

Design and User Experience Evaluation of Bersii Android-based Mobile Application User Interface

Mirza Ramadhani, Achmad Aqil Susanto, Fauzan Mustofa, Viana Salsabila Tauda

Abstract— The user interface has a substantial and influential role because it becomes a direct liaison between the application system and its users and shapes each user's perception of the Bersii application. Bersii application is created to reduce single-use plastic waste in Indonesia to build and increase public awareness of the importance of protecting the environment. The Bersii mobile application has features such as product refills to reduce the use of plastic waste. This paper designs the user interface (UI) of the Bersii mobile application for buying refill products. The user interface (UI) design results will be tested using usability and User Experience (UX). The usability test uses the System Usability Scale (SUS), and the UX test uses the User Experience Questionnaire (UEQ). The results of usability testing obtained a score of 79, which was included in the category "good". In each aspect of the UEQ test, it obtained the following scores: attractiveness 2,11, perspicuity 1,71, efficiency 1,98, dependability 1,89, stimulation 2,01, and novelty 1,45. Overall, the results of the UEQ testing were included in the category "good".

Index Terms— mobile application, plastic waste, user interface, user experience, usability.

I. INTRODUCTION

Garbage is a part of human life that is not easy to remove, and the waste found often is single-use plastic waste. This worrying condition needs to be addressed, so the Bersii application was created to reduce single-use plastic waste in Indonesia to build and increase public awareness of the importance of protecting the environment. This application contains the concept of refillable products that avoid excessive

plastic use and utilize the 3R principles, namely Reduce, Reuse and Recycle.

This research focuses on designing the user interface for the Bersii application. The user interface has a substantial and influential role because it becomes a direct liaison between the application system and its users[1] and shapes each user's perception of the Bersii application[2]. This aims to give an excellent initial impression for potential users, be able to compete with other competitors[3] and analyze the level of user satisfaction when using the Bersii application. The user interface that is built must adapt to the user's needs, which can be tested using the System Usability Scale (SUS) and the User Experience Questionnaire (UEQ).

In this paper, the UI design of the Bersii application is designed for the Android operating system. Bersii application design focuses and leads to a type of e-commerce where users can refill products quickly and easily. The Bersii application will be designed and implemented in the prototype stage, built to define user requirements. Because the ease and success of users using the application and performing their duties in the application properly will affect user satisfaction[4]. Therefore, it is necessary to consider user-friendly and user-oriented principles when designing an application[5].

II. LITERATURE REVIEW

A. Android OS.

Android is a mobile operating system. The application programming interface (API) provides access to hardware, mobile phone data, or system data itself[6]. Android does not distinguish between core apps and third-party apps.

Android is a Linux-based mobile device operating system that includes operating systems, middleware, and applications. Some other understandings of Android, namely:

1. It is an open-source platform for developers (programmers) to create applications.
2. It is an operating system purchased by Google Inc. from Android Inc.
3. Not a programming language, but only provides a living environment or run time environment called DVM (Dalvik Virtual Machine) that has been optimized

Manuscript received July 1, 2022. This work was supported in part by Computer Science Department of Bina Nusantara University.

Mirza Ramadhani is with the Computer Science Department of Bina Nusantara University, Malang, Indonesia (email mirza.ramadhani@binus.ac.id)

Achmad Aqil Susanto is with the Computer Science Department of Bina Nusantara University, Malang, Indonesia (email achmad.susanto@binus.ac.id)

Fauzan Mustofa is with the Computer Science Department of Bina Nusantara University, Malang, Indonesia (email fauzan.mustofa@binus.ac.id)

Viana Salsabila Tauda is with the Computer Science Department of Bina Nusantara University, Malang, Indonesia (email viana.tauda@binus.ac.id)

for devices with small memory systems[7].

B. User Interface

The user interface is part of the computer system users interact with to undertake their tasks and achieve their goals[8]. Designing user interfaces is a complex process requiring a detailed analysis of human performance and preferences[9].

When designing the user interface, it is necessary to follow specific guidelines. Here are The Eight Golden Rules of User Interface for creating an effective UI.

- Strive for consistency
- Cater to universal usability
- Offer informative feedback
- Design dialogs to yield closure
- Prevent error
- Permit easy reversal of action
- Support internal locus of control
- Reduce short-term memory

C. User Experience

User experience, or UX, is related to the user's behavior, attitude, and feeling about using a particular product, system, or service. The user experience highlights the valuable, emotional, experiential, and meaningful aspects of human-computer interaction and product ownership but also includes anyone's perceptions of practical elements such as usefulness, ease of use, and efficiency of the system. User experience is subjective because it is about a person's feelings and thoughts about the system. User experience is dynamic because it changes over time when conditions change[10].

The user experience elements[11]:

- Strategic: Strategy is the first step. In this step, the designer must understand what the audience expects of us and how to achieve that goal. We will find out the needs of the user (user needs) and the purpose of the product in this element.
- Scope: This element consists of two: functional specifications and content requirements. Functional specifications determine what features will be in the product, for example, cart features, payment method features, and others. Content requirements are descriptions of a set of content elements in the product, for example, maps, videos, images, illustrations, icons, buttons, and others.
- Structure: This element consists of interaction design and information architecture. Interaction design is where we define how the system responds to what the user does. Alternatively, we make user flow and interaction in this layer, such as swipe and scroll. Information architecture is how users process the information contained in our products/services.
- Skeleton: The skeleton plan is divided into three components: information design, interface design, and navigation design. Information design is how to manage the information, and information must be

displayed correctly so that users can understand the information more easily. Interface design is how to arrange interface elements to allow the user to start interacting with the functions or features of the product. Navigation design is how users can move from one page to another. Target in Skeleton layer is made a wireframe.

- Surface: This layer consists of sensory experience and has been in the form of high fidelity.

D. Heuristic Evaluation Method

Heuristic evaluation is a way of checking usability for computer software that helps identify usability problems in interface design (Jacob et al., 1994). Heuristic evaluation is also one of the most widely used methods to measure the user's comfort level in human and computer interaction (HCI).

