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UI UX Design of Waste Sorting Website-Based Application Applying the Design Sprint Method Case Study Palmerah West Jakarta

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ABSTRACT

Public awareness that is increasingly paying attention to environmental problems requires public awareness to manage waste in a more efficient way. Due to the lack of understanding and appropriate methods for sorting waste, solutions different from conventional methods must be sought. Technology has become an important part of innovation in management. User Interface (UI) and User Experience (UX) are increasingly considered important in meeting user needs due to new interaction patterns with technology. The aim of this research is to understand and meet user needs in waste sorting. Therefore, the author has found a solution by creating a UI/UX design for an interactive waste sorting application. This study was conducted using the design sprint method which consists of five steps: understand, differentiate, decide, create a prototype, and verify. The results of tests carried out using the system usability scale method produced a score of 75, which shows that this application makes it easier for users to sort waste more efficiently and environmentally friendly.

Keywords: System Usability Scale,Design Sprints,Waste Bank

INTRODUCTION

Indonesia faces a complex and increasingly urgent waste problem that needs to be addressed. According to the Indonesian Information Portal, with a population of approximately 270.20 million people, every individual in Indonesia contributes to the increasing amount of waste generated. It is estimated that around 185,753 tonnes of waste is produced on a regular basis, causing the total national waste production to reach 67.8 million tonnes in 2020. This condition not only impacts the environment, but also demands more serious efforts in sustainable waste management to prevent further environmental damage in the future.

In the Palmerah sub-district of West Jakarta, waste bank services are becoming more common in Jakarta, especially in sub-districts close to waste bank destinations. However, some waste bank sites have difficulty sorting the large amount of waste and do not have time to sort the waste. By utilising advances in technology and communication, it is possible to create innovative information services about waste sorting (Bagus et al., 2024).

It cannot be ignored that a web-based waste sorting application must have an excellent user interface. User Interface is mentioned in the design about the system and how users interact with the system through commands, data input, and content usage (Najib & Rois Abidin, 2023). Since almost all functions are performed by the application, the user interface (UI) is an important component of the application system. A poor interface can affect the performance of the system (Fathan Fauzan et al., 2024). A good UI should not only make the appearance more attractive, but it should also make it easy for users to interact with the application. In addition, user satisfaction and user comfort should be the main principles in UX design (Murdijat & Yunita, 2024). Various services, such as marketing techniques and interface design, can be used to achieve high-quality user experience (Nisa, n.d.). Therefore, a good user experience through a web-based waste sorting application ensures efficient and satisfactory service.

