83**
R6	3	4	4	2	4	4	4	4	4	4	**93**
R7	4	2	2	1	3	2	3	3	3	1	**60**
R8	3	3	3	4	2	3	4	3	2	4	**78**
R9	2	3	3	2	3	2	2	2	3	1	**58**
R10	3	3	3	3	3	2	3	2	3	2	**68**
R11	3	3	3	3	4	3	3	2	2	1	**68**
R12	3	2	2	2	3	2	2	3	2	1	**55**
R13	3	2	3	3	3	3	2	2	2	1	**60**
R14	2	2	3	2	3	3	2	2	2	1	**55**
R15	3	3	3	3	3	3	3	3	3	3	**75**
R16	3	1	2	2	3	3	2	3	3	1	**58**
R17	3	1	2	1	3	1	3	4	2	1	**53**
R18	2	2	2	1	3	3	2	2	3	1	**53**
R19	3	2	3	2	3	2	4	2	4	2	**68**
R20	3	3	4	1	4	3	4	3	4	4	**83**
R21	2	2	2	2	2	2	3	3	2	1	**53**
R22	3	3	4	3	3	1	3	3	1	0	**60**
R23	3	3	3	1	3	2	2	1	2	1	**53**
R24	3	2	3	3	3	1	4	2	2	2	**63**
R25	3	2	3	1	3	2	3	1	3	2	**58**
R26	3	3	2	2	4	3	2	2	1	2	**60**
R27	2	1	2	1	3	1	1	2	3	1	**43**
R28	3	3	3	3	3	3	3	3	3	3	**75**
R29	2	3	2	3	3	1	2	1	2	2	**53**
R30	3	2	2	2	3	3	2	2	3	1	**58**
										Average	**65,5**

$$Average\ Rating = \frac{1965}{30} = 65{,}5$$

3.5.2. Heuristic Evaluation

This heuristic evaluation test will be carried out by three experts in the same field to get more input to improve the design so that it is more optimal.

Figure 4. Heuristic Evaluation

Code	Severity Rating					
	Evaluator 1		Evaluator 2		Evaluator 3	
	T	C	T	C	T	C
H1	3	1	0	0	3	0
H2	0	0	0	0	0	2
H3	0	0	0	0	0	0
H4	0	0	0	0	0	0
H5	0	0	0	0	0	2
H6	0	0	0	0	0	0
H7	1	2	0	1	0	0
H8	1	1	0	0	0	0
H9	0	0	3	2	0	0
H10	0	0	4	0	0	0

3.6. Iteration 2

The iteration that occurs after the testing stage returns to the define stage is to reformulate the problems that arose during testing. After defining respondents who had difficulty or were unable to complete tasks in tasks TT3, TT4, TT7, TT9, TP2, TP4, and TP5, the analysis results were obtained in the form of pain points. Furthermore, from the problems obtained, you will get ideas for solutions through how might we. The solution ideas that have been found will be changed and implemented in a high fidelity wireframe design.

3.6.1. Define

After the testing phase, the iteration returns to the define stage in the design process of the Mobile and Laptop Marketplace Service Application to readdress the issues identified during testing. This return to the define stage allows for a clearer and more precise redefinition of the problems faced by users. Following the redefinition process, analysis of respondents who experienced difficulties or were unable to complete tasks during usability testing (specifically tasks TT3, TT4, TT7, TT9, TP2, TP4, and TP5) revealed pain points, as illustrated in Figure 4.139.

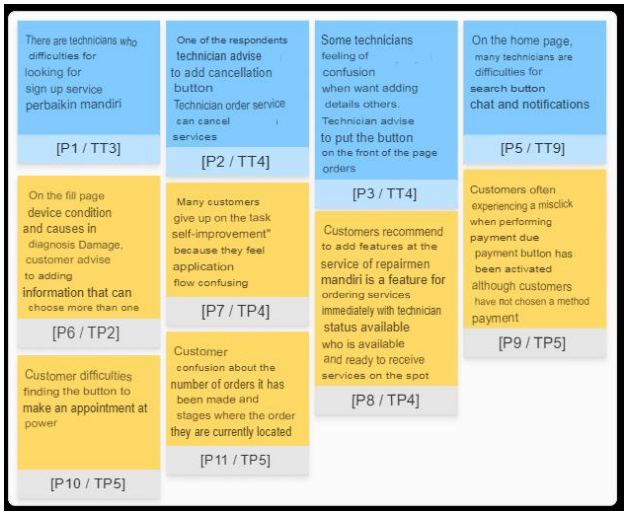

Figure 12. Define (2)

3.6.2. Ideate

After defining the problems in the define stage, the next step is the ideate stage, aimed at finding innovative solutions to the identified issues. In this stage, various ideas and concepts will be generated. The solutions generated will be elaborated through How Might We (HMW) concepts, which can stimulate new and innovative ideas. Subsequently, after HMW, the next step is creating solution ideas to produce alternative solutions that can address the identified problems. The implementation of HMW and solution ideas from usability testing can be seen in Figure 13.