The evaluation method used this time is the heuristic evaluation method, where this method is often used in general. This method serves to help identify and examine usability problems in interface design to determine the suitability of interface design. Nielsen and Molich proposed Heuristic Evaluation, almost the same as Cognitive Walkthrough, but is a little more structured and directed. This approach identifies a set of usability criteria or heuristics, and the design is carried out as, e.g., where those criteria are violated.

The purpose of heuristic evaluation is to improve the design effectively. The evaluator evaluates the performance of a series of tasks by design and sees their suitability with the criteria for each level. This process is carried out by UI/UX experts/evaluators to detect problems. If any errors are detected, the design can be reviewed to fix the problem before entering the next implementation level. Heuristic evaluation is very good when used as a design evaluation technique, and this is because it is easier to find or determine usability problems that arise[12].

E. Usability Testing

Usability testing means testing for efficiency, ease of learning, and ability to remember how to perform interactive tasks without difficulty or error" (Badre, 2002). Usability Testing is a technique used in user-centered interaction design to evaluate a product by testing it on users[13].

The development of an application can be directed according to the needs and user experience when using the previous application. Because basically, each testing approach has different goals, time, and resources[14]. This can be seen by providing direct input on how users use or access the system. Usability testing measures the usability or ease of using a particular object or set.

F. Prototyping

Prototyping is a software development method that uses an approach to make designs quickly and gradually so potential users can immediately evaluate them. In addition, prototyping is widely used to introduce the user interface at the final stage to the public.

According to Rosa A.S., Prototyping is a version of a potential system that gives developers and potential users an idea of how the system will function in its finished form. The prototype allows developers and users to interact during the manufacturing process so that a developer can easily model the software to be made[15]. Using this prototyping method, developers and clients can interact with each other during the prototyping process of the system.

G. System Usability Scale (SUS)

The System Usability Scale (SUS) is a questionnaire that can measure the usability of a computer system according to the user's subjective point of view. John Brooke developed SUS in 1986[16]. Until now, SUS has been widely used to measure usability and has advantages. System Usability Scale (SUS) is a questionnaire that can measure the usability of a computer system according to the user's subjective point of view. The SUS is in the form of a questionnaire consisting of 10 question items. When performing SUS calculations using a 5-point Likert scale.

Respondents were asked to rate the ten items in the SUS statement according to their subjective assessment. According to Brooke, the SUS questionnaire can measure the level of user satisfaction with a product. Calculating the score on the SUS has its own rules. For odd-numbered questions, the score answered on the questionnaire is reduced by 1 (equation 1). For even questions, subtract 5 (equation 2). Then all scores are added up and multiplied by 2.5 (equation 3). The range of the questionnaire values is 0-100. The mean SUS score is 68, and SUS score above 68 means satisfied.

H. User Experience Questionnaire (UEQ)

UEQ is part of the classic usability test to get a comprehensive impression of UX from the usability and experience aspects[17]. UEQ allows rapid assessment of the user experience of interactive products[18]. In other words, UEQ measures technical and nontechnical aspects related to the user's emotion or perception of pleasure[19].

UEQ has complete aspects, namely attractiveness, pragmatic quality, and hedonic quality, which are the advantages of UEQ compared to other tools. In addition, the availability of a template in the form of an Excel format data analysis tool to measure UX makes it easy to use the UEQ measuring tool[20]. The results of the UEQ measurement can be used as a reference for improving the quality of the user interface[21].

I. Evaluation

Evaluation is a planned activity that collects information about how something works, and then the information is used to determine the suitable alternative when someone makes a decision. The main function of evaluation, in this case, is to provide helpful information for the decision-maker to determine the policy to be taken based on the evaluation that has been done[22].

When everyone has succeeded in doing his job, he will undoubtedly judge whether what he did was in accordance with his original wishes. Something of value can be information about a particular program, production, and alternative procedures. Therefore, evaluation is not new in human life because it always accompanies one's life.

J. 3R (Reduce, Reuse, Recycle)

In managing waste, the thing that is familiar to do is 3R (Reduce, Reuse, Recycle). According to the Regulation of the Minister of Environment Number 13 of 2012, reduce, reuse, and recycle activities or limit, reuse, and waste recycling, hereinafter called 3R activities, are all activities that can minimize everything that can cause waste, waste reuse activities that are worthy of use for the same function or other functions, and the activity of processing waste to be used as a new product.

City waste management that prioritizes 3R needs to be supported to reduce the amount of waste. Future waste management patterns reduce the volume of garbage dumped into landfills by further intensifying the 3R program[23].

III. METHODOLOGY

A. Tools and Materials

1. Stationery for making UI storyboards
2. UX Questionnaire using UEQ
3. Usability questionnaire using SUS
4. Figma and Axure applications to design wireframes, mockups, and UI prototypes

B. Research Flow

The flow of research was carried out in designing the UI design of the Bersii application.

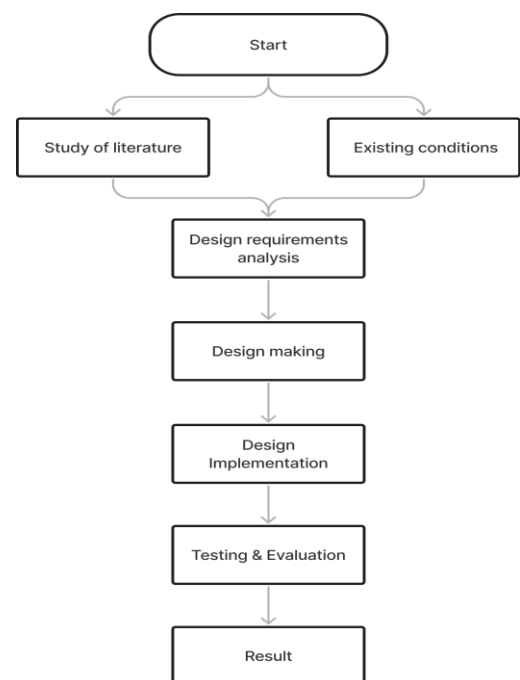


Fig. 1. Research Flow

C. Data Collection

In collecting this data, we tested the Bersii application prototype using the System Usability Scale (SUS) and the User Experience Questionnaire, which would be given to respondents later. The determination of the number of respondents to the problems tested is close to the level of certainty, namely 95%[24]. Respondents involved included adolescents and adults with an age range of 15-50 years. This data collection was done using a random sampling technique.