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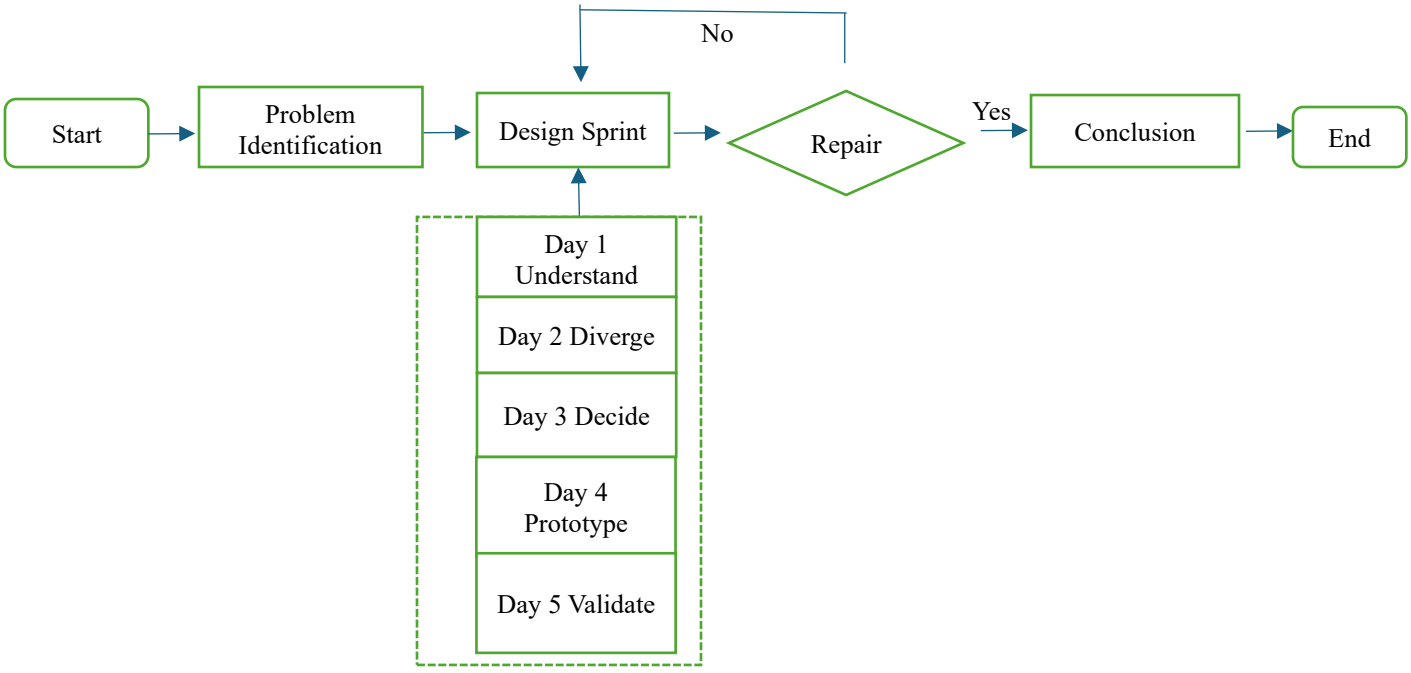
According to the results of an interview with the head of the waste bank management, it was stated that recording user data at the Palmerah sub-district waste bank is still done conventionally. The process, including the calculation of the total user balance, the type of waste brought, and the total weight of the waste, is done using a calculator. This calculation is often considered prone to miscalculation as well as filling in the balance sheet for each user.

Based on these obstacles, the researcher proposes to design a website-based waste sorting application UI with the name zerowaste, in this design using the Design Sprint method is very helpful in this research because it reduces discrepancies and turns work that takes months into work done in one week (Anwar et al., 2024). This method combines the principles of user-centred design with a highly communicative and interactive approach (Lazwardi et al., 2024). All ideas, inspirations, problems, and solutions generated are discussed in five intensive stages lasting five days and then modelled into prototypes to be tested by potential users to ensure that the UI built is effective and quality (Dody Firmansyah, Muhamad, 2022). As well as this research, testing with the System Usability Scale (SUS) to ensure that the UI built is effective (Saddyah & Saragih, 2024).

This research aims to improve user experience, facilitate user interaction with the web-based zerowaste application, and help the waste sorting industry become more efficient and effective in terms of processing time by using the Design Sprint method. The researcher will provide further explanation on how the Design Sprint method can be used to create an ideal UI. The purpose of this research is to make the findings useful for stakeholders in the web-based waste sorting industry.

METHOD

In this stage, the process used to design a website application for waste sorting, which the researcher calls zerowaste, is discussed. Before using the Design Sprint method to design the application, an analysis was first conducted to identify the existing problems. This is the workflow of the design process for the zerowaste website application (Wahyu Kusuma et al., 2024).



