Implementation of the Double Diamond Method in User Experience Design of Health Service Application (Homecare)

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Abstract. The rapid development of technology at present is almost utilized in every aspect of life, including education, economy, social, and health. However, the equal distribution of this technology has not been fully implemented, especially in the field of health. According to data from Databoks in 2022, 71% of the population has never accessed health services online. This serves as the basis for the creation of the User Interface (UI) and User Experience (UX) for health service applications (homecare) using the Double Diamond method, which is divided into four stages: discover, define, develop, and deliver. Data collection in this research is conducted through literature studies, interviews, and observations. Additionally, usability testing is performed using the System Usability Scale (SUS), with a testing result of 83.3%, categorized as excellent. This can contribute to a positive user experience for the users.

Keywords: Double Diamond, Health, Technology, User Experience (UX), User Interface (UI)

1 Introduction

The rapid development of technology today is capable of providing balance in human activities. Almost all human activities are related to technology, with many connections from the economic, educational, to healthcare sectors [1]. Efforts to address this must be made by providing healthcare services, which are crucial for all segments of society. Healthcare services encompass various types of services designed for treatment, prevention, and the recovery process of health.

Healthcare services are generally provided by patients coming directly to hospitals, clinics, or other healthcare centers. Currently, homecare healthcare services are another way that people can receive healthcare treatment without having to go to hospitals, clinics, or healthcare centers. The utilization of technology is done through various fields, one of which is the healthcare sector [2]. This is in accordance with Presidential Instruction Number 03 of 2003 regarding the national policy and strategy for the development of e-government, stating that every state institution must build a website/application to improve public service access [3].

Based on data published by Databoks in 2022, 71% of the population has never accessed healthcare services online. This indicates the need for a system to support the public in accessing healthcare services online. The design of the User Interface (UI) and User Experience (UX) system is expected to provide ease both in appearance and user experience, using the Double Diamond method consisting of discover, define, develop, and deliver [4] [5]. Additionally, testing is conducted using the System Usability Scale (SUS) method with an assessment using 10 questions [6].

2 Literature Study

Applications play a significant role today, one of which is providing services easily and quickly. Generally, applications have a User Interface (UI) [7]. User experience is the user's experience in using the application, with supporting elements such as usability, value, adoptability, and desirability [8]. User interface and user experience merge in mobile, web, and dashboard applications because optimal application display is assessed based on user interaction during operation.

In this research, the double diamond method was employed, focusing on problem analysis as the foundation for creating solutions. The design approach structure in the Double Diamond process is divided into four phases, aiming to address challenges and find implementable solutions: discover, define, develop, and deliver. The stages of the Double Diamond method are depicted in figure.
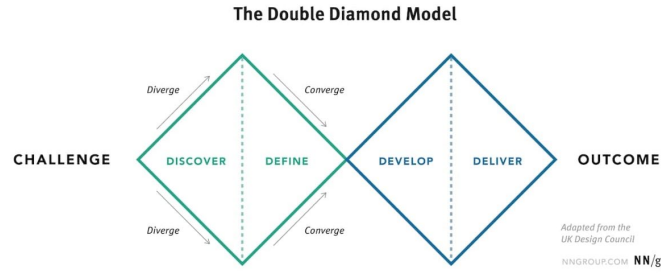
Figure 1. Double Diamond Approach Process
(Germinate, 2021)

When designing software, usability testing is always carried out. Usability testing is useful for knowing the quality of an interface design of the application. Testing with usability testing aims to evaluate whether the user experience in the application can run well or not. Usability testing is an effort to increase the profitability of a product [9]. In this study, the usability testing process was carried out using the system usability scale (SUS) method by providing 10 questions which were calculated using a score calculation scale of strongly agree, agree, disagree, strongly disagree and neutral. The results of the answers are then calculated by calculating the answers using the following calculation formula:

$$SUS = ((\sum(OP - 1) + (\sum(5\text{-}EP))) \times 2,5 \qquad (1)$$

Description:
OP = Score with odd sequence number
EP = Score with even sequence number

Evaluation of the final score of the calculation with the System Usability Scale (SUS) method is carried out based on the general guidelines of the SUS scale. The following are the general guidelines used:

Table 1. System Usability System (SUS) Score Scale

Grade	SUS	%	Adjective	Acceptable	NPS
A+	84.1 – 100	96-100	Best Imaginable		
A	80.8 – 84.0	90-95			Promoter
A-	78.9 – 80.7	85-89			
B+	77.2 – 78.8	80-84	Excellent	Acceptable	
B	74.1 – 77.1	70-79			
B-	72.6 – 72.5	65-69			
C+	71.1 – 72.5	60-64			Passive
C	65.0 – 71.0	41-59	Good		
C-	62.7 – 64.9	35-40		Marginal	
D	51.7 – 62.6	15-34	Ok		Detractore

3 Research Method

The research method is a scientific mechanism in obtaining and processing data with research objectives to achieve certain useful results. This research was conducted using the double diamond method and usability tests to test the results of the interface design that has been made using the system usability scale (SUS). The results are reviewed based on design consistency, feature functionality and userfriendly interface.

3.1 Discover

At the discover or initiation stage in the Double Diamond method, research is carried out with the aim of understanding and knowing the problems and needs related to the design of the system that will be made later. The research includes several things, which consist of:
  a. Study Literature
      Based on the results of previous research identification, the issues in this study were addressed using the Double Diamond method to analyze user needs and implement them in the system design for a home

healthcare service application. This method focuses on the user experience, both for those who are considering or have already used home healthcare services.

b. Interview

Interviews are conducted to obtain more in-depth information obtained from respondents or research subjects. At this stage, interviews are conducted by referring to the experiences of both users and healthcare professionals. In this study, interviews were conducted with medical personnel.

c. Observation

The observation stage is conducted to validate the results of the interviews that have been conducted by distributing questionnaires. Based on the distributed questionnaires, results were obtained from 51 respondents with an age range of 18-35 years. There are three more specific questions related to healthcare service access (homecare), namely:
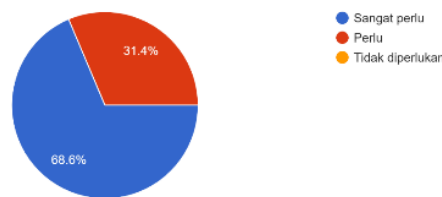

Figure 2. The Answer to Question 1

The questionnaire results from the questions obtained from 51 respondents regarding the necessity of on-call healthcare services. Respondents were in the age range of 18-35 years, with a total of 68.6% stating that on-call healthcare services are very necessary.
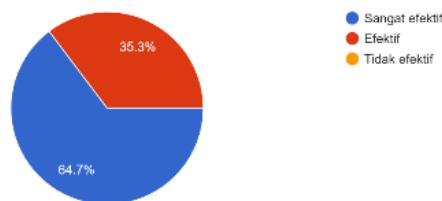

Figure 3. The Answer to question 2

Questionnaire results from questions related to the effectiveness of the homecare application. Based on 51 respondents with an age range of 18-35 years, 64.7% stated that it was very effective.
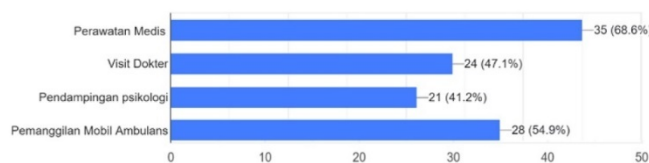

Figure 4. The Answer to Question 3

The results of the questionnaire are related to the presence of features that are expected or currently needed. Based on the results of the questionnaire, 51 respondents with an age range of 18-35 years chose the medical care feature (68.6%), ambulance call (54.9%), doctor visit (47.1%) and psychological assistance (41.2%).

3.2 Define
3.2.1 Emphatyze Map

In the empathy map stage, it is carried out to study the behavior of users and healthcare professionals to gather strong information supported by data from the observation stage. Based on the analysis of the issues experienced through user experiences, an empathy map is created. It is useful for understanding the user more deeply to identify the problems, desires, and needs currently being experienced by the user.