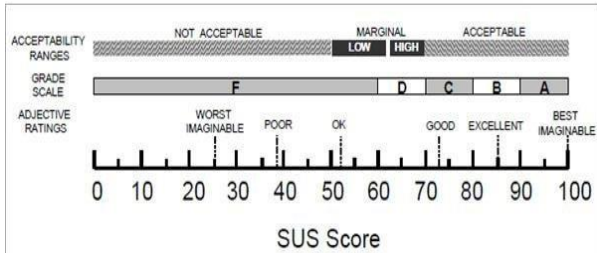


Fig. 2. SUS Score Scale

Meanwhile, the System Usability Scale (SUS) has ten-question components and five answer options, ranging from the option of disagreeing to the choice of strongly agreeing. Besides that, it also has a minimum score of 0 and a maximum of 100. The average score of SUS from several studies is 68, so if there is a SUS value above the number 68, it will be considered above the average, while if the SUS value is below the number 68, it will be considered below the average[25] as shown in figure 2 The following components of the SUS question will be used in the Bersii application in Table 1.

Table 1. SUS Question

No.	Component
1	I think that I would like to use this system frequently
2	I found the system unnecessarily complex
3	I thought the system was easy to use
4	I think that I would need the support of a technical person to be able to use this system
5	I found the system very cumbersome to use
6	I thought there was too much inconsistency in this system
7	I would imagine that most people would learn to use this system very quickly
8	I found the system very cumbersome to use
9	I felt very confident using the system
10	I needed to learn a lot of things before I could get going with this system

The sampling was taken using a random sampling technique. According to Sugiyono [26], the random sampling technique is simple because sample members from the population are taken randomly without seeing and paying attention to the similarities or strata that exist in the population. This technique is used if the members of the population are considered homogeneous.

Table 2. Likert Scale Questions

annoying	000000	Enjoyable
not understandable	000000	Understandable
creative	000000	Dull
easy to learn	000000	difficult to learn
valuable	000000	inferior
boring	000000	exciting
not interesting	000000	interesting
unpredictable	000000	predictable
fast	000000	slow
inventive	000000	conventional
obstructive	000000	supportive
good	000000	bad
complicated	000000	easy
unlikable	000000	pleasing
usual	000000	leading edge
unpleasant	000000	pleasant
secure	000000	not secure
motivating	000000	demotivating
meets expectations	000000	doesn't meet expectations
inefficient	000000	efficient
clear	000000	confusing
impractical	000000	practical
organized	000000	cluttered
attractive	000000	unattractive
friendly	000000	unfriendly
conservative	000000	innovative

The System Usability Scale (SUS) uses a Likert scale. The ease of use of the Likert scale makes this scale more widely used by researchers[27]. This Likert scale uses several statement items, which can be seen in Table 2 with a scale of 1 to 5 points of choice addressed to the respondents. It aims to measure the behavior of each individual on each question item with a 5-point scale of choice, namely strongly agree, agree, quite agree, disagree, and strongly disagree, which is attached in Table 3.

Table 3. Likert Scale Questions

Option	Weight
Strongly Agree	5
Agree	4
Quite Agree	3
Disagree	2
Strongly Disagree	1

This UEQ evaluation is carried out to users of the Bersii application in the form of a prototype that can be accessed directly. The questionnaire created will be given to several users by considering the requirements of the UEQ respondents[28]. User Experience measurement is carried out to know Bersii App users' experience.

This analysis yielded the final questionnaire with 26 items arranged into six scales[29]:

- Attractiveness: The overall impression of the product. Do users like it or not? Is it interesting, fun, or enjoyable?
- Perspicuity: Is it easy to get to know the product? Is it easy to learn? Is the product easy to understand and unambiguous?
- Efficiency: Can users complete their tasks without unnecessary effort? Is the interaction efficient and fast? Does the product react to user input quickly?
- Dependability: Does the user feel in control of the interaction? Can he predict the behavior of the

system? Do users feel confident when working with the product?

- Stimulation: Is using the product interesting and motivating? Is it fun to use?
- Novelty: Is the product innovative and creative? Does it catch the user's attention?

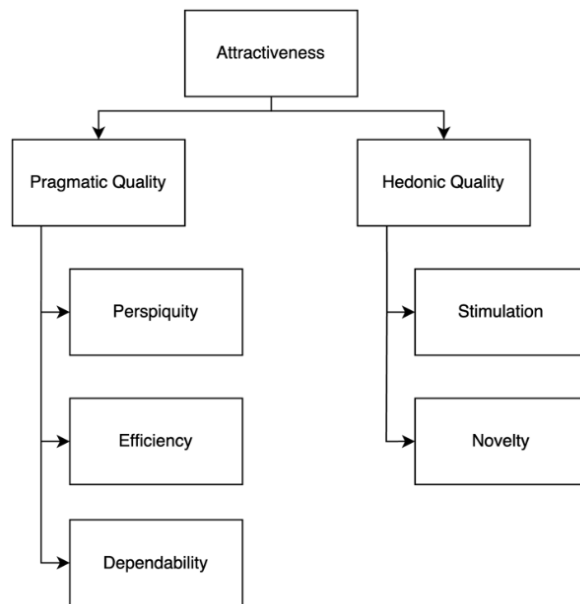


Fig. 3. Assumed scale structure of the UEQ

The concept of the UEQ scale structure used to measure user experience is shown in Figure 3[30]. Attractiveness is a pure valence dimension (emotional reaction to a pure acceptance/rejection dimension). Perspicuity, Efficiency, and Dependability are aspects of pragmatic quality, i.e., they describe the quality of interaction related to the task or goal that the user wants to achieve while using the product. Stimulation and Novelty are hedonic quality aspects that are not related to tasks and goals but describe aspects related to pleasure or pleasure when using the product.