Gambar 1. Alur Penelitian

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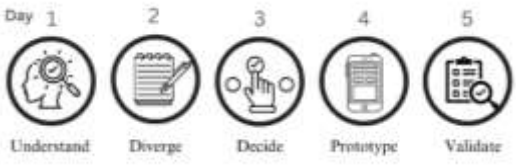
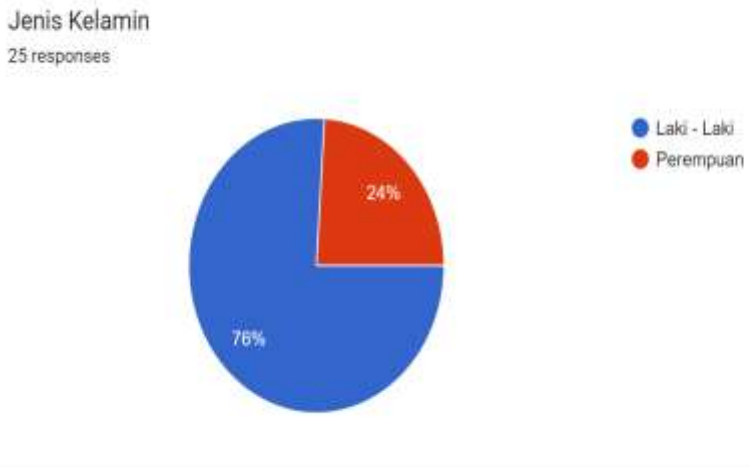
In the analysis stage, data is collected from various users to identify and solve related problems. After the problems are analysed, the Design Sprint method consisting of five work steps is used. Ideas and notions that correspond to the previous analyses can be immediately implemented into the prototype with this method. This chart shows the Design Sprint (Nafisah, Jauharotun, Suryanto, Andik Adi, Nurlifa, 2023).



Gambar 2. Metode Design Sprint

In Figure 2, the stages of a design sprint are shown which consist of, Understand, where the problem is analysed and user needs are identified, Diverge (Kartini & Widiati, 2024), where various alternative ideas are developed and explored, Decide, where a decision is made to select the best solution based on the ideas that have been generated, Prototype, where the selected solution is realised in the form of a testable prototype (Dwiansyah et al., 2023), and Validate, where the prototype is tested to get feedback from users. In this research, validation will be carried out using SUS, a measurement method used to evaluate the level of usability and user acceptance of the prototype created (Winly Apriliani & Sukmasetya, 2023).

1. Understand, In the Understand stage, which is the first step in the Design Sprint process, questions are asked to evaluate users' problems, needs, and expected outcomes (Mulyana et al., 2024). A survey has been conducted on potential users using the Google Form service. A total of 25 people, consisting of men and women, have taken part in the data collection. The Affinity Diagram method will be used to collate and categorise the respondents' responses on user needs and problems.



Gambar 3. Responden Google From

2. Diverge, At this stage, the researcher gathers ideas and concepts that match the user needs of the problem at hand. The information obtained from the questionnaire and organised in the form of a relationship diagram is the basis of the concept. At this point, the first stage evaluation was carried out by creating several ideas to be developed. In the process of collecting ideas, the ‘crazy 8s’

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technique is used, which allows ideas to be organised effectively and in an orderly manner. This technique involves sketching on a piece of paper folded into 8 sections, and the aim of this technique is to generate eight different solution ideas (Birri Firamadhani & Arwin Dermawan, 2023).

3. Decide, At this stage, wireframe designs are created by combining the ideas that have been obtained from the previous stage. The wireframe, which is the basic framework of an application page, includes important components such as content, menus, columns, footers, and other features . To simplify and explain the sequence of tasks and steps performed when using the application from start to finish, the creation of user flow is also considered very important at this point (Narizki et al., 2023).
4. Prototype, After the wireframe and user flow are obtained from the previous stage, the next step is prototyping. This prototype serves as a visual representation of the solution found for the current problem and will be tested to ensure that it fits the user's needs in the next stage . Figma application is a popular design tool for creating application views on various platforms, such as mobile phones, desktops, and websites, where prototypes are created (Nadillah et al., 2024). The advantage of Figma is its ability to allow multiple people to work simultaneously from different places, which facilitates effective collaboration. This feature makes Figma a top choice for many UI/UX designers as it allows them to prototype websites or applications quickly and effectively (Yudistira et al., n.d.).
5. Validate, The application prototype created in the previous stage was tested and evaluated in the final stage. To collect feedback from potential users and determine the extent to which this prototype can address existing problems, researchers use the SUS method. this testing method is recognised and widely used in the industry, which allows the evaluation of various types of products, such as websites and applications (Firdani et al., 2024).In SUS testing, we will use a questionnaire that has several questions such as the following table:

Table 1. Questions On SUS

No.	QUESTION
1	I think I will use this system again.
2	I find the system complicated to use.
3	I find the system easy to use
4	I need help from other people or technicians in using this system
5	I feel the features of this system are working properly
6	I feel that there are many things that are inconsistent (incompatible) in this system. inconsistent in this system)
7	I feel others will understand how to use this system quickly
8	I feel the system is confusing
9	I feel there are no barriers in using this system
10	I need to familiarise myself with the system before using it.

