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Application of Design Thinking on BPD Bali Mobile Banking

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Abstract: The banking company, one of the country's driving forces behind economic growth, continues to innovate for its customers by harnessing technological advancements. Bank BPD Bali has also embraced this progress through the launch of BPD Bali Mobile Banking. In developing this service, it is crucial to consider functionality, usability, needs, and user comfort, including creating a compelling UI/UX design to ensure user satisfaction. In evaluating BPD Bali's mobile banking, an SUS score of 57.19 was obtained. Therefore, redesigning BPD Bali's mobile banking system using design thinking is necessary. This approach enables genuine empathy with target users and effectively develops solutions for user problems and needs. Through five stages—Empathize, Define, Ideate, Prototype, and Test—the final result is a prototype recommendation tested using SUS. The prototype testing achieved a SUS score of 79.69, indicating that users can readily accept the recommendation.

Keywords: Design Thinking, Evaluation Usability Testing, SUS

1. Introduction

The development of technology today is increasingly rapid, and various innovations in technological development bring society to a new civilization [1]. This technological advancement ushers in a world where everything can be done online and certainly affects all aspects. According to the We Are Social report on [2], internet users have reached 212.9 million as of January 2023, meaning approximately 77% of the population in Indonesia has been using the internet. The continuous advancement of technology is significantly impacting today's dynamic life, where mobility is very high. This trend gradually demands society to effectively and efficiently utilize time by leveraging technology. Enhancing innovation through technology is also being continuously developed by every banking institution to improve performance [3]. According to Piter Abdullah, in an excerpt from keuangan.kontan.co.id [4], banking as an intermediary institution contributes 80% of the economy to the cost of consumption and production activities. The importance of banking makes banks take advantage of advances in information technology and the internet by creating innovations.

Mobile banking (m-banking) innovation is one of the opportunities for moving to digital. There are changes each year where customers who use m-banking continue to grow. Based on Bank Indonesia data, the use of mobile banking has grown 67.67% since 2021, which reached 1.90 billion times, to 3.2 billion in May 2022 [5]. Because of this trend opportunity, banks that have not previously provided m-banking services are slowly starting to offer m-banking services as they see an increase in customers using m-banking. Due to the rise in m-banking users, PT Bank Pembangunan Daerah Bali, often called Bank BPD Bali, capitalized on technological developments with the launch of the

e-banking service "BPD Bali Mobile Banking" which was released in 2015 and is available on the Play Store. Using technological developments by creating m-banking is certainly very useful for users. Still, there are complaints or feedback to Bank BPD Bali, which can be seen in the Play Store. Such as "the UI or appearance of the application being less modern, old-fashioned, and less comfortable," "does not support e-money payments such as Shopee, Dana, etc.", "The transaction process is quite complicated, one of which is the transfer feature, which has a complicated process or stage of up to three processes."

Based on the complaints, usability testing was conducted on BPD Bali's mobile banking to gain a clearer understanding. The testing was carried out using the System Usability Scale (SUS) to measure satisfaction levels. It involved a SUS questionnaire consisting of 10 statements rated on a 5-point Likert scale: "strongly disagree," "disagree," "neutral," "agree," and "strongly agree." In the usability testing evaluation, a SUS score of 57.19 was obtained. Based on the Net Promoter Score (NPS), the result falls under the detractor category. This means that consumers are disappointed with the product and will likely give negative recommendations to others [6].

Based on the identified issues, there is a specific need for problem-solving related to the user interface and user experience to delve deeper into user needs and enhance service satisfaction for M-banking BPD Bali in the future. Therefore, it is necessary to improve the user interface of M-banking BPD Bali by conducting analysis and designing UI/UX for mobile banking BPD Bali using design thinking. The design thinking method allows for genuine empathy with the target users and the effective development of solutions to address user needs and create innovation [7]. The UI/UX design in the research will go through 5 stages: Empathize, Define, Ideate, Prototype, and test. The study aims to provide solutions or recommendations to improve the user interface (UI) and user experience (UX) and enhance the m-banking services of BPD Bali.