IV. RESULT

A. Design Needs Analysis

The target users of this Bersii application are students, housewives, and workers. However, in general, household needs are in great demand by homemakers. Bersii makes category boundaries for the application category, including cooking oil, soap, shampoo, and detergent. The UI design of the developed application allows users to perform the following five features.

- 1) Purchasing refills: The Bersii application has its main feature, namely refills, which provide a variety of refill product needs. Customers can directly access the application to refill products according to their needs. Available categories can be viewed periodically.
- 2) View order history: Users can check the history of previous orders and refill product order activities and can view orders that have been completed.

- 3) Chat: Customers can chat with the driver of the Bersii application to find out where their order is.
- 4) Cart: In the cart section, customers can see refilled products added to the cart. Customers can also add products, delete products, and edit products.
- 5) Payment for refill products: In every purchase of refill products, customers will make payments by cash on delivery or scan barcodes to make payments.

B. Design Making

The design stage of the UI design of the Bersii application starts with making a wireframe design. This wireframe design is an initial design that describes the UI form of the application before proceeding to the mockup and prototyping design stage. The outline designed on a wireframe is usually known as a blueprint. The wireframe concept aims to convey the arrangement, layout, structure, navigation, and organization. This is useful to make it easier for a developer to work on developing the structure of the application being built. Here is the wireframe design for the Bersii application in Figure 4.

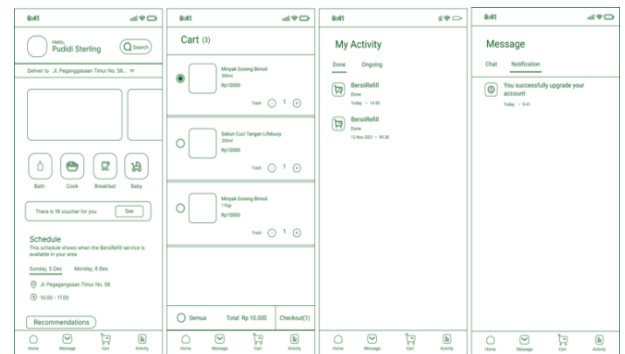


Fig. 4. Wireframe of Bersii App

At the next stage of designing the UI design of the Bersii application, the mockup design is categorized as low fidelity. Overall, the mockup provides an overview and perspective that looks more realistic. This makes mockups an important and helpful tool when designing a product. The following is a mockup design of a Bersii mobile application shown in Fig. 5.

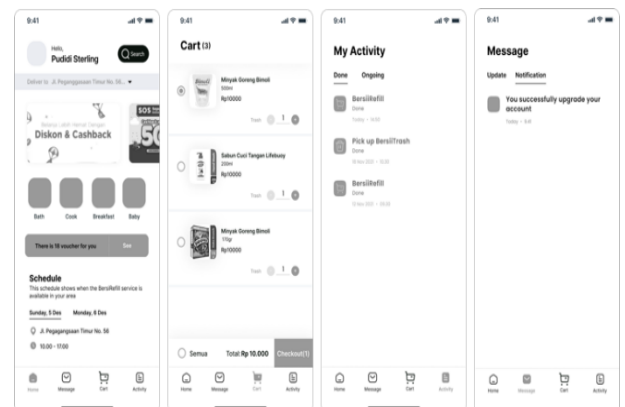


Fig. 5. Mockup of Bersii App

C. Design Implementation

At the next stage of designing the UI design of the Bersii application, the prototyping design is categorized as high fidelity. The following is the display of the Bersii mobile application UI prototype shown in Fig. 6.

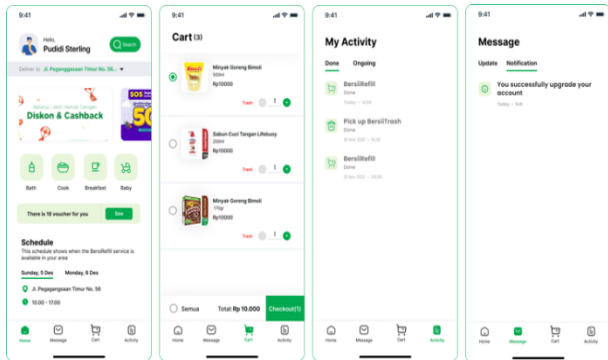


Fig. 6. User Interface of Bersii App

D. Design Testing Result

User experience measurement using UEQ is done online using Typeform. Question points refer to the UEQ User Experience Questionnaire list, which is available online. UEQ was distributed to several respondents, of which 20 respondents were obtained. The results of the UEQ distribution of the questionnaire can be seen in Figure 7.

Items																										
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
7	7	1	1	1	7	7	4	1	4	7	1	7	7	6	7	1	1	1	7	1	7	1	1	1	1	7
6	5	2	2	1	5	7	5	2	2	7	1	6	6	5	6	2	2	2	2	2	2	6	2	3	2	4
7	7	1	1	1	7	7	7	1	2	7	1	6	6	7	7	1	2	1	7	1	6	2	3	2	7	
5	3	3	5	1	5	6	4	2	5	6	1	4	5	3	5	2	4	2	5	6	6	1	3	5	3	
6	7	2	2	1	7	7	6	2	6	6	1	6	6	6	7	2	1	2	6	2	6	2	2	7		
5	6	4	3	3	5	5	4	5	5	3	5	6	4	6	3	3	2	6	2	6	2	2	2	5		
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
7	4	7	7	1	7	2	4	5	1	7	3	5	7	1	7	6	1	5	7	1	6	1	4	1	7	
7	7	1	1	1	7	7	7	1	1	7	1	7	7	7	7	1	1	1	7	1	7	1	1	1	7	
5	4	3	4	2	3	5	4	3	4	7	1	3	4	5	6	3	3	4	5	4	5	4	3	3	4	
6	7	5	7	6	5	6	5	5	4	5	2	4	5	4	5	4	3	2	3	5	5	3	4	4	5	
6	7	2	1	2	5	5	6	3	3	5	2	6	5	5	6	3	4	3	6	2	6	2	2	2	6	
1	7	1	1	1	7	7	7	1	1	7	1	7	7	7	7	1	1	1	7	1	7	1	1	1	7	
7	7	1	1	1	7	7	7	1	2	7	1	7	7	7	7	1	1	1	7	1	6	1	2	2	7	
7	5	1	1	1	7	7	7	3	6	7	1	7	7	7	7	1	1	1	7	1	7	1	1	1	7	
7	7	1	1	1	7	7	7	1	1	7	1	7	7	7	7	1	1	1	7	1	7	1	1	1	7	
6	5	2	2	2	5	6	5	1	2	6	2	5	6	6	6	2	2	2	6	1	6	2	2	2	6	
6	6	5	4	2	5	5	4	3	3	5	3	4	5	5	6	2	2	2	6	2	6	2	1	2	5	
7	7	7	7	7	7	7	7	1	7	1	7	7	7	7	7	1	1	7	1	7	1	1	1	1	7	
7	7	1	1	1	7	7	7	1	2	7	1	7	7	7	7	1	1	1	7	1	7	1	1	1	7	