Figure 5. Empathy Map Results

3.2.2 User Persona

A user persona is created to assist in the design development process, aiming to understand the target user more deeply. With the presence of a user persona, information and messages will be more precise and focused. The user persona can serve as a crucial reference in designing an on-call healthcare service application (homecare).

Figure 6. User Persona Results

3.2.3 Problem Statement and How Might We (HMW)

This problem statement is used as a written statement that describes issues to be addressed, categorized into two parts, involving both user and healthcare professional perspectives. Referring to the issues identified earlier, How Might We (HMW) questions are also formulated. How Might We (HMW) serves as an approach used in formulating design questions that stimulate creative and innovative thinking.
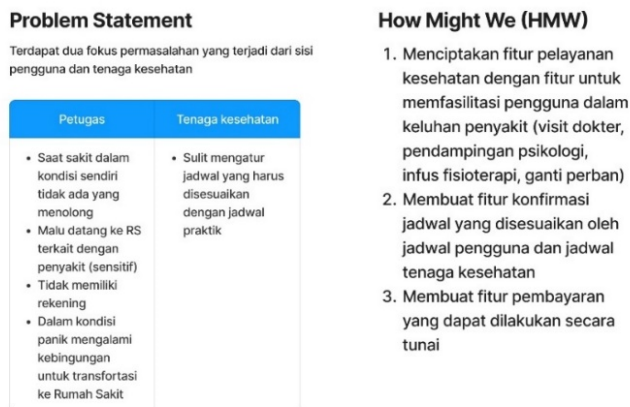
Figure 7. Problem Statement and How Might we Results

3.2.4 Customer Journey Map

A Customer Journey Map is used as a user journey map to illustrate the user experience when interacting with the on-call healthcare service application (homecare). In this context, it is formed with diagrams, visuals, graphics, and narratives that provide a comprehensive understanding. This research explains that there is an initial scenario describing the user's condition when using the application, outlining the steps from start to finish.
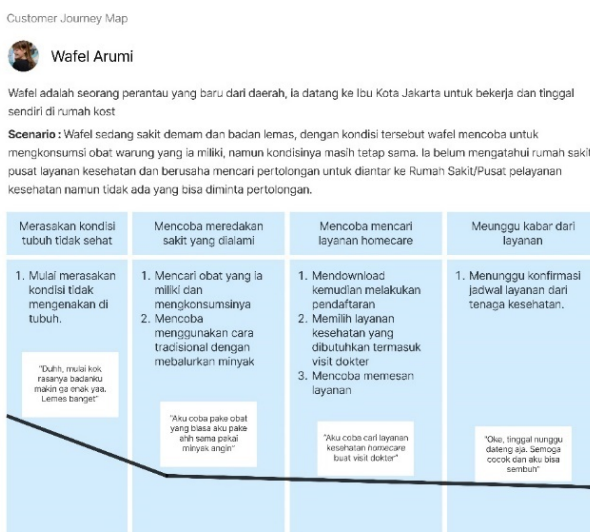
Figure 8. Customer Journey Map results

3.3 Develop
3.3.1 Information Architecture (IA)

Information architecture (IA) serves as the foundational structure for the User Interface (UI) and User Experience (UX). In the navigation bar, there are three features: homepage, history, chat, and profile (account). The observation results indicate that there are four features in this on-call healthcare service application (homecare): medical care (68.6%), ambulance calling (54.9%), doctor visits (47.1%), and psychological support (41.2%). Based on the percentages, it shows that the high figures should be a concern, considering that these are part of the needs required by users.
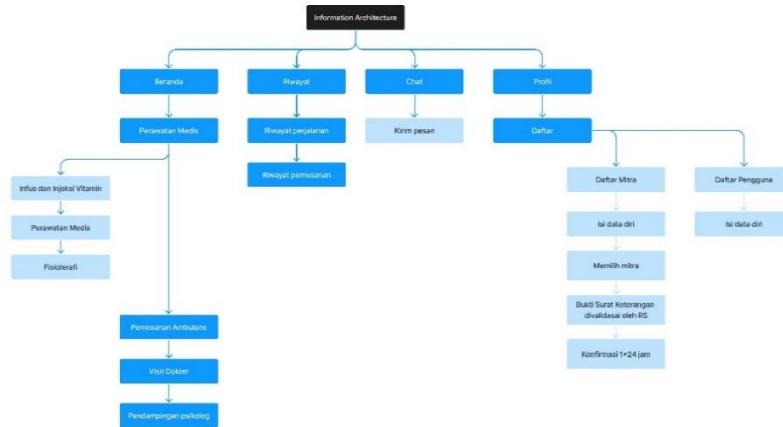
Figure 9. Information Architecture Results