2. Related Works

2.1. UI (User Interface)/ UX (User Experience)

User interface (UI) focuses on a display's beauty and color selection to create an emotional bond with users through an attractive and beautiful appearance so that the application is pleasing to the eye and users feel comfortable using it [8]. When a user or a person uses a product after using the product or even before using the product, which focuses on understanding consumer preferences and even responses in the form of emotions or physics, then this is called UX or user experience [9].

2.2. Design Thinking

Design thinking makes it possible to truly empathize with target users, develop solutions that effectively solve user problems and needs, and create innovation. The design thinking method identifies and understands users, user problems, and solutions that enable the author to define the issue from a certain point of view. Thus, it allows for the generation of as many ideas as possible and the development of innovative solutions by democratizing prototype design [10]. Design thinking has five stages: empathize, define, ideate, prototype, and test [7].

2.2.1 Empathize

The first stage of design thinking revolves around the need and action to understand the user's problems and to grasp the overall [11]. In this stage, understanding and empathizing with the perspectives and needs of users related to the issue or challenge at hand are conducted. The focus is gathering user information, utilizing various methods and techniques, such as interviews,

observations, direct observations, and in-depth interviews, to collect information about potential users [12].

2.2.2 Define

The second stage after empathizing is to analyze and interpret the information gathered. This stage focuses on identifying the existing problems from the empathized results to create a plan to address the needs for the solution to be developed later [11]. The observations gathered during the empathy process are then analyzed to discover/identify the focal points of the problems faced by the users [13].

2.2.3 Ideate

The third stage focuses on creating and producing ideas and solutions [14]. Creative thinking at this stage is crucial to discovering innovative solutions and developing realistic solutions [11]. In this stage, efforts are made to generate as many ideas and creative concepts as possible to solve problems or address challenges identified in the defined stage [12].

2.2.4 Prototype

The prototype stage in design thinking is the fourth stage in the design thinking process, where models or prototypes are produced from the ideas selected in the ideation stage. These prototypes are physical or visual representations of the planned solutions, which can help understand how the solutions will function in real life [12]. It is the stage where solutions and ideas are implemented into a design that will become a product so that real users can test the resulting prototype [15].

2.2.5 Test

The testing stage in design thinking is where researchers test the prototype created in the previous stage, namely the prototype stage, and evaluate the user experience of the application prototype design [12]. The prototype is tested with real users in the final stage of design thinking to gather user experience feedback [15]. This testing is also conducted to assess if the design functions or operates effectively based on user needs and to gather feedback for future application enhancements [14].

2.3. SUS (System Usability Scale)

System Usability Scale (SUS) It is a usability test or usability of a system with a questionnaire and focuses on the user's [16]. The use of the SUS questionnaire consists of 10 statements on a 5-point Likert scale, with 5 points being ready to be, "strongly disagree, " disagree," "neutral," "agree," and "strongly agree." The interpretation of the SUS score and the calculation formula can be seen in Figures 1 and 2.