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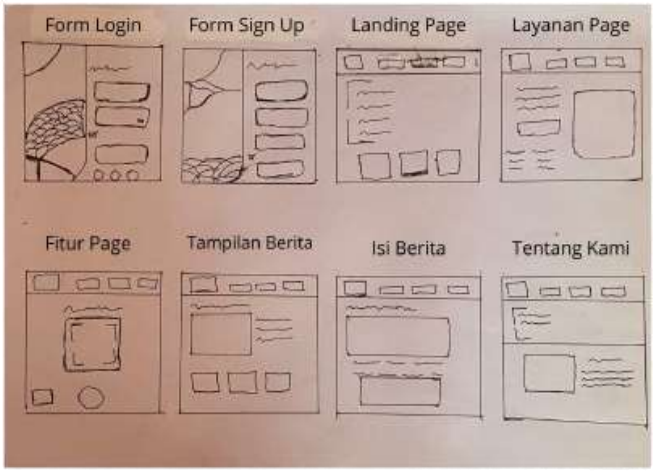
RESULT

In this section, the results of each stage of the research are presented thoroughly. It is important to show how far the research can solve the problem identified initially. The results of this research will provide further explanation of the five stages of the Design Sprint method.

1. Understand, The Understand stage was conducted on Monday, with the aim of digging deeper into user needs and problems. Questionnaires collected through G-Forms were used to identify various problems and suggestions from potential users' responses. The data obtained from the questionnaire was then analysed and grouped into affinity diagrams, which facilitated the process in the next stage. The data that has been compiled in the form of affinity diagrams is shown in Figure 4.

Gambar 4. Affinity Diagram

2. Deverge, On Tuesday, the research team generated a selection of ideas for the app design. These ideas were based on the questionnaire information that had been compiled in the affinity diagram in the previous stage. This process was implemented using a technique known as ‘crazy 8s’ and resulted in five groups of ideas or solutions that included sketches of the landing page, login form, registration form, homepage, and main features of the interactive learning application. The results can be found in Figure 5.



Gambar 5. Crazy 8 Content

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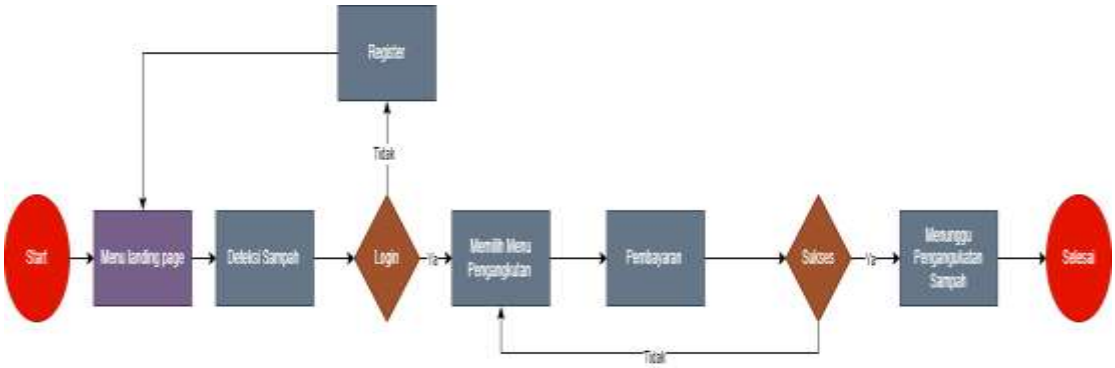
3. Decide, On the third day, after completing the final result of grouping ideas and sketching the application design according to user needs, the next step was to implement these ideas into the user flow design.



