

The Use of Design Thinking Methods in the Development of Telkomedika Mobile Applications for Patients with Conscientiousness Personality Types

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ABSTRACT

Keywords: mobile application; disc personality type; usability testing; user acceptance testing.	This research aims to improve the quality of Telkomedika Telkom University Clinic services by developing a mobile application that is tailored to the personality type of patients with conscientiousness. This Mobile Application is designed to fulfill the patient's need for service information through the service information feature and streamline the queuing process through the online reservation feature. Through the use of the DISC personality type approach, this study focuses on the preferences and characteristics of patients to increase satisfaction. Users or patients with this conscientious personality type tend to be meticulous, systematic, and structured. Therefore, a structured interface design and also an easy-to-understand task flow will help users in using the application efficiently. The results of the study show the importance of understanding user preferences in designing applications. Usability Testing on the Telmed 2.0 application prototype resulted in a Single Ease Question (SEQ) score of 6.88, indicating ease of use. In addition, User Acceptance Testing showed that all features worked well, with a score of 91.5 on the System Usability Scale (SUS), indicating an excellent level of ease of use of the application.
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Introduction

Utilizing information and communication technology to improve government services and governance in the health sector is one of the efforts in digitizing health services (Surachman, Andriyanto, Rahmawati, & Sukmasetya, 2022). In optimizing efficient and effective health services through digital transformation, the Ministry of Health (Kemenkes) of the Republic of Indonesia has stipulated the Decree of the Minister of Health Number HK.01.07/MENKES/1559/2022 concerning the Implementation of an Electronic-based Government System in the Health Sector and the Health Digital Transformation Strategy. This is strengthened by Law of the Republic of Indonesia

Number 25 of 2009 concerning Public Services strengthening the concept of public services as the government's obligation to meet the needs of citizens and residents. These public services cover various important sectors, including education, health, transportation, and other strategic sectors, and are an integral part of the digital transformation efforts that have been mandated by the Ministry of (Lais et al., 2022).

Telkomedika is a company engaged in health services, provision services, clinical services, or other supporting health services. Telkomedika is also a tangible manifestation of Telkom Group in supporting government programs. In this case, Telkomedika has a relationship with the concept of public service as the government's obligation to meet the needs of citizens and residents. (Amalina, Wahid, Satriadi, Farhani, & Setiani, 2017). Telkomedika is committed to realizing a better level of health services for the community through the provision of the best healthcare services. In line with Telkomedika's vision, to realize this, the right steps are needed, including providing high-quality health service products at competitive prices, increasing added value for shareholders through sustainable business, and increasing added value for shareholders through sustainable business (Telkomedika, 2024).

Based on the author's observations, several problems were found during the service activities that took place at the Telkom University Telkomedika Clinic. These problems include the lack of clear information regarding the systematics of using services at the clinic, the absence of information on the schedule of doctors on duty every day, and a confusing queue system. As a form effort to optimize patient satisfaction with Telkomedika services, a platform is needed that can integrate the Telkomedika Telkom University clinical information system.

"Confirmation of Personality Types Using Visual Evoked Potential with User Interface Design Stimulus" found that there are similar VEP patterns among individuals who have the same personality type. Based on the recording of 20 participants whose personality type was known, it was found that 93.75% of VEP was classified according to personality type. The use of this DISC (Dominance, Influence, Steadiness, Conscientiousness) personality type can help to determine the user's needs because each personality type has different brain waves (Perdana, Santosa, Setiawan, & Wimbari, 2021).

Referring to the problems faced, it is necessary to develop a mobile application that can integrate the Telkomedika Telkom University clinic service information system. It is hoped that this mobile application can provide an optimal experience for patients in accessing information and services quickly and easily anywhere and anytime. The use of the DISC personality type approach in the application development process is also expected to increase patient satisfaction in using the application by paying attention to the characteristics and preferences of the conscientious personality type. (Puspitaningrum, Perdana, & Utama, 2023).

The formulation of the problem in this study includes three main points, namely designing and developing the Telkomedika Telkom University mobile application based on the personality type of conscientiousness with the design thinking method, conducting

Usability Testing on the mobile application prototype using the Single Ease Question (SEQ) method, and analyzing the results User Acceptance Testing on mobile applications using the System Usability Scale (SUS) method The use of the SEQ method is used to determine the level of user convenience in carrying out scenarios carried out on application prototypes (Johansson, 2021). Meanwhile, the use of the SUS method is used to find out how easily the application can be used by users (Suryanto, Faroqi, & Simarmata, 2022). This research aims to create a mobile application that suits the needs and preferences of patients and measure the ease and effectiveness of using the application.