3.3.2 Wireframe

Wireframe is a part of a structured visual representation of the user interface (UI) of the application. The wireframe for the on-call healthcare service application (homecare). In this research, there are several wireframes for the pages of the healthcare service application, including login, register, account, chat, history, homepage, doctor visit, medical care (bandage change, physiotherapy, and infusion and injection), psychological support, ambulance calling, and order details from the payment gateway, as well as a page to manage service schedules.

Figure 10. Information Architecture Results

3.3.3 Design System

In this stage, a design system is created by developing components used to build and maintain consistency in designing the application. The design system helps improve work efficiency. The components created include a color system, user interface components, an icon system, and a type system.
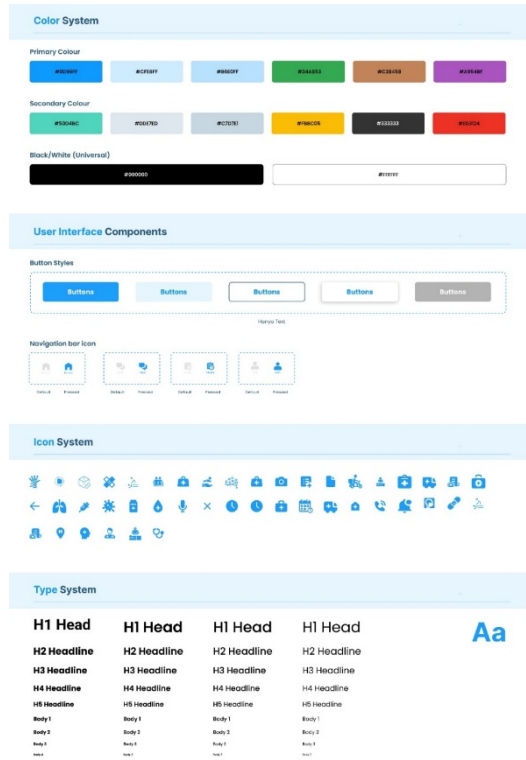
Figure 11. Design System

3.3.4 High Fiedelity Prototype

In this stage, it is the visualization phase of the previous stages. A high-fidelity prototype is created to understand the functionality with visual elements that guide user interaction. The high-fidelity prototype enables the identification of issues in the product. In this research, it consists of several wireframes for the pages of the healthcare service application, including login, register, account, chat, history, homepage, doctor visit, medical care (bandage change, physiotherapy, and infusion and injection), psychological support, ambulance calling, and order details from the payment gateway, as well as a page to manage service schedules.
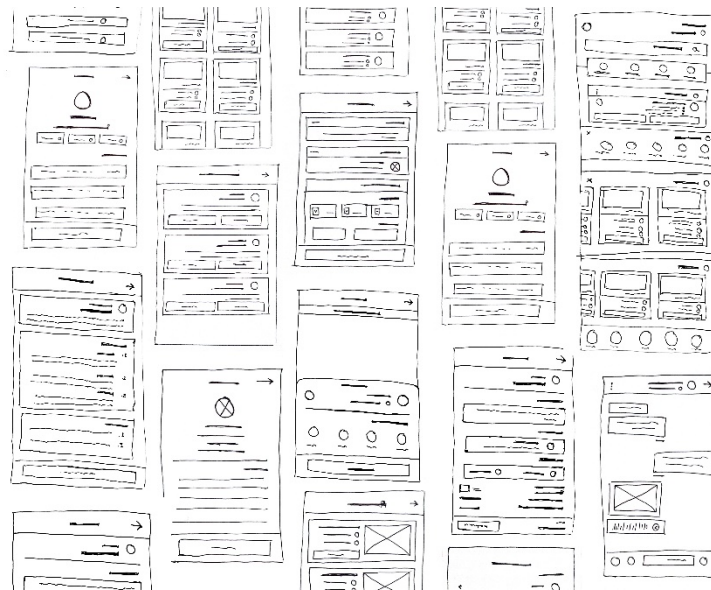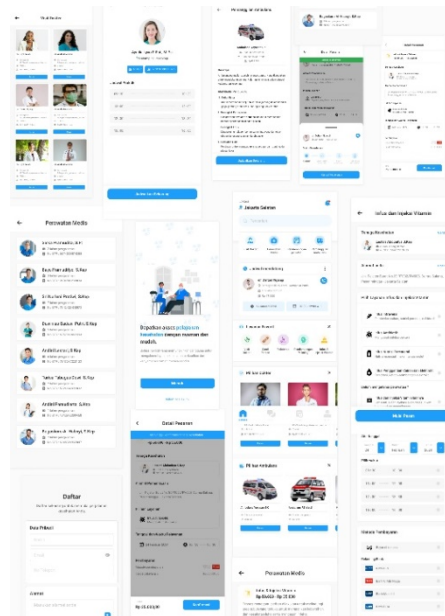