Gambar 6. User Flow Decide

4. Prototype, On the fourth day, the application prototyping stage was held. In this prototyping process, the research team developed an interface tailored to the needs and preferences of users based on the findings from the previous stage and this prototype can be accessed in its entirety through the link bit.ly/3OgVITo. In this stage, Researchers will also create a brand identity for the waste sorting application being developed.
   This application will be named 'zerowaste'. The following are the results of the interactive learning application prototype that has been designed.

Based on the agreement in this study, the researcher has decided to create a unique identity for the appearance of the application we designed. This app will be named 'Zerowaste'. The app's logo depicts a laptop, reflecting technology, as well as an ascending line, which symbolises increasing capabilities as shown in Figure 7. This reflects the concept that today's technology makes it easier for us to help sort waste, which is in line with the purpose of the waste sorting app we are developing.

Gambar 7. Brand Identity

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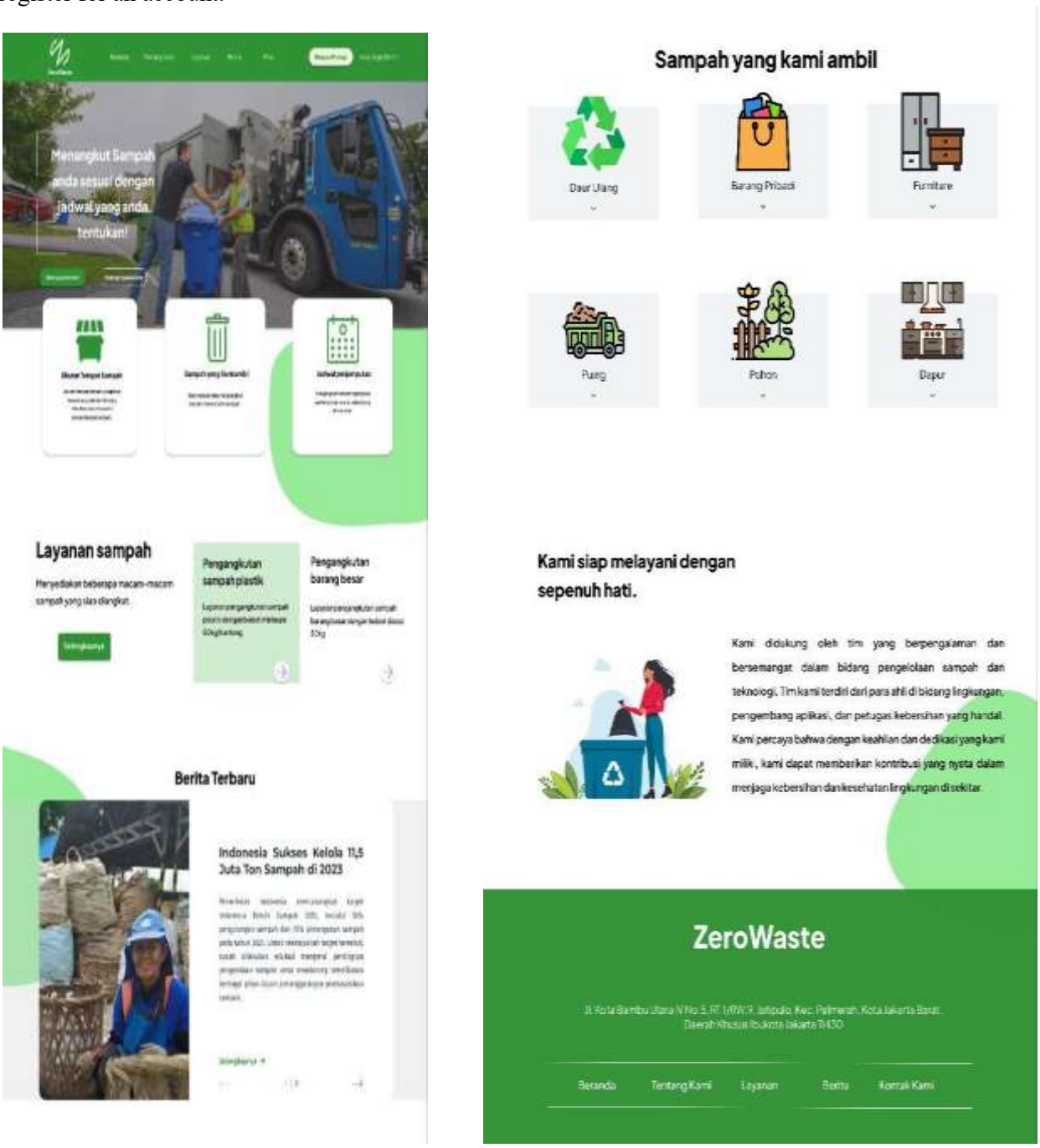
This application will start with a landing page that will always appear when the user opens the application as shown in Figure 8. This splash screen will display the logo of the waste sorting application 'zerowaste.' After the splash screen, the user will be directed to the main page, which is the initial page of the application. This landing page will welcome users and provide buttons to proceed to the login stage or register for an account.