To maintain the focus of this research, research limits were set, including user targets limited to Telkom University students, application development only focused on the patient side, and did not include the admin side. In addition, this study uses a design thinking method consisting of six stages and is only limited to the implementation of the final result of the system without covering the application launching stage. It is hoped that this research can provide a basis for Telkomedika Clinic in the development of mobile applications, increase patient satisfaction in using services, and be a reference for further research related to the development of mobile applications using a personality type approach.

A mobile application is defined as an application that can be downloaded and has a certain function to add functionality to the mobile device itself. To get the mobile application needed, users can download the application through the Google Play Store or similar applications that provide various applications for Android or iOS users. (Hasan, Kahfi, & Alamsyah, 2019).

Based on the DISC Theory by Dr. Marston, the compliance personality type or conscientiousness is a person who is accurate, precise, detail-oriented, and meticulous. This person is described as someone who is a perfectionist, completes things completely, and values precision and also precision. This C personality type is the most analytical compared to the other three personalities (Beedu, 2021).

User Experience (UX) is a process used to create products that can provide a relevant and meaningful experience for users that includes aspects of design, branding, functionality, and usability. ISO (The International Organization for Standardization) defines UX as a person's perception and response that is generated through the use or anticipation of the use of a product, system, or service. A UX Designer is responsible for thinking, planning, and changing things that affect the user experience (UX). On the other hand, User Interface (UI) is defined as the process that designers use to build product interfaces with a focus on appearance and style, which is the access point where users interact with the design. The form of UI is divided into Graphical User Interface (GUI) on digital platforms, Voice-Controlled Interface (VUI) that uses voice, and Gesture-Based Interface through body movements in virtual reality. (Sidik, 2018).

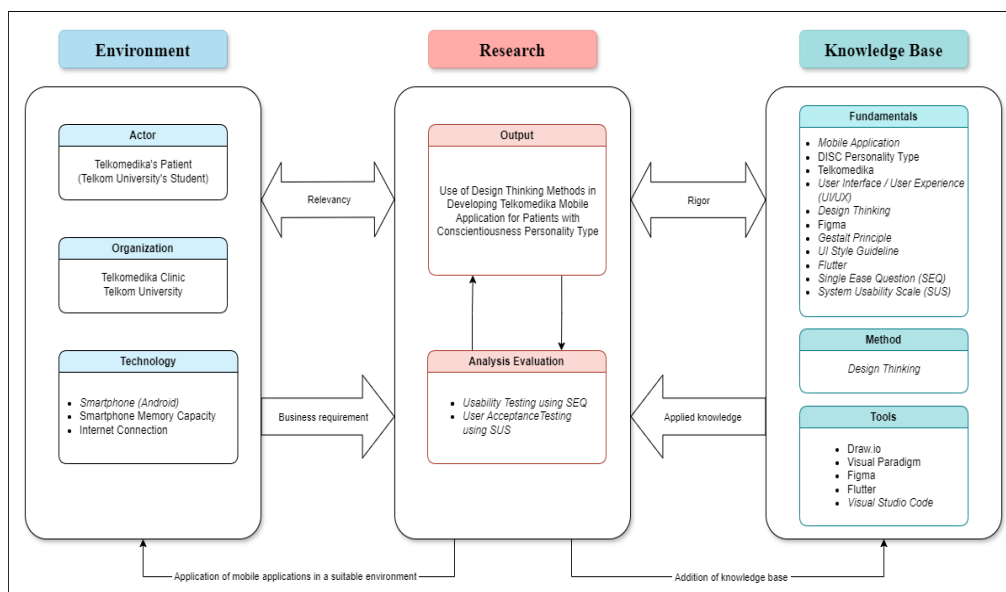
Interaction Design Foundation (2016a) Explains that design thinking is an iterative process that aims to understand users, face assumptions, and define problems to find alternative solutions. Herbert Simon also contributed to the development of this method

with five phases in his book "The Sciences of the Artificial" in 1969, while NNGroup introduced three main phases in Design Thinking 101 in 2016, which include understanding, exploring, and materializing. These three phases can be defined in more detail, namely empathize, define, ideate, prototype, test, and implement (Sarah Gibbons, 2016).