$$\square = \sum^{x} / \eta$$

$\square$ = Average SUS score

$\sum^{x}$ = Total SUS score

η = Total Respondents

Figure 1. SUS Calculation Formula

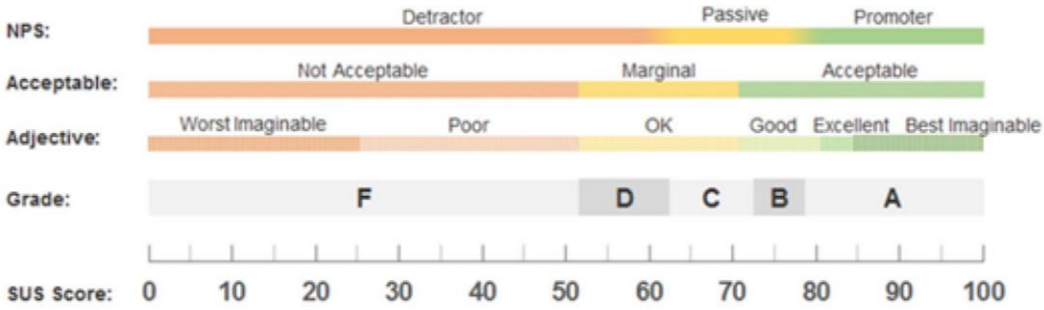

Figure 2. Score Result Interpretation SUS

2.4. Figma

Figma is a graphic design application designed specifically to create prototypes and user interfaces for applications and websites [17]. It is a free design tool that can be accessed online, making it accessible even with a lower-end computer. Figma also has a supportive community that offers numerous plugins, templates, and designs to assist in building prototypes, as well as features specifically for designing prototypes or user interfaces [17].

3. Experiment and Analysis

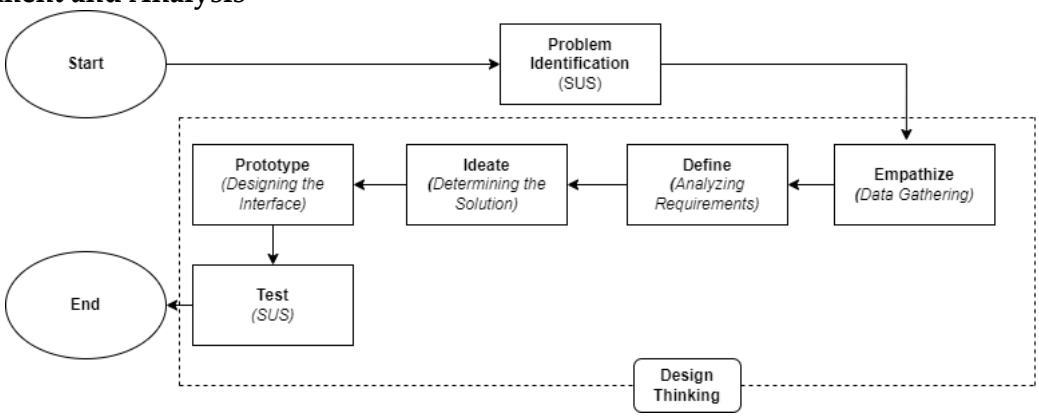

Figure 3. Methodology

This research consists of several stages or process flows carried out, as shown in Figure 3:

3.1. Problem Identification

The identification process and usability testing evaluation are carried out, evaluating BPD Bali m-banking using the SUS (System Usability Scale). According to Nielsen in the quote Field [18], In the usability testing evaluation, the respondents can be five people; 5 respondents are enough to do a usability test. In testing the usability testing evaluation in this study, using 8 respondents who are customers of Bank BPD Bali.

Based on the testing conducted on BPD Bali's mobile banking, the recapitulation results can be seen in Table 1. The SUS score for BPD Bali's mobile banking in the usability testing evaluation phase is 57.19 (grade D). From the SUS score, it can be concluded that based on the adjective approach, BPD Bali's mobile banking service still falls into the OK category, with an acceptance level that is still acceptable to BPD Bali's customers. However, based on the NPS interpretation approach, the

obtained result belongs to the Detractor category. This condition indicates that consumers are disappointed with the product and potentially inclined to give negative recommendations to others.

Table 1. Evaluation Results with SUS

		SUS										Score	
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total	Grade
Respondents	R1	3	1	1	1	4	3	1	3	3	0	20	50
	R2	2	1	3	3	3	3	1	2	3	1	22	55
	R3	2	1	3	3	3	3	3	3	3	1	25	62,5
	R4	3	3	3	3	3	3	3	3	3	3	30	75
	R5	2	1	2	3	3	1	1	1	1	1	16	40
	R6	4	4	4	4	4	3	4	4	4	0	35	87,5
	R7	3	1	1	1	3	3	3	2	1	0	18	45
	R8	2	1	2	1	3	2	3	2	1	0	17	42,5
							Score SUS					57,19	

3.2. *Empathize*

In the empathize stage, which is the first stage of design thinking, empathy is established through interviews and observations of 8 respondents or customers who are the same in the testing and evaluation phase of usability testing. An Empathy Map is created with 4 quadrants (says, thinks, does, and feels) with the persona in the middle. The Empathy Map of the 8 respondents can be seen in Figure 4.