Fig. 7. UEQ Response Data

Figure 7 is a captured data table provided by 20 respondents. The data is data that has been selected based on the level of consistency. The data in figure 7 is then transformed to determine each item's negative and positive values. The data from the transformation can be seen in figure 8.

Items																										
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
3	3	3	3	3	3	3	0	3	0	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3	3
2	1	2	2	3	1	3	1	2	2	3	2	2	1	2	2	2	2	2	2	2	2	2	2	1	2	0
3	3	3	3	3	3	3	3	3	2	3	3	2	2	3	3	2	3	3	3	3	3	2	2	1	2	3
-1	-1	-1	-1	3	1	2	0	2	-1	2	3	0	-1	-1	1	2	0	2	1	-2	2	3	1	-1	-1	-1
2	3	2	2	3	3	3	2	2	-2	2	3	2	2	2	3	2	3	2	2	2	2	2	2	2	2	3
1	2	0	1	1	1	1	1	0	-1	1	1	1	2	0	2	1	1	2	2	2	2	2	2	2	2	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	-3	-3	3	3	-2	0	-1	3	3	1	1	3	-3	-2	3	-1	3	3	2	3	2	3	0	3	3
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
1	0	1	0	2	-1	1	0	1	0	3	3	-1	0	1	2	1	1	0	1	0	1	0	1	0	1	0
2	3	-1	-3	-2	1	2	1	-1	0	1	2	0	1	0	1	0	1	2	-1	-1	1	1	0	0	0	1
2	3	2	3	2	1	1	2	1	1	2	1	1	2	1	0	1	2	2	2	2	2	2	2	2	2	2
-3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	2	3	3
3	1	3	3	3	3	3	3	-2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
2	1	2	2	2	1	1	3	2	2	1	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2
2	2	-1	0	2	1	1	0	1	1	1	0	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
3	3	-3	-3	-3	3	3	-3	3	3	3	3	3	3	-3	3	3	3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Fig. 8. UEQ Response Transformation Data

Result of the average, variance, and standard deviation for the 26 UEQ items can be seen in Figure 9.

Item	Mean	Variance	Std. Dev	No.	Left	Right	Scale
1	2,0	2,2	1,5	20	annoying	enjoyable	Attractiveness
2	2,0	1,8	1,4	20	not understandable	understandable	Perspicuity
3	1,3	4,0	2,0	20	creative	dull	Novelty
4	1,2	4,9	2,2	20	easy to learn	difficult to learn	Perspicuity
5	2,0	3,1	1,7	20	valuable	inferior	Stimulation
6	2,0	1,6	1,3	20	boring	exciting	Stimulation
7	2,1	1,8	1,4	20	not interesting	interesting	Stimulation
8	1,6	1,7	1,3	20	unpredictable	predictable	Dependability
9	1,6	3,1	1,8	20	fast	slow	Efficiency
10	1,1	2,9	1,7	20	inventive	conventional	Novelty
11	2,3	1,0	1,0	20	obstructive	supportive	Dependability
12	2,4	0,9	0,9	20	good	bad	Attractiveness
13	1,7	1,8	1,3	20	complicated	easy	Perspicuity
14	2,1	1,1	1,1	20	unlikable	pleasing	Attractiveness
15	1,5	2,8	1,7	20	usual	leading edge	Novelty
16	2,4	0,8	0,9	20	unpleasant	pleasant	Attractiveness
17	1,6	3,0	1,7	20	secure	not secure	Dependability
18	2,1	1,3	1,1	20	motivating	demotivating	Stimulation
19	2,1	1,4	1,2	20	meets expectations	does not meet expectations	Dependability
20	2,0	2,2	1,5	20	efficient	inefficient	Efficiency
21	2,0	2,3	1,5	20	clear	confusing	Perspicuity
22	2,2	0,7	0,8	20	impractical	practical	Efficiency
23	2,3	0,9	1,0	20	organized	cluttered	Efficiency
24	1,9	1,3	1,1	20	attractive	unattractive	Attractiveness
25	2,0	1,4	1,2	20	friendly	unfriendly	Attractiveness
26	2,0	1,8	1,4	20	conservative	innovative	Novelty

Fig. 9. Average, Variants And Standard Deviation

The value of each item has a range above 1. The assessment shows that each question item has a value in the good category. The data in the figure becomes a reference for calculating the six scales. Furthermore, the analysis will be carried out, and conclusions will be drawn from the largest and smallest scale of UEQ. Each of these scales has several questions on the 26 items. The calculated scale is to find the average value.

The result data that have been transformed are then grouped based on six scales. The six scales include attractiveness, perspicuity, efficiency, dependability, stimulation, and novelty. The six scales can be seen in Figure 10.