Figure 12. Information Architecture Results

3.3.5 Prototype

A prototype of the physical model is conceptualized based on the previous stages. This is the most crucial part of the User Interface (UI) and User Experience (UX) of the homecare service application, aiming to facilitate obtaining feedback from users.
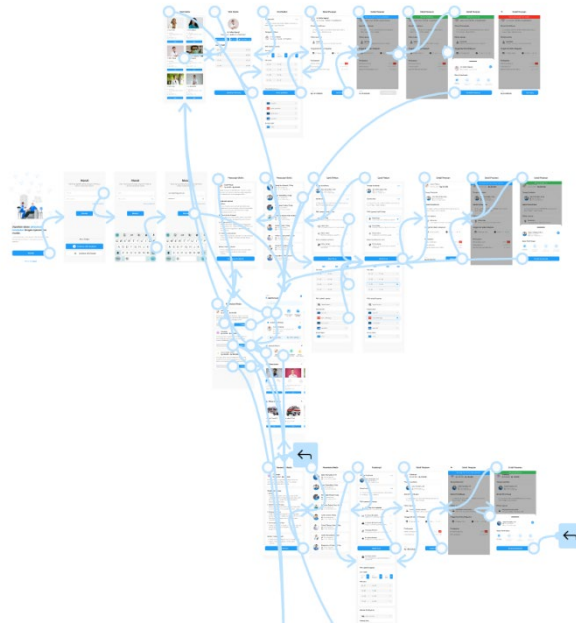
Figure 13. Prototype Results

3.4 Deliver

This testing is conducted to gather responses from the created prototype and serves as a measure of how well the User Interface (UI) and User Experience (UX) have been designed. The testing method uses the System Usability Scale (SUS), employing a score scale of 1-5 for 10 SUS questions directed to respondents. The questions include the following:

Table 1. System Usability Scale (SUS) Question

| No	Pertanyaan
1	I think i will use this application again
2	I find this application complicated to use
3	I find this application easy to use.
4	I need help from others in the technical aspects of using this application
5	I feel that the features in this application have met the needs of homecare health services.
6	I feel there are many inconsistencies in this application
7	I feel others will quickly understand how to use this application.
8	I find this application still confusing.
9	I feel no obstacles and trust in using this application.
10	I have to learn a lot before I can use this application

The data obtained from the questionnaire will then be calculated using the SUS score calculation rules based on odd and even question numbers. For odd-numbered questions, 1 will be subtracted from the respondent's answer score (n-1), and for even-numbered questions, 5 will be subtracted from the respondent's answer score (5-n). Below is Table 2, containing the SUS score data calculated based on the assessment of 51 respondents.