Gambar 8. Landing Page

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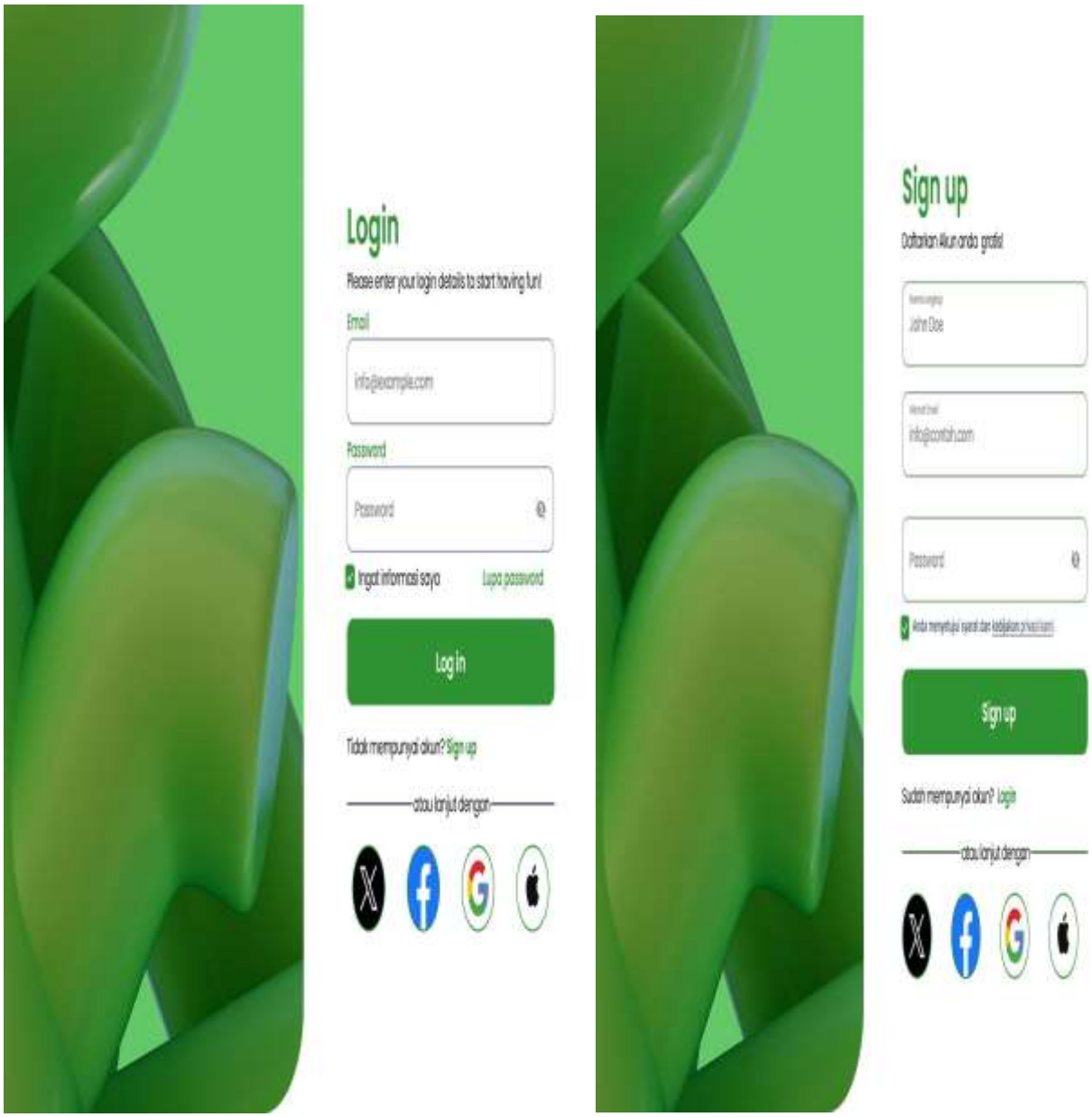
The next step, users can start by creating an account or registering first by inputting their full name, username and password in Figure 9. After the account is successfully created, users can login, using the username and password that has been registered.