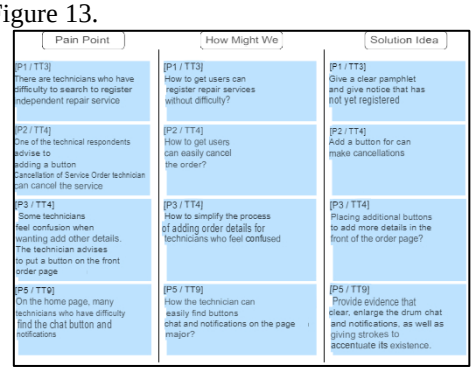

Figure 13. Ideate (2)

3.6.3. Prototype

The next step in the design process is to create a redesign of the previous design by integrating new solutions to address the problems faced by users. This redesign aims to enhance the performance and usability of the product or service being developed.

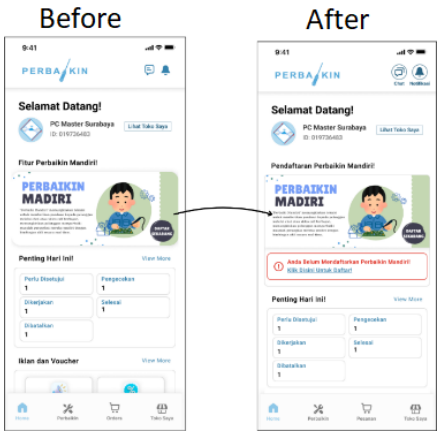

Figure 14. Prototype (2)

3.6.4. Testing

3.6.4.1. Usability Testing (2)

a. Learnability (2)

The results of the second evaluation score from the technician learnability aspect obtained a score of 96,6% which can be concluded as successful with very good qualifications. Meanwhile, the customer evaluation results obtained a score of 93,3% which can be concluded as successful with very good qualifications.

b. Efficiency (2)

The results of the second evaluation value from the technician efficiency aspect obtained a value of 98,63% which can be concluded as successful with very good qualifications. Meanwhile, the customer evaluation results obtained a score of 85,23% which can be concluded as successful with very good qualifications.

c. Memorability (2)

The results from the technician memorability aspect obtained a score of 95% which can be concluded as successful with very good qualifications. Meanwhile, the customer evaluation results obtained a score of 85% which can be concluded as successful with very good qualifications.

d. Error (2)

The results of calculating the defective rate for technicians in the second stage of error usability testing evaluation, with a value of 0,232 and for customers with a value of 0,202.

e. Satisfaction (2)

The results obtained from the respondent satisfaction aspect were 83,23. This value has entered acceptable and is included in the good category.

3.6.4.2. Heuristic Evaluation (2)

After improvements/iterations have been made to the design based on suggestions given by the evaluator, the second stage of heurisic evaluation testing is carried out. Evaluators 1, 2, and 3 gave a severity rating value on a scale of 0, which means there are no problems with usability.

4. CONCLUSION

The growing demand for smartphone and laptop repair services in Surabaya, coupled with the challenges faced by both users and service providers, underscores the need for innovative solutions. This research successfully addressed this need by designing a mobile application marketplace interface for repair services, prioritizing usability and user experience (UX).

The design thinking methodology proved instrumental in achieving this goal. By empathizing with users, defining the problem, ideating solutions, prototyping, and testing, the research culminated in an interface that significantly enhances usability and ease of use.

Rigorous evaluation through usability testing and heuristic evaluation, combined with iterative refinement, yielded positive results. Both technicians and customers reported high levels of learnability, efficiency, memorability, and satisfaction, with minimal error rates. The absence of significant usability issues, as confirmed by UI/UX experts, further validates the effectiveness of the design.

In conclusion, this research demonstrates the successful application of design thinking to create a user-centric solution for the smartphone and laptop repair industry. The resulting mobile application marketplace has the potential to streamline the repair process, improve customer satisfaction, and empower service providers in Surabaya and beyond. This study contributes to the growing body of knowledge on the importance of UX design and the effectiveness of design thinking in addressing real-world challenges. In the future, the results of this research can be used to develop better applications according to user experience.

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