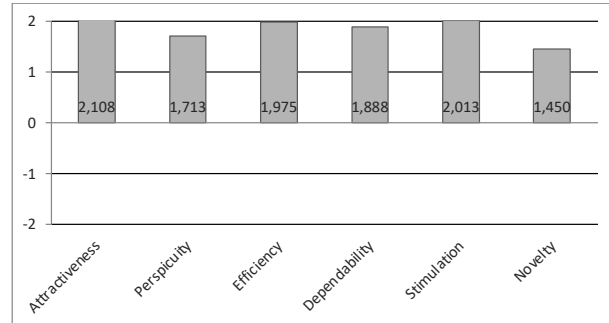


Fig. 10. Six-Scale Average Score Chart

Based on Figure 11, it can be seen clearly that all the scales are at the green boundary. This shows that the overall measurement scale is at a level that is categorized as good. The components of the scale are attractiveness, perspicuity, efficiency, dependability, stimulation, and novelty. The best rating is on the attractiveness element, while the lowest rating is on the novelty element.

The value of the attractiveness component is seen in the items that are enjoyable, good, unlikable, pleasant, attractive, and friendly. All attractiveness items get scores above 1, which are included in the good level category. Based on the questionnaire, the attractiveness component of the item with the best score was good and pleasant, while the lowest item was attractive. In the novelty component, value is based on creative, inventive, leading edge, and innovative items. Based on

the questionnaire, the novelty component of the item that gets the best score is innovative while the lowest item is inventive.

Based on the questionnaire, the six scales can be processed to determine the pragmatic and hedonic qualities of the evaluated application. Pragmatic qualities consist of perspicuity, efficiency, and dependability, while stimulation and novelty are part of hedonic qualities. Its structure can be seen in Figure 3. The assessment for attractiveness, pragmatic quality, and hedonic can be seen in Table 4.

Table 4. Pragmatic and Hedonic Quality of Bersii App

Pragmatic and Hedonic Quality	
Attractiveness	2,11
Pragmatic Quality	1,86
Hedonic Quality	1,73

The table shows three qualities: attractiveness, pragmatic quality, and hedonic quality. From these three qualities, it can be seen that attractiveness occupies the highest rank with a value ranging from 2.11, which is included in the good category—then followed by pragmatic quality with a value of 1.86 and hedonic quality with a value of 1.73. The diagram can be seen specifically in Figure 11.

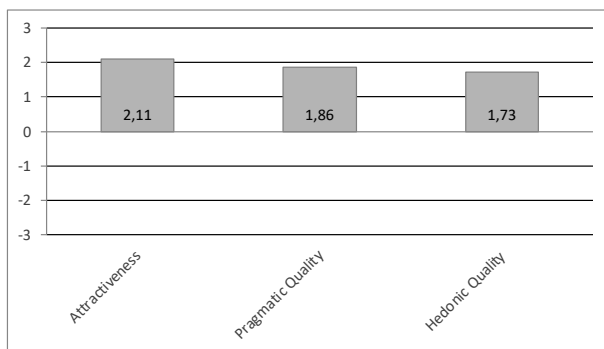


Fig. 11. Attractiveness, Pragmatic Quality, and Hedonic Quality Average

The diagram that can be seen in Figure 11 shows the ratings given for attractiveness, pragmatic and hedonic qualities. All these assessments provide results that fall into the good category. It can be seen that the attractiveness component in the bar chart is in the dark green area, which means that it represents a excellent rating. Meanwhile, pragmatic and hedonic qualities enter the light green area, which means that they represent good rating.

In addition, another analysis carried out and used is benchmark analysis. This analysis compares the

evaluation of this study with similar studies that have been reported on UEQ online. Benchmarks for the user experience of the Bersii application can be seen in Table 5 and Figure 12.

Table 5. UEQ Benchmark Evaluation of Bersii App

Scale	Mean	Comparison to benchmark
Attractiveness	2,11	Excellent
Perspicuity	1,71	Above Average
Efficiency	1,98	Excellent
Dependability	1,89	Excellent
Stimulation	2,01	Excellent
Novelty	1,45	Good

Table 5 shows the position of the Bersii application's UEQ assessment compared to similar studies. Table 5 shows that the highest value position is on the attractiveness scale, and the lowest is on the novelty scale.

The assessment form is then made into a diagram to facilitate the observation of the assessment of each scale. The benchmark diagram for the Bersii application can be seen in Figure 12. Figure 12 shows the Bersii Application assessment benchmark. Based on Figure 9, four classes have excellent scores, and two classes have good scores. Excellent value is owned by the components of attractiveness, efficiency, Dependability and Stimulation. At the same time, the two components that fall into the good category are perspicuity and novelty.

Usability testing was carried out using the SUS questionnaire given to 10 respondents. From the data obtained from the SUS questionnaire, calculations were then carried out according to the procedures in the SUS data analysis. The data from the SUS calculation are shown in Table 6.

Table 6. SUS Calculation Result Data

ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	SUS RAW Score	SUS Score
R1	5	1	5	1	5	1	5	1	5	1	40	100
R2	5	1	5	1	5	1	5	1	5	1	40	100
R3	3	1	5	1	5	3	5	1	5	3	34	85
R4	5	5	5	5	5	5	5	5	5	5	20	50
R5	4	3	4	2	4	2	3	3	4	3	26	65
R6	4	2	4	2	4	2	4	1	4	3	30	75
R7	5	2	4	2	4	2	4	2	4	4	29	73
R8	5	1	5	1	5	1	5	1	5	2	39	98
R9	3	3	5	5	5	3	5	3	5	5	24	60
R10	5	5	4	1	4	2	5	1	5	1	33	83
SUS Score Average												79

However, in using SUS, there are several rules for calculating the SUS score, such as:

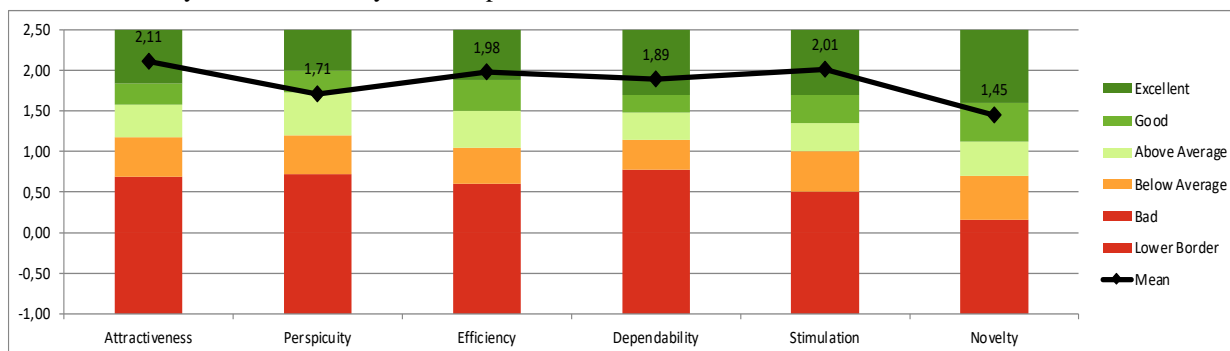


Fig. 12. UEQ Benchmark of Bersii App

- 1) Each question has an odd number, and the score of each question obtained from the user's score will be reduced by 1.
- 2) Each question has an even number, then the final score is obtained, and then the number 5 is reduced by the question score obtained from the user.
- 3) The SUS score is obtained from the scores sum for each question which is then multiplied by 2.5.

In the calculation rules, each score obtained applies to one respondent. For the following calculation, the SUS score of each respondent needs to be found the average score by adding up all the scores and dividing by the total number of respondents. To calculate the SUS score, here is the formula:

$$\bar{x} = \frac{\sum x}{n} \quad (1)$$

Description:

$$\bar{x} = \text{Average Score}$$

$$\sum x = \text{Total SUS Score}$$

$$n = \text{Total Respondent}$$

From the data from the SUS calculation with 10 respondents, an average score of 79 is obtained. In the SUS calculation rules, when viewed from the average SUS score according to general guidelines on SUS interpretation, the average score of 79 falls into class B. This shows that the results of the UI design of the Bersii application prototype are classified as above average scores. Furthermore, the SUS score obtained compared with the benchmark SUS score in Figure 2. From the results, the SUS score for the UI design of the Bersii application prototype received an assessment in the "Good" category. The results of the SUS score are shown in Figure 14.

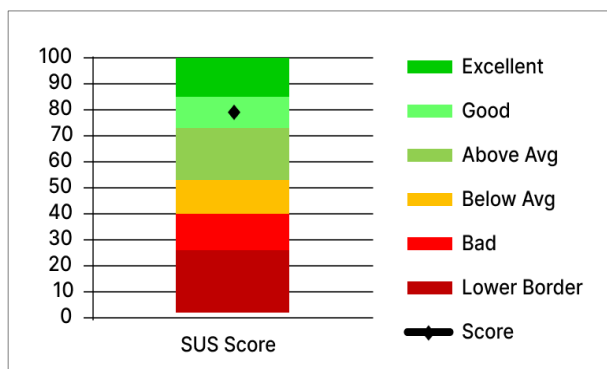


Fig. 13. SUS Score Result

V. CONCLUSION

Based on the analysis of the Bersii application design that has been produced in the results and discussion section, a conclusion can be given. Of the 26 items of UEQ questions grouped into six classes. The assessment of the six classes received scores on aspects of attractiveness 2.11, perspicuity 1.71, efficiency 1.98, dependability 1.89, stimulation 2.01 and novelty 1.45. Then the results of usability testing get an average score

of 79. Based on this, the Bersii application design is able to meet the SUS and UX assessment standards so that the user experience experienced by Bersii application users can be said to be good.

REFERENCES

- [1] N. W. I. Abu, A. Son, H. Olt, N. W. I. Abu, A. Son, and H. Olt, "User Interface Design for Situation-aware Decision Support Systems," *IDEAS Res. Inst.*, 2012.
- [2] Roger S. Pressman and B. R. Maxim, *Software Engineering a Practitioner's Approach*, 9th ed. New York: McGraw-Hill Higher Education (International). [Online]. Available: <https://bookshelf.vitalsource.com/books/9781260569650>
- [3] M. Multazam, "Perancangan User Interface dan User Experience pada Placeplus menggunakan pendekatan User Centered Design," *Univ. Islam Indones.*, vol. 1, p. 8, 2020.
- [4] A. Anggie, "EVALUASI USER INTERFACE PADA APLIKASI E-COMMERCE (STUDI KASUS INFORMA DAN IKEA)," *Pemodelan Arsit. Sist. Inf. Perizinan Menggunakan Kerangka Kerja Togaf Adm*, vol. 4, no. 1, p. 113, 2018.
- [5] R. Guntupalli, "User interface design: methods and qualities of a good user interface design.," *Softw. Eng. 2008*, p. 37, 2008, [Online]. Available: www.hv.se
- [6] S. N. Anwar, I. Nugroho, and E. Lestariningsih, "Perancangan Dan Implementasi Aplikasi Mobile Semarang Guidance Pada Android," *J. Teknol. Inf. Din.*, vol. 20, no. 1, pp. 148–158, 2015.
- [7] "Semua Bisa Menjadi Programmer Android Case study - Ir. Yuniar Supardi - Google Buku." <https://books.google.co.id/books?id=ouVyDwAAQBAJ&pg=PR4&pg=PR4&dq=Supardi,+Yuniar.+2014.+Semua+Bisa+Menjadi+Programer+Android#v=onepage&q=Supardi%2C+Yuniar.2014.+Semua+Bisa+Menjadi+Programer+Android&f=false> (accessed Apr. 11, 2022).
- [8] D. Sriram, *Designing the user interface: Strategies for effective human-computer interaction*, vol. 2, no. 2. 1987. doi: 10.1016/0954-1810(87)90189-0.
- [9] Vatsal Sharma and Ankit Kumar Tiwari, "A Study on User Interface and User Experience Designs and its Tools," *World J. Res. Rev. (WJRR)ISSN2455-3956*, vol. 12, no. 6, pp. 41–44, 2021, [Online]. Available: <https://www.iso.org/obp/ui/#iso:std:iso:9241:-11:ed-1:v1:en>.
- [10] J. Salam, A. Siraj, and R. M. M. Ibrahim, "The Importance of Linking User Experience Design with Graphic Design to Produce Interactive Applications (an Example of an Application on Smartphones)," *Comput. Sci.*, vol. 2012, no. 2, pp. 3–4, 2021, [Online]. Available: <https://doi.org/10.1007/s12666-019-01582-7> <https://doi.org/10.1007/s11837-020-04451-7> <https://dx.doi.org/10.1016/j.mineng.2015.10.002> <https://dx.doi.org/10.1016/j.mineng.2020.106488> <https://www.industry>
- [11] J. J. Garrett, *The elements of user experience*, 2nd ed., vol. 10, no. 5. Berkeley: New Riders, 2011. doi: 10.1145/889692.889709.
- [12] P. Krisnayani, K. Resika Arthana, and G. Mahendra Darmawangsa, "Analisa Usability Testing Pada website Menggunakan Metode Heuristic Evaluation," *Kumpul. Artik. Mhs. Pendidik. Tek. Inform.*, vol. 5, no. 1, p. 98, 2016.
- [13] M. S. Hartawan, "Analisa User Interface untuk Meningkatkan User Experience Menggunakan Usability Testing pada Aplikasi Android Pemesanan Test Drive Mobil," *J. Teknol. Inf. ESIT, Univ. Krisnadwipayana*, vol. 14, no. 2, pp. 46–52, 2019.
- [14] G. B. Segura, *Handbook of Usability Testing*, 2nd ed., vol. 17, no. 2. Indianapolis: Wiley Publishing, Inc., 2008.
- [15] S. Butsianto and E. N. Arifin, "PENGEMBANGAN SISTEM INFORMASI PENJUALAN BERBASIS WEB MENGGUNAKAN METODE PROTOTYPING PADA TOKO BAY STICKER," *J. Tek. Inform.*, vol. 10, p. 275, 2020. doi: 10.35393/1730-006-002-014.
- [16] J. Brooke, "SUS: A 'Quick and Dirty' Usability Scale," *Usability Eval. Ind.*, no. November 1995, pp. 207–212, 2020. doi: 10.1201/9781498710411-35.
- [17] H. Santoso, M. Schrepp, R. Y. Kartono Isal, A. Yudha Utom, and B. Priyogi, "Measuring the User Experience," *J. Educ.*