Method

Conceptual Model

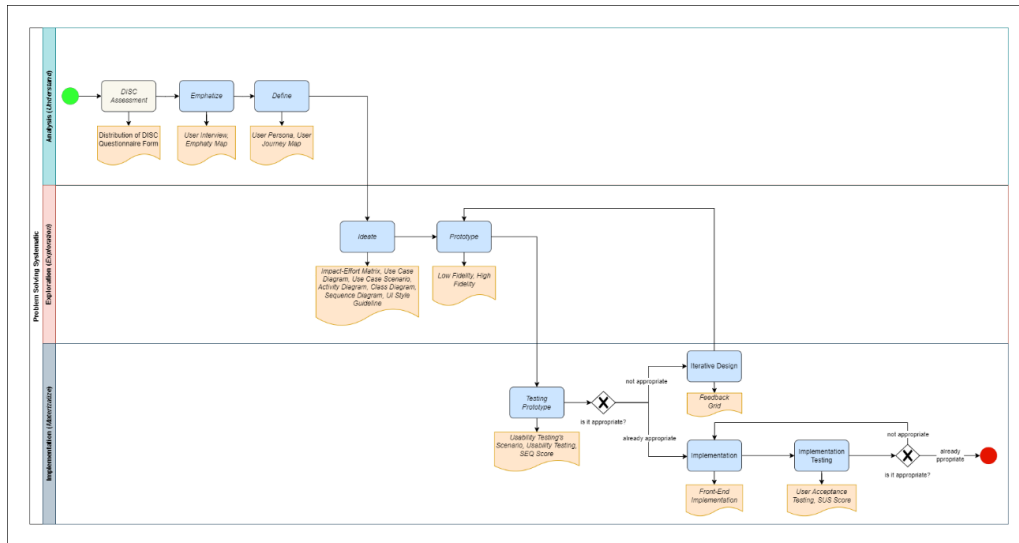
Conceptual models are representations of the structural elements that build applications and serve as a frame of reference for communication and understanding. In the study of information systems, conceptual models are needed to ensure the relevance and effectiveness of organizations can run optimally, as researched by Hevner in 2004, which found a conceptual model that focuses on the development and evaluation of new ideas of innovative information technologies to improve the effectiveness of the completion of important tasks of the organization. The following conceptual model used as a reference in the study can be seen in Figure 1. Conceptual Model (Hevner, 2004).



Picture 1 Conceptual Model

Systematics of Problem Solving

Problem-solving systematics is a structured approach in research that is used to identify, analyze, and solve problems in the development of Telkomedika mobile applications. This approach helps in identifying the source of the problem and finding the right solution. To facilitate problem-solving in the development of mobile apps for Telkomedika patients, the systematics of problem-solving is by the design thinking phase 101, namely understanding or analyzing, exploring or exploring, and materializing or implementing.



Picture 2 Systematics of Problem Solving

Data Collection Methods

In this stage of data collection or analysis, there are several stages to obtain data and information to be analyzed. The initial stage begins with a literature study to collect basic theories related to application design, DISC personality types, and design thinking methods. After that, an interview was conducted with Telkomedika to understand the business process and general problems related to patients. Furthermore, a DISC assessment was carried out to identify respondents with conscientious personality types. The next stage is a user interview with Telkomedika patients with a conscientious personality type to dig deeper into the needs and problems faced by users for each process. After knowing the patient's needs and designing the application, data collection in the form of usability testing is carried out to measure the ease of use of the application and identify whether there is anything that needs to be improved. Finally, when the iterative design and implementation have been completed, user acceptance testing is carried out to ensure that the application is to the user's needs and that the functions and features in the application can be used effectively and efficiently.