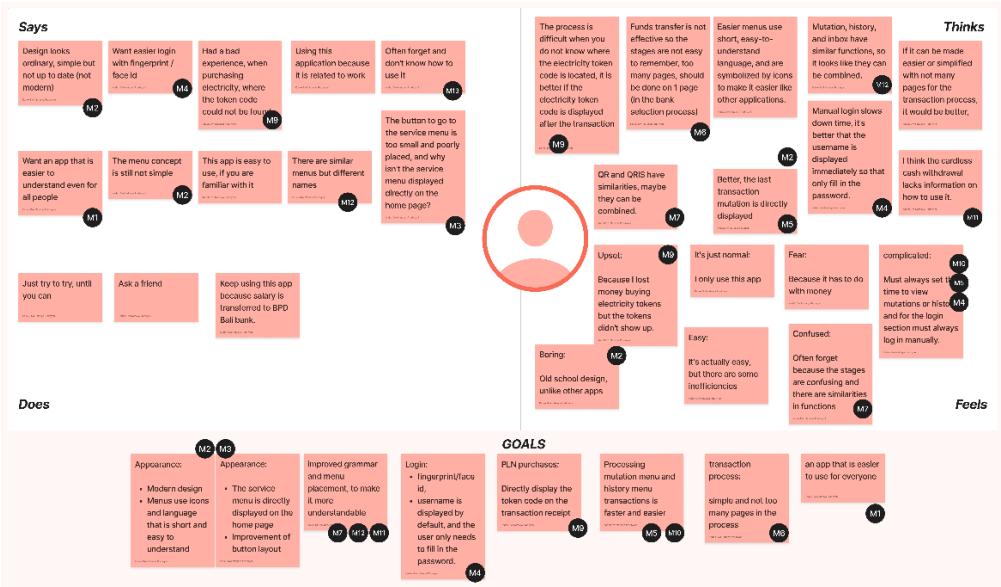

Figure 4. Empathy Map

3.3. *Define*

The define stage involves defining by combining all observations, interviews, and data collected in the empathize phase that has been transformed into an empathy map to gain insights into

identifying user problems by creating a user persona or a description of a user type that is fictional yet realistic according to the collected data. The user persona results can be seen in Figure 5.

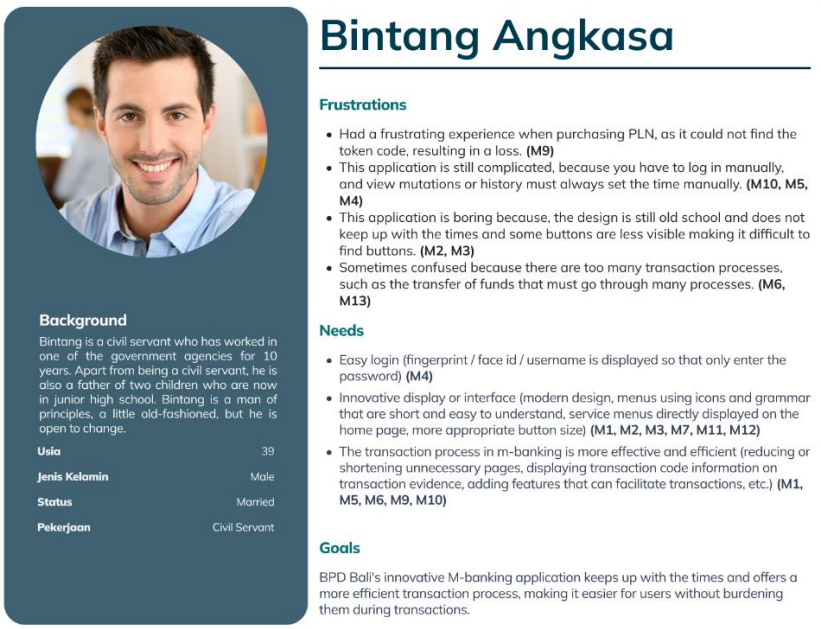

Figure 5. User Persona

3.4. Ideate

In the ideate stage, the process involves finding solutions or designing strategies for existing problems in the form of a user journey map and user flow.