Gambar 9. Form Login and Form Registration

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In the service view, users can perform garbage collection services in the service options below and garbage pickup procedures and show the location of the garbage bank in Figure 10.

Gambar 10. Service Display

In this menu, users can detect waste before sending waste. In order to help users detect waste as shown in Figure 11, researchers allowed the application to access file storage.

Gambar 11. Trash Detection Display

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5. Validate, The last stage in this process is the validation stage. At this stage, the prototype design that has been made in the previous stage will be tested to ensure its suitability for user needs and preferences. Usability Testing uses a questionnaire with the (SUS) method. This questionnaire will be distributed to 25 respondents via Google Forms, and respondents will be asked to answer ten questions using a 1-5 rating scale according to SUS guidelines. The questions can be seen in Table 2.

Table 2. Questionnaire Results

Question	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
1	5	2	4	1	4	2	4	2	4	1
2	5	2	5	2	5	1	5	1	5	4
3	5	1	5	2	5	2	5	1	5	4
4	4	1	5	2	5	1	5	5	5	3
5	5	1	5	2	5	1	5	2	4	1
6	5	1	5	2	5	1	5	1	5	2
7	4	2	4	3	4	2	4	2	4	3
8	2	4	4	2	4	3	4	3	4	2
9	4	2	5	2	4	1	5	1	4	2
10	4	2	4	3	4	3	4	3	4	3
11	3	3	4	3	4	3	4	2	4	3
12	4	3	4	3	4	3	3	2	3	3
13	5	3	5	4	4	2	3	1	5	3
14	4	2	4	3	3	3	4	2	3	4
15	3	3	4	3	4	2	4	2	3	3
16	4	2	4	2	4	2	4	2	4	4
17	5	1	5	3	5	2	5	1	4	2
18	3	2	4	3	4	3	4	2	4	3
19	4	2	3	3	4	3	4	2	4	3
20	4	2	5	3	4	3	4	2	3	3
21	5	2	4	3	4	2	4	2	4	3
22	4	2	4	1	5	2	4	1	4	1
23	4	2	4	3	3	2	3	3	4	2
24	4	2	4	2	5	2	4	1	4	3
25	5	1	5	1	5	2	4	1	4	2

From Table 2 above, it can be seen that the scores in the table are values on a Likert scale, where value 1 indicates 'Strongly Disagree,' value 2 indicates 'Disagree,' value 3 indicates 'Neutral,' value 4 indicates 'Agree,' and value 5 indicates 'Strongly Agree.'. The data that has been obtained from respondents will be used in the calculation of SUS scores by following some predetermined rules as follows:

1. If the question number is odd, the participant's score will be reduced by 1.
2. If the question number is even, the participant's score will be reduced by 5, but the result cannot be negative.
3. After the score reduction process is complete, the score obtained will be multiplied by a factor of 2.5 to get the final score.