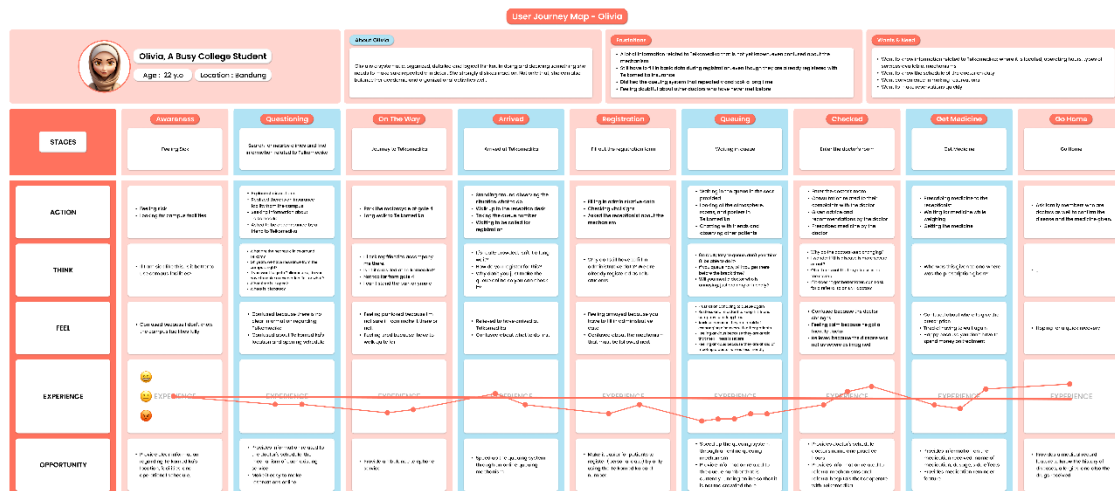
Data Processing Methods

Data processing in the development of the Telkomedika mobile application follows the flow of the design thinking method that has been explained in the systematics of problem-solving. Data processing begins with an in-depth understanding of users through the emphasize stage, the data obtained from user interviews is processed into an empathy map. After brainstorming and finding solution ideas in the form of prototypes, usability testing is then carried out to measure the ease of use of the application. Usability Testing was carried out using the Maze tools and the results were processed using the Single Ease Question (SEQ) method. Furthermore, when the prototype has been implemented using Visual Studio Code and Android Studio, User Acceptance Testing is carried out to ensure that the features in the application are functioning properly using the application that has been implemented and filling out a Google form. The results of this User Acceptance Testing are processed using the System Usability Scale (SUS) method.

Analysis and Planning

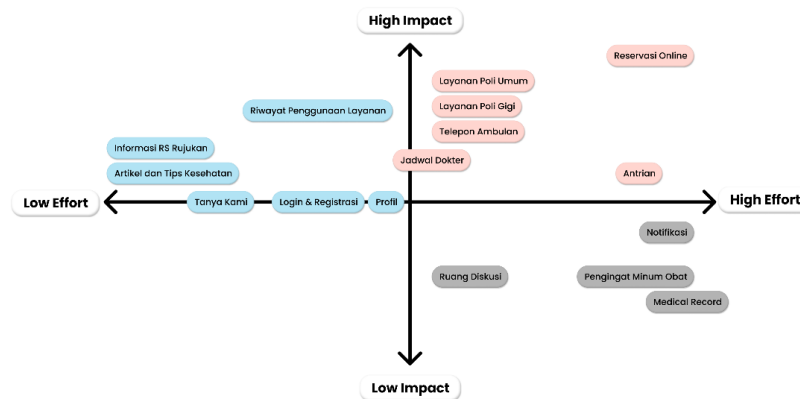
After knowing the existing business processes at the Telkom University Telkomedika Clinic, a difference between the current performance and the expected performance was found. Two main problems need to be overcome to improve the efficiency of performance or business processes at the Telkom University Telkomedika Clinic, especially in providing services to patients. First, there is still a lack of accessibility of information related to doctors' services and schedules. Second, the queue process is confusing and inefficient because it is still done manually. To overcome this problem, the development of two new features in the application is proposed. The service information feature will provide clear and up-to-date information regarding the various services available, doctor schedule information, and conditions or procedures that need to be carried out. With the service information feature, patients can more easily access Telkomedika information from anywhere and anytime. The second proposed feature is the online reservation feature. Through this feature, patients can make service reservations without having to come in person, it can streamline waiting time (queue) and can increase patient satisfaction.

Based on user interviews at the emphasize stage, many insights were obtained from user experience. Furthermore, at the define stage, these insights are poured into a user journey map to find out in-depth about user needs, desires, and experiences by compiling information related to user behavior and feelings.



Picture 3 Journey Map

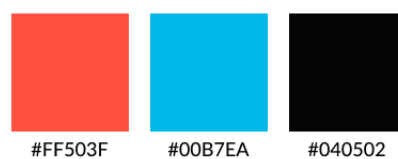
In the ideation phase, the insights that have been obtained at the define stage are then analyzed to find various ideas that can be the best solution to user problems. The Impact Effort Matrix is used as a tool to determine the priority order of features that will be a solution. The features that will be implemented first are those that have a great influence on the user experience and are easy to implement, such as login and registration, profile, ask us, service usage history, referral hospital information, as well as health articles and tips. Features that require great effort to implement but still have a significant impact on users, doctor schedules, ambulance calls, public poly services, dental poly services, queues, and online reservations will be implemented afterward.