3.4.1. User Journey Map

The user journey map focuses on visualizing the flow of a customer's journey to achieve their goals in using a product or service. It is useful for understanding and addressing user needs and issues. The results of the user journey map can be seen in Figure 6.

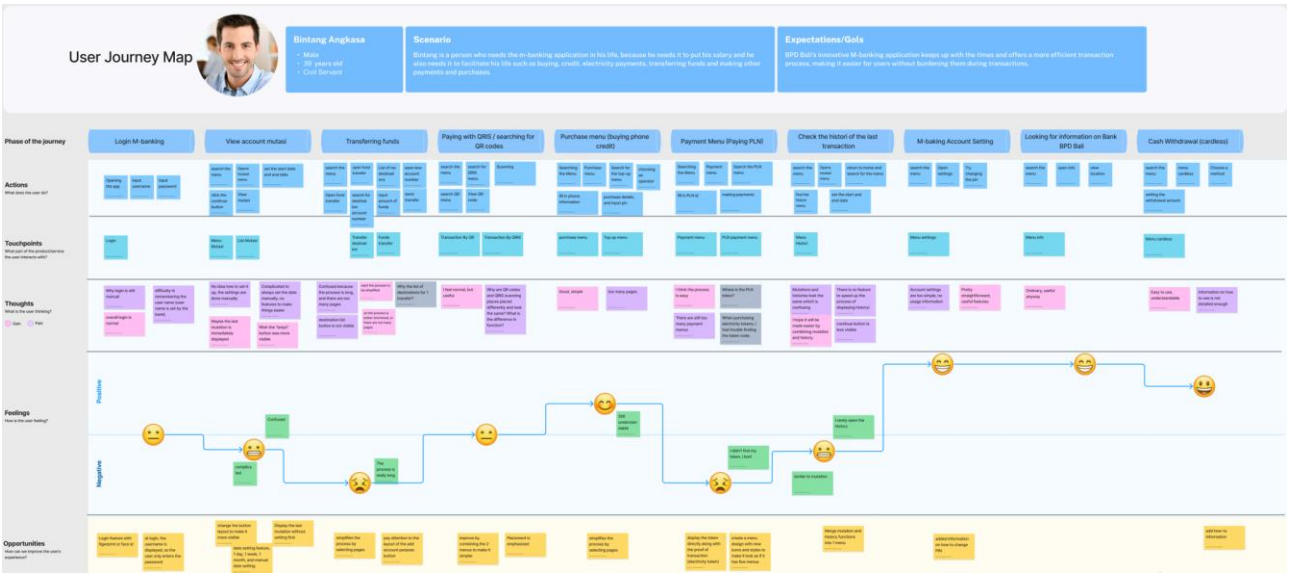

Figure 6. User Journey

Based on the findings from developing the User Journey Map, here is a detailed explanation of the revamp plan for BPD Bali's mobile banking interface, incorporating user input as depicted in Table 2.