Table 2. The final result of the average SUS score

No	Question										Amount	Amount x 2,5
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10		
1	4	3	4	4	3	3	4	3	4	2	34	85
2	3	4	2	4	3	3	2	4	3	3	31	77,5
3	4	4	4	4	4	4	3	3	4	3	37	92,5
4	4	3	4	4	3	3	4	3	4	3	34	85
5	4	3	3	4	4	3	4	4	4	3	36	90
6	3	4	2	4	3	4	2	3	3	3	31	77,5
7	4	3	4	4	3	3	4	3	4	2	34	85
8	3	2	2	3	3	4	4	3	3	4	31	77,5
9	3	2	3	4	2	2	3	4	3	4	30	75
10	4	4	4	4	4	4	1	4	4	1	34	85
11	3	4	3	4	4	4	4	3	3	3	35	87,5
12	4	3	4	3	4	3	4	3	4	3	34	85
13	4	4	3	3	4	4	3	4	4	4	37	92,5
14	3	4	3	4	3	3	3	3	2	3	32	80
15	4	4	4	4	4	4	4	4	1	4	37	92,5
16	4	3	4	3	4	3	4	3	4	3	35	87,5
17	3	3	1	3	3	4	3	3	3	4	30	75
18	4	2	4	2	4	2	4	2	4	2	30	75
19	3	4	4	3	3	4	4	3	3	4	35	87,5
20	2	4	3	4	4	4	3	3	2	4	33	82,5
21	2	2	4	2	3	4	3	3	4	3	32	80
22	4	3	4	4	3	3	4	3	4	2	34	85
23	4	3	4	3	4	3	4	3	4	3	35	87,5
24	3	4	3	4	3	4	3	4	3	4	35	87,5
25	4	3	4	4	3	3	4	3	4	2	34	85
26	2	4	2	4	2	4	2	4	2	4	30	75
27	3	4	4	4	4	4	3	4	4	4	38	95
28	4	3	4	4	3	3	4	3	4	2	34	85
29	4	3	4	4	3	3	4	3	4	2	34	85
30	4	4	3	4	4	3	3	4	3	3	35	87,5
31	4	3	4	4	3	3	4	3	4	2	34	85
32	4	4	3	3	4	4	3	4	4	4	37	92,5
33	4	3	4	4	3	3	4	3	4	2	34	85
34	4	3	4	4	3	3	4	3	4	2	34	85
35	3	4	3	4	3	3	3	3	2	4	32	80
36	3	3	3	3	3	4	3	3	3	4	32	80
37	4	3	4	4	3	3	4	3	4	2	34	85
38	4	4	3	3	4	4	3	4	4	4	37	92,5
39	3	4	4	2	2	4	4	3	3	3	32	80
40	4	3	4	4	3	3	4	3	4	2	34	85
41	4	3	4	4	3	3	4	3	4	2	34	85
42	4	3	4	4	3	3	4	3	4	2	34	85
43	3	3	2	2	3	4	3	2	2	4	28	70
44	2	3	3	4	3	3	3	3	2	4	30	75
45	3	4	3	2	2	4	4	3	3	3	31	77,5
46	4	3	4	4	3	3	4	3	4	2	34	85
47	4	3	2	4	3	4	3	4	4	4	35	87,5
48	3	4	3	3	3	4	3	3	3	4	33	82,5
49	4	3	4	4	3	3	4	3	4	2	34	85
50	4	3	4	4	3	3	4	3	4	2	34	85
51	3	3	3	3	2	2	3	4	3	4	30	75

The average score from the sum of the System Usability Scale (SUS) scores is "83.3". This result was obtained from testing the UI/UX prototype design for the healthcare service application conducted by 51 respondents. Referring to Table 1, the testing in this research on the design of the homecare healthcare service application falls under Grade A. This leads to the conclusion that the UI/UX design of the healthcare service application (homecare), based on testing with the System Usability Scale method with respondents, is satisfactory.

4 Conclusion

From the research conducted on the home healthcare service application using the Double Diamond method and testing with the System Usability Scale (SUS), the study found that it has enhanced the user experience in utilizing the healthcare service application. The test results yielded an SUS score of 83.3%, categorized as Excellent.

As a suggestion for further development of the home healthcare service application, it is recommended to conduct a more in-depth assessment involving healthcare professionals and assess user satisfaction levels to achieve more optimal results.

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