Picture 4 Impact Effort Matrix

After determining the features to be developed based on the impact and effort, the next step is to determine the design material or User Interface Style Guideline. This UI Style Guideline is used as a guide in designing visuals or user interfaces in the Telmed 2.0 application. This guideline is used to be able to apply and ensure consistency and uniformity in UI design where this guideline is also adjusted to the user, namely patients with personality types. There are three elements in the UI Style Guide, namely color palette, typography, and shape.

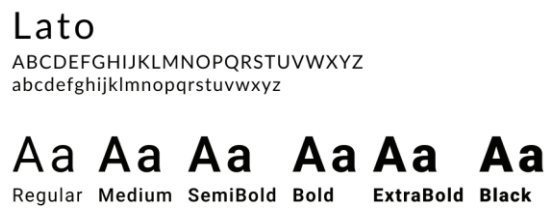
In designing the Telmed 2.0 application interface, color selection is based on the theory of color psychology. The color red, which is the identity color of Telkomedika, is used to give an energetic and assertive impression. The color blue, on the other hand, was chosen to create a calming and professional atmosphere. The combination of these two colors, as well as the use of white and black as complements, aims to create an interface that is not only visually appealing but also by the characteristics of users who have a conscientious personality type. (Zharandont, 2015).



Picture 5 Color Palette

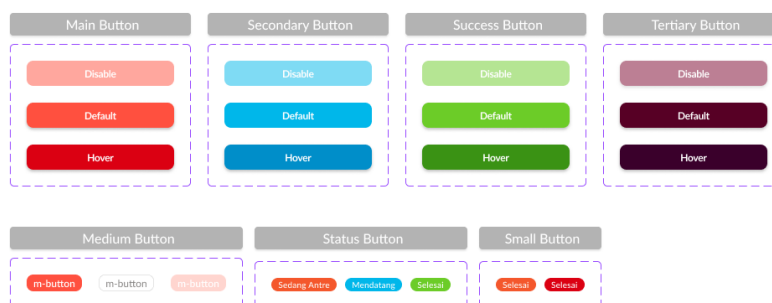
The choice of font in the design of the application has a great influence on the user's perception. According to certain types (Amare & Manning, 2012), fonts can trigger emotions and affect the way users interpret information. The Conscientiousness personality type has a perfectionist nature, likes neatness, and meticulousness, and does not like inaction. With these qualities, of course, this individual with the conscientious personality type wants the use of clear, firm, and neat fonts, making it easier for the individual to read the information on the application clearly and quickly. Therefore, as explained by the Interaction Design Foundation (2016) Lato font, has a clear and

unambiguous design and is easy to read on digital screens. By choosing the Lato font as the type of font used in this application, it can increase user satisfaction.



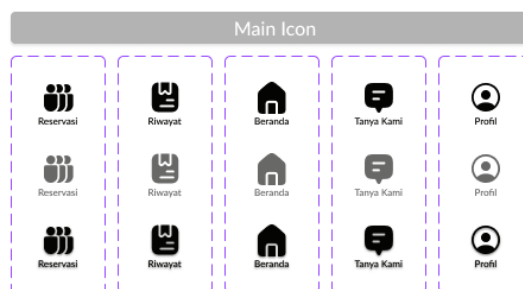
Picture 6 Typography

The definition of shapes in the UI Style Guideline plays a very important role in creating a consistent and orderly Telmed 2.0 application interface. For users with conscientious personality types, clear and structured shapes provide a sense of comfort and efficiency when using the app. In this UI Style Guideline, researchers classify buttons into several types based on their function. The main button is used as the main action that the user will take. The secondary button is used as an optional action. The success button is used as feedback to the user positively when they have completed a task. The medium button is used as the day button, the status button is used as the reservation history status, and the small button is the rest of the queue.



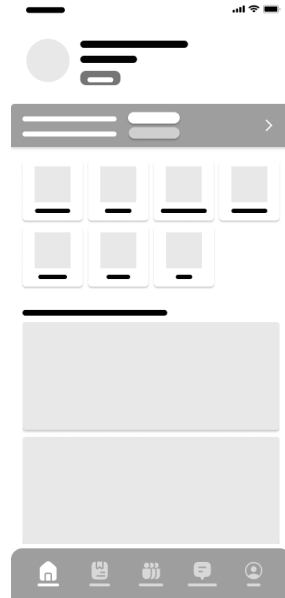
Picture 7 Shape 1-Button

Furthermore, the main *icon* that is used as part of the *UI Style Guideline* is a representative form of the main features in the Telmed 2.0 application. There are *reservation* icons, history, homepage, ask us, and profile.