Table 2. Improvement Plan

Problem	Improvement Plan
• "Transfer dana" has long transaction steps • The '+' add destination button is not visible.	• Simplifying the "transfer dana" process by streamlining the page. • Improving the layout of the add destination account button.
• The payment menu has a large menu. • The placement of the electricity token code information is not efficient.	• Create a menu design with new icons and styles to make it appear more concise. • Display the token code simultaneously with the transaction proof (electricity token).
• "Mutation Menu" is less efficient, setting the date manually. • There is no speed up time setting feature.	• Displaying the latest mutation without time settings in the mutation menu. • Rearranging the button layout for better visibility. • Combining the mutation and history functions into a single "activity" menu. • Adding date settings feature: 1 day, 1 week, 1 month, and manual date setting.
• Menu history is less efficient, setting the date manually. • The position of the 'lanjut' button is not visible. • Similarity of Mutation and History functions creates confusion.	
• Manual login, and no easy features. • the login username is difficult to recall.	• Username at login is displayed by default, so only enter the password. • Login feature with fingerprint or face id
• The similarity of the transaction menu functions by QR and by QRIS, where users are more familiar with QRIS.	• Placement is more emphasized. • Combining the 2 menus to make it simpler and easier to find.
• The purchasing menu has a lengthy process page.	• Simplify the process by selecting pages
• Cardless lacks information on how to utilize its features.	• Update information on how to use
• Simple setup, no usage information available to change PIN or Password	• Addition of instructions on how to change PIN or Password

3.4.2. User Flow

The user flow focuses on depicting the sequence of steps taken by customers to accomplish their goals. In Figure 7, one of the user flows has been created to illustrate the steps users take when logging in. There are 2 representations of user flows: the original one (user flow in the previous m-banking) and the recommended one after the changes, which aligns the login process with user

needs. This includes adding the feature of using fingerprint/face ID and displaying the username by default, so users only need to enter their m-banking password.

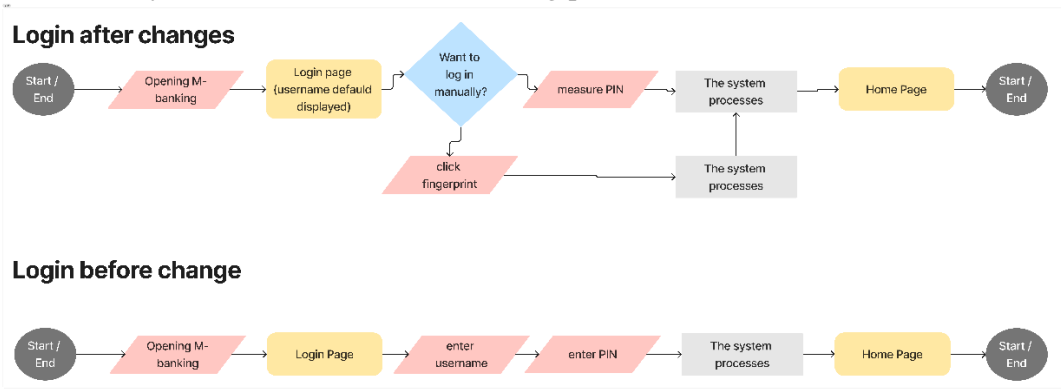

Figure 7. User Flow

3.5. *Prototype*

The prototype stage process is the phase where the redesign process of BPD Bali m-banking begins based on a collection of ideas or solutions after conducting the data collection process at the empathize, define, and ideate stages. At this stage, a high-fidelity prototype is made using Figma. According to Sommerville in the quote [16], a Prototype is used to explain a concept, trial system design, and find a problem to find the most appropriate solution. The results can be seen in Figure 8.