This process is carried out on each question in the SUS questionnaire to produce a final score that reflects the level of user satisfaction with the UI/UX design of the application.

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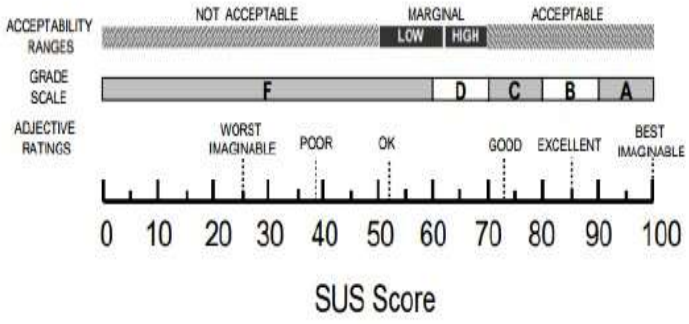
Table 3. Questionnaire Results

Question	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total	Total 2.5
1	4	3	3	4	3	3	3	3	3	4	33	82.5
2	4	3	4	3	4	4	4	4	4	1	35	87.5
3	4	4	4	3	4	3	4	4	4	1	35	87.5
4	3	4	4	3	4	4	4	0	4	2	32	80
5	4	4	4	3	4	4	4	3	3	4	37	92.5
6	4	4	4	3	4	4	4	4	4	3	38	95
7	3	3	3	2	3	3	3	3	3	2	28	70
8	1	1	3	3	3	2	3	2	3	3	24	60
9	3	3	4	3	3	4	4	4	3	3	34	85
10	3	3	3	2	3	2	3	2	3	2	26	65
11	2	2	3	2	3	2	3	3	3	2	25	62.5
12	3	2	3	2	3	2	2	3	2	2	24	60
13	4	2	4	1	3	3	2	4	4	2	29	72.5
14	3	3	3	2	2	2	3	3	2	1	24	60
15	2	2	3	2	3	3	3	3	2	2	25	62.5
16	3	3	3	3	3	3	3	3	3	1	28	70
17	4	4	4	2	4	3	4	4	3	3	35	87.5
18	2	3	3	2	3	2	3	3	3	2	26	65
19	3	3	2	2	3	2	3	3	3	2	26	65
20	3	3	4	2	3	2	3	3	2	2	27	67.5
21	4	3	3	2	3	3	3	3	3	2	29	72.5
22	3	3	3	4	4	3	3	4	3	4	34	85
23	3	3	3	2	2	3	2	2	3	3	26	65
24	3	3	3	3	4	3	3	4	3	2	31	77.5
25	4	4	4	4	4	3	3	4	3	3	36	90
				Average								75.1

Based on Table 3, it can be concluded that the initial score has been converted into a calculated score, and the calculation results show an average score of 75. The results are then classified into groups based on the average value obtained from the test. Details of the SUS score group assessment on interactive learning applications can be found in Figure 12[20].



Gambar 12. SUS Score Display

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Based on the results of this study, it is found that users, especially from the user community, are able to understand well the interface design prototype of the waste sorting information application. In addition, the interface design of the application should be designed to be user-friendly. This opinion is supported by the results of testing with the SUS method, where a score of 75 was obtained. Based on the SUS assessment standard, the score is categorised in the Acceptable classification. This prototype is considered to have the potential to be used as a guide in the development of an interactive waste sorting application. With this approach, it is expected that user interest in utilising the application can be increased.

CONCLUSION

This study examines the UI/UX design of a waste sorting application using the design sprint method, which helps the design process from user data collection to the validation stage. The SUS method was used to test usability; the results achieved a score of approximately 75, which is in line with SUS standards and categorised as 'Acceptable.' This shows that the design of the ZeroWaste app is very easy to use and can fulfil users' needs. The app has great capacity to improve user experience, and further development efforts are advised to concentrate on improvements based on the test results. As a result, this application is expected to help the operation of waste banks in Palmerah Sub-district.

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