Picture 8 Shape 2-Icon

After determining the UI Style Guideline, the next thing is to design low fidelity from several pages which are the main features of the Telmed 2.0 application. This low-fidelity design is used to visualize the page in general by focusing on its structure. This low-fidelity design will facilitate the process of designing pages in the form of high-fidelity.

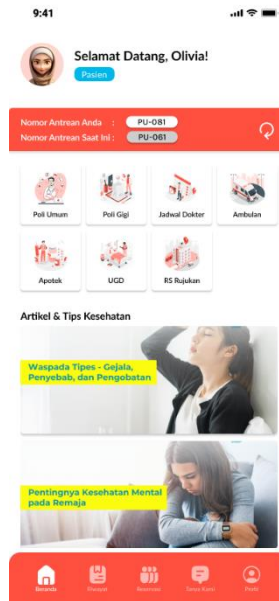


Picture 9 Low-Fidelity Home Page

Results and Discussion

Prototype

Low Fidelity which has been designed previously is expanded into high fidelity by being guided by the UI Style Guideline that has been determined. In designing this high-fidelity Telmed 2.0 mobile application, Figma is used as the main tool because it is easy to use can be learned quickly, and has plugin features that can help streamline the design process.



Picture 10 High-Fidelity Home Page

Testing Prototype Design

This prototype design testing is carried out using the Usability Testing method with the aim of testing and validating whether the prototype design that has been made previously is by the needs and expectations of users. The results of the Usability Testing are outlined in the measurement of the Single Ease Question (SEQ) in the form of a table that provides an overview of the level of ease of use of the application based on the user's perspective.

Table 1 Usability Testing Result Score

Respondent 1			
<i>Task</i>	<i>Time</i>	<i>Settlement Status</i>	<i>Score SEQ</i>
1.	14.49 seconds	Finish	7
2.	36.95 seconds	Finish	7
3.	30.67 seconds	Finish	7
4.	18.09 seconds	Finish	7
5.	4.53 seconds	Finish	7
Rata-rata score SEQ			7
Respondent 2			
<i>Task</i>	<i>Time</i>	<i>Settlement Status</i>	<i>Score SEQ</i>
1.	31.51 seconds	Finish	6
2.	86.29 seconds	Finish	6
3.	73.94 seconds	Finish	6
4.	16.47 seconds	Finish	7
5.	41.28 seconds	Finish	7
Rata-rata score SEQ			6.4
Respondent 3			
<i>Task</i>	<i>Time</i>	<i>Settlement Status</i>	<i>Score SEQ</i>
1.	30.93 seconds	Finish	7
2.	58.76 seconds	Finish	7
3.	25.38 seconds	Finish	7

4.	32.23 seconds	Finish	7
5.	20.03 seconds	Finish	7
Rata-rata score SEQ			7
Respondent 4			
<i>Task</i>	<i>Time</i>	<i>Settlement Status</i>	<i>Score SEQ</i>
1.	22.79 seconds	Finish	7
2.	113.24 seconds	Finish	7
3.	16.79 seconds	Finish	7
4.	6.68 seconds	Finish	7
5.	48.3 seconds	Finish	7
Rata-rata score SEQ			7
Respondent 5			
<i>Task</i>	<i>Time</i>	<i>Settlement Status</i>	<i>Score SEQ</i>
1.	13.27 seconds	Finish	7
2.	89.11 seconds	Finish	7
3.	30.2 seconds	Finish	7
4.	28.14 seconds	Finish	7
5.	19.2 seconds	Finish	7
Rata-rata score SEQ			7

From the average score that has been obtained previously, Table 2 of the Final Result of the SEQ Score is the final score of the SEQ score of the five respondents. Based on the average results of the SEQ score obtained from five Telkomedika Telkom University patients, the total SEQ score was obtained which was 6.88. From this score, it can be concluded that *the Telmed 2.0 application* prototype design scenario is easy to use.

Table 2 SEQ Score Final Result

	Answer 1	Answer 2	3 answer	4 answer	5 answer
Average score	7	6.4	7	7	7
Total SEQ Score	6.88				

Iterative Design Prototype

Based on the Usability Testing that has been carried out previously, feedback on the design of the Telmed 2.0 application was obtained. The creation of this feedback grid aims to analyze all feedback from users related to the design prototype that has been tested at the Usability Testing stage. The feedback that has been collected is then categorized based on likes, wishes, questions, and ideas.