- Online*, vol. 13, no. 1, 2016, doi: 10.9743/jeo.2016.1.5.
- [18] A. Sularsa and A. S. Prihatmanto, "Evaluasi User Experiences Produk iDigital Museum dengan Menggunakan UEQ," *J. Teknol. Inf.*, vol. 2, no. 2, pp. 56–62, 2015.
- [19] V. Intanny, I. Widiyastuti, M. Dolorosa, and K. Perdani, "Pengukuran Kebergunaan dan Pengalaman Pengguna Marketplace Jogjaplaza . id dengan Metode UEQ dan USE Questionnaire," *Pekommas*, vol. 3, no. 2, pp. 117–126, 2018, [Online]. Available: <https://media.neliti.com/media/publications/267627-measuring-usability-and-user-experience-a292205a.pdf>
- [20] Kharis, P. I. Santosa, and W. W. Winarno, "Evaluasi User Experience pada Sistem Informasi Pasar Kerja Menggunakan User Experience Questionnaire (UEQ)," *10th Natl. Conf. Inf. Technol. Electr. Eng.*, pp. 237–243, 2019.
- [21] A. A. I. I. Paramitha, G. R. Dantes, and G. Indrawan, "The evaluation of web based academic progress information system using heuristic evaluation and user experience questionnaire (UEQ)," *Proc. 3rd Int. Conf. Informatics Comput. ICIC 2018*, no. October, pp. 1–6, 2018, doi: 10.1109/IAC.2018.8780430.
- [22] S. Siswanto and E. Susanti, "Dasar-Dasar Evaluasi Pendidikan," *Paramurobi: Jurnal Pendidikan Agama Islam*, vol. 2, no. 1, pp. 65–74, 2019. doi: 10.32699/paramurobi.v2i1.817.
- [23] "Yulinah Trihadiningrum | Depok Bebas Sampah." <https://depokbebassampah.wordpress.com/makalah/yulinah-trihadiningrum/> (accessed Apr. 11, 2022).
- [24] T. S. Tullis and J. N. Stetson, "A Comparison of Questionnaires for Assessing Website Usability," *Usability Prof. Assoc. Conf.*, no. June 2006, pp. 1–12, 2004, [Online]. Available: <http://home.comcast.net/~tomtullis/publications/UPA2004TullisStetson.pdf>
- [25] E. Susilo, F. D. Wijaya, and R. Hartanto, "Perancangan dan Evaluasi User Interface Aplikasi Smart Grid Berbasis Mobile Application," *J. Nas. Tek. Elektro dan Teknol. Inf.*, vol. 7, no. 2, pp. 150–157, 2018, doi: 10.22146/jnteti.v7i2.416.
- [26] Sugiyono, "Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif, dan R&D)," *Metod. Penelit. Pendidik. (Pendekatan Kuantitatif, Kualitatif, dan R&D)*, p. 308, 2015.
- [27] W. Budiaji, "The Measurement Scale and Number of Responses in Likert Scale," *J. Agric. Fish. Sci.*, vol. 2, no. 2, pp. 127–133, 2013, doi: 10.31227/osf.io/k7bgy.
- [28] M. Schrepp, "User Experience Questionnaire Handbook Version 8," URL https://www.Res.net/publication/303880829_User_Experience_Questionnaire_Handbook_Version_2. (Accessed 02.02. 2017), no. September 2015, pp. 1–15, 2019, [Online]. Available: www.ueq-online.org
- [29] M. Schrepp, A. Hinderks, and J. Thomaschewski, "Design and Evaluation of a Short Version of the User Experience Questionnaire (UEQ-S)," no. January, 2017, doi: 10.9781/ijimai.2017.09.001.
- [30] I. R. Wulandari and L. D. Farida, "Pengukuran User Experience Pada E-Learning di Lingkungan Universitas Menggunakan User Experience Questionnaire (UEQ)," no. August 2018, 2019.