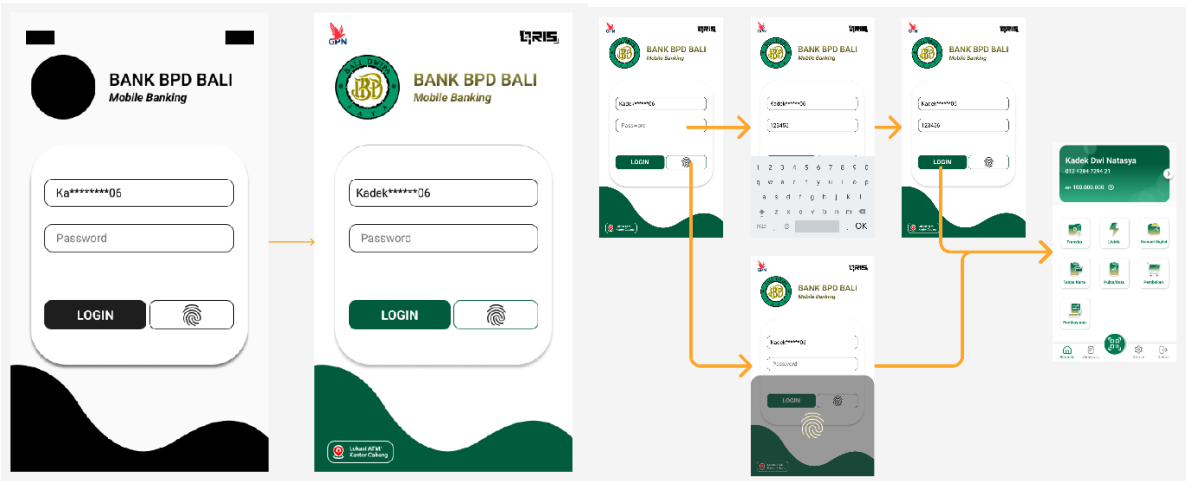

Figure 8. *Prototype*

3.6. *Test*

In the test stage process, the testing process is carried out on the prototype of the redesigned BPD Bali m-banking design. Testing is done using the same techniques as in usability testing evaluation. Based on the results of testing the BPD mobile banking redesign design, using think-aloud, all users gave a positive response and had a SUS value of 79.69 (grade A-), adjective, Good category, and NPS, classified as Promoter, this Promoter condition is a condition where consumers are enthusiastic about the products offered and are also interested in recommending to others [6], the SUS results can be seen in Table 3.

Table 3. Test Results With SUS

		SUS										Score	
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total	Grade
Respondenst	R1	4	3	4	3	4	3	4	3	4	0	32	80
	R2	4	4	4	4	4	4	4	4	4	4	40	100
	R3	3	4	4	3	3	3	3	3	3	1	30	75
	R4	4	3	3	3	3	3	3	3	3	2	30	75
	R5	3	3	3	3	3	3	3	3	3	3	30	75
	R6	4	4	4	4	3	4	3	4	4	1	35	87,5
	R7	3	3	3	2	3	3	4	3	4	1	29	72,5
	R8	4	4	3	2	3	3	3	3	3	1	29	72,5
							Score SUS					79,69	

4. Conclusions

Based on the research results, it can be concluded that the redesign of BPD Bali's mobile banking using the design thinking method went through 5 design processes: empathize, define, ideate, prototype, and test. The research resulted in a design solution, where the prototype testing of M-banking BPD Bali obtained a SUS score of 79.69 (grade A-), indicating that consumers are enthusiastic about the offered product and are interested in recommending it to others. In comparison, the SUS score evaluation resulted in a score of 57.19 (grade D), indicating consumer disappointment with the product and the potential for negative recommendations. Therefore, it can be concluded that the design of BPD Bali's mobile banking has been well executed and is acceptable to users, which means that the design is ready to be used as a recommendation for BPD Bali.

Drawing on the study that has been done, it is suggested that to get comprehensive results and cover all the bases, more assessment tools should be added during the testing phase. The suggested outcomes may be turned into an application or used as guidance when BPD Bali's mobile banking is built in the future.

References

[1] baktikominfo.id, "DAMPAK POSITIF DAN NEGATIF PERKEMBANGAN TEKNOLOGI KOMUNIKASI DI ERA DIGITAL," 10 05 2019. [Online]. Available: https://www.baktikominfo.id/en/informasi/pengetahuan/dampak_positif_dannegatif_perkembangan_teknologi_komunikasi_di_era_digital-806.

[2] dataindonesia.id, "Pengguna Internet di Indonesia Sentuh 212 Juta pada 2023," dataindonesia.id, 2023.