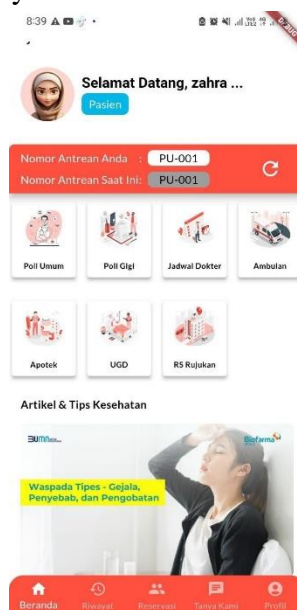
Feedback Grid

LIKE	WISHES
<ul style="list-style-type: none"> • Dari segi flow cukup aman ya (Nico, 06:51) • Garis underline itu ngabantu juga sih jadi kita sekarang misal lagi dipoli umum atau dipoli gigi itu sudah cukup membantu. Jadi kita tuh sekarang kita ada di menu yang mana. (Nico, 06:18) • Layoutnya udah cukup in ya cukup modern mungkin kalau untuk mahasiswa nggak ada masalah dengan layout kayak gitu. (Lili, 13:26) • Sudah cukup meng-cover semuanya sih, karena kita bisa lihat jadwal, terus bisa reservasi juga dan aplikasinya jadi kita datang ke Telkommedika nya (Lili, 15:31) • Overall sebenarnya aplikasinya udah bagus lah ya, maksudnya ada tujuannya, dan tujuannya tuh kepeke banget gitu lah, terutama yang buzer jadwal dokter. (Nego, 07:45) • Warnanya minimalis, jelas, dan perpaduannya dengan background putih sangat baik. (Indry, 06:50) • Dasarnya sederhana dan simple, tidak rame juga (Indry, 08:03) • Whitepacenya sudah aman (Indry, 05:22) • Fitur jadwal dokter sudah membantu mengatasi keluhan terkait informasi jadwal dokter, jadi kita bisa tetap dengan dokter yang sama (Indry, 07:26) • Sejauh ini ukuran font sudah aman, tidak pakai kacamata pun masih dapat terbaca (Indry, 06:40) • Di berandanya sudah jelas ato mau kemana-mana secara dasar tuh enak dilihatnya, ga bikin pusing walaupun banyak informasi di datanya (Sania, 06:32) • Informasinya terhighlight dengan jelas karena backgroundnya putih (Sania, 07:08) 	<ul style="list-style-type: none"> • Jadi kalau bisa jadwal dokter nih muncul, itu ada sekalian lah tombol reservasi gitu. (Dega, 06:52) • Dibekalnya ada button yang dapat mengintegrasikan dari jadwal dokter ke reservasi agar dapat mengefisien waktu (Indry, 05:25)
QUESTIONS	IDEAS
<ul style="list-style-type: none"> • Kalau yang RS rujukan itu, emang bisa minta surat rujukannya langsung dari aplikasi Telkommedika apa gmana? (Lili, 08:35) • Kalau yang reservasi itu ternyata bisa dilakukan dari dua cara ya? (Lili, 09:20) 	<ul style="list-style-type: none"> • Agak ga common aja sih kalau misalunya kalo beranda letaknya di tengah (Nico, 06:08). Misal home dipaling kiri, jadi profile di paling kanan (Nico, 06:32) • Mungkin spasi jaraknya antar komponennya itu kayak lebih di ini lagi gitu sih, jadi white space-nya lebih kelihatan gitu (Nico, 07:51) • Mungkin warna icon kayak kalau misalkan putih gitu kan atau yang agak lebih kontras lagi sedikit itu bisa lebih kelihatan sih (Lili, 13:00)

Picture 1 Feedback Grid

Implementasi Front-End

At this front-end implementation stage, the results of the Telmed 2.0 application prototype design are then implemented in front-end form. This implementation will make this mobile application more functional and can be used directly by users. On the home page, there is a user profile section, queue information section, service information section, article section, and navigation bar. The queue information section displays the patient's queue number after making a general poly service reservation, as well as the queue number that is currently in progress. The service information section contains services available at the Telkommedika Telkom University clinic. The article section contains health articles and health tips. The navigation bar is used to facilitate users in accessing various features quickly.



Picture 2 Home Page Implementation

Implementation Testing

Testing the implementation of the Telmed 2.0 application is carried out using the User Acceptance Testing method. In this testing process, users will identify whether the features in it are functioning properly and validate whether the Telmed 2.0 application is to the needs and expectations of users.

Table 3 Hasil User Acceptance Testing

ID Use case	Task	Flow	Test Results	
			Accept	Rejection
UC-01	Registration	Fill out the registration form	✓	
		Click the login button.	✓	
		Click the login button on the successful registration pop-up.	✓	
UC-02	Login	Fill out the login form	✓	
		Click the login button.	✓	
UC-03	Forgot Password	Fill out the forgot password form	✓	
		Click the change password button.	✓	
		Click the login button on the change password pop-up.	✓	
UC-04	View Doctor Schedule	Search for a doctor on the doctor's search bar	✓	
		Click the doctor dropdown card.	✓	
		Click the day button.	✓	
		Click on the general poly section.	✓	
UC-05	Making a Public Poly Reservation	Click the online reservation button on the general poly information page	✓	
		Fill out the general poly reservation form on the reservation page.	✓	
		Click the reservation button.	✓	
UC-06	Making a Dental Poly Reservation	Click the online reservation button on the dental poly information page	✓	
		Fill out the dental poly reservation form on the reservation page.	✓	
		Click the reservation button.	✓	
UC-07	Viewing the General Poly Queue	Click the view queue button on the public poly reservation pop-up successfully.	✓	
		Click the queue history dropdown card.	✓	
UC-08	Calling an Ambulance	Button ambulance phone	✓	
UC-09	Viewing Service Usage History	Click History navigation	✓	
		Click all sections	✓	
		Click section entry	✓	
		Click on the upcoming section.	✓	
		Click section finish	✓	
UC-10	View Profile	Click the history card dropdown.	✓	
		Click profile navigation	✓	

ID Use case	Task	Flow	Test Results	
			Accept	Rejection
UC-11	Changing Your Profile	Click the edit profile button	✓	
		Fill out the profile edit form.	✓	
		Click the save profile changes button.	✓	
		Click the cancel profile update button on the pop-up confirming the profile update.	✓	
		Click the button to confirm the profile update.	✓	
UC-12	View Referral Hospitals	Click on the referral hospitals feature	✓	
		Click on dropdown card rs.	✓	
UC-13	View Health Articles	Health article cards	✓	

The results of User Acceptance Testing show that the Telmed 2.0 application has managed to get positive validation from all patients. All patients stated that the task flow of the application ran smoothly and the available features worked as expected. It can be concluded that the application has successfully met the needs and expectations of users.

After completing the User Acceptance Testing process, the patient then fills out the System Usability Scale (SUS) form to measure the level of usability and ease of use of the Telmed 2.0 application.

Table 4 SUS Score Final Result

Patient	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Sum	Score SUS
Patient 1	5	1	5	1	5	2	5	2	5	2	37	92,5
Patient 2	4	1	5	2	5	2	5	1	5	1	37	92,5
Patient 3	5	1	5	1	5	1	5	1	5	1	40	100
Patient 4	4	1	5	1	5	1	5	1	5	1	39	97,5
Patient 5	4	3	4	2	4	2	3	2	5	1	30	75
SUS Total Score												91,5

Based on Table 4 of the Final Results of the SUS Score that has been carried out on five Telkomedika Telkom University patients, a total score of 91.5 was obtained. From these scores, it can be concluded that the level of ease of patient effectiveness in using the application is excellent.

Conclusion

Based on a series of research that has been carried out in designing and developing Telkomedika Telkom University clinic mobile applications based on the conscientiousness personality type using the design thinking method, it can be done by understanding the behavior, habits, and characteristics of the personality type as the basis

for determining the UI Style Guideline. By understanding the characteristics of this conscientious personality type, the interface design is designed in a structured, detailed, and neat manner. As a result, users with a conscientious personality type tend to feel more satisfied with the Telkomedika Telkom University application because the design follows their preferences and characteristics. Not only that, the easy and understandable task flow also helps users reduce the time to complete user tasks, so it is very suitable for the characteristics of users who want time efficiency. The results of the Usability Testing showed a SEQ (Single Ease Question) score of 6.88, it can be concluded that the Telmed 2.0 application prototype design scenario is easy to use. Furthermore, the User Acceptance Testing resulted in a SUS (System Usability Scale) score of 91.5, which shows that the level of ease of patient effectiveness in using the application is excellent.

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