[3] Imamah, "PENGARUH MOBILE BANKING TERHADAP PROFITABILITAS BANK DI BURSA EFEK INDONESIA," *Jurnal Administrasi Bisnis,* vol. 15, 2021.

[4] keuangan.kontan.co.id, "Peran perbankan sangat besar dalam menggerakkan ekonomi nasional," 17 08 2020. [Online]. Available: https://keuangan.kontan.co.id/news/peran-perbankan-sangat-besar-dalam-menggerakkan-ekonomi-nasional.

[5] keuangan.kontan.co.id, "BI Catat Transaksi Mobile Banking Tembus Rp 3.888,09 Triliun hingga Mei 2022," 11 08 2022. [Online]. Available: Maphttps://keuangan.kontan.co.id/news/bi-catat-transaksi-mobile-banking-tembus-rp-388809-triliun-hingga-mei-2022.

[6] B. T. Simarmata, "MENGUKUR TINGKAT KEPUASAN NASABAH DENGAN NET PROMOTER," *Jurnal Ilmiah Skylandsea ,* p. 261, 2019.

[7] A. Tankó, "Design and Development of a User Centered Mobile Aplication for Intermodal Public Transit in Bangkok A Design Thinking Approach," *Special Issue of the Infocommunication Journa,* 2022.

[8] D. Yogi Irdes, KONSEP INTERAKSI MANUSIA DAN KOMPUTER, Lakeisha, 2022.

[9] A. P. K. M. A. A. Muhammad Azmi, "Evaluasi User Experience Aplikasi Mobile Pemesanan Makanan Online dengan Metode Design Thinking (Studi Kasus GrabFood)," *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer (J-PTIIK) - Vol 3 No 8*, 2019.

[10] P. N. Winda Suci Lestari Nasution, "UI/UX Design Web-Based Learning Application Using Design," *ARRUS Journal of Engineering and Technology,* vol. 01, pp. 28-27, 2021.

[11] D. Darma Paramartha, "Perancangan Ui/Ux Aplikasi Banten Online Menggunakan Metode Design Thinking," *Jurnal Teknologi Informasi dan Komputer - Vol. 9 No. 2*, 2023.

[12] P. R. Muhammad Fadil Ardiansyah, "Perancangan UI/UX Aplikasi Pengolahan Limbah Anorganik Menggunakan Metode Design Thinking," *LOGIC : Jurnal Ilmu Komputer dan Pendidikan,* vol. 1, p. 842, 2023.

[13] A. M. W. S. Sri Soedewi, "Penerapan Metode Design ThinkingPada PerancanganWebsite UMKMKirihuci," vol. 10, p. 85, 2022.

[14] Y. R. R. ,. T. I. H. Muhammad Adhitya, "Rancangan UI/UX Design Aplikasi Pembelajaran Bahasa Jepang Pada Sekolah Menengah Atas Menggunakan Metode Design Thinking," *JURIKOM (Jurnal Riset Komputer) - Vol. 9 No. 4,* 2022.

[15] D. Diva Kurnia, "Implementation Of User Interface And User Experience Car Wash Service Provider Android Based Application “Spotless” Using Design Thinking Method," *Jurnal Teknik Informatika (JUTIF) - Vol.3, No. 6,* 2022.

[16] D. Ilham Hananto, "Analisis dan Perbaikan Usability Situs Halo FILKOM menggunakan Metode Design Thinking dan System Usability Scale," *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer (J-PTIIK) - Vol 6 No 11 ,* 2022.

[17] Jubilee, Desain UI/UX dengan Figma dari Nol, Jubilee Digital, 2021.

[18] M. U. A. Iryanto, "Evaluasi Usability Aplikasi SIAP TARIK Dengan Menggunakan Metode Usability Testing dan System Usability Scale (SUS) Pada Puskesmas Tarik Sidoarjo," *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer,* p. 7097, 2019.

[19] D. Dara Adhelia, "Perancangan User Experience APlikasi Mobile Lelenesia menggunaka Metode Desin Thinking," *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer (J-PTIIK) - Vol 3 No 11,* 2019.