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Measuring MyTelkomsel Usability with Post-Study System Usability Questionnaire

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ABSTRACT

The MyTelkomsel app is a mobile operator service app that makes it easy for Telkomsel users to access the digital services provided. Currently, the MyTelkomsel app has been downloaded more than 100 million times on Google Playstore and has a rating of 4.0 out of 5, so further evaluation is needed to gain an in-depth understanding of the user experience. This study evaluates the user experience using the Post-Study System Usability Questionnaire (PSSUQ) and Usability Testing with the think-aloud method. The PSSUQ results from 110 respondents show that the quality of information is 3.38 and the quality of the interface is 3.37, which is considered good. However, system quality had the lowest score, at 3.26. Usability testing involving 10 participants showed effectiveness (task success rate) of 81% and efficiency (time spent on tasks) of 56.45 seconds, but the error rate (50%) indicated that there were still problems with navigation and interface design. Meanwhile, the think-aloud test results showed that users had difficulty using the customer service and purchase history features in the application. The conclusion of this study is that although the quality of the MyTelkomsel application is generally good and acceptable to users, improvements in interface design and system performance are still needed to improve the overall quality of the application and enhance the user experience.

I. INTRODUCTION

In the digital age, the telecommunications industry is growing rapidly in tandem with advances in information technology and the increasing internet usage by the general public. The number of internet users in Indonesia is expected to increase from 61.10% in 2021 to 72.78% in 2024, according to data from the Central Statistics Agency (BPS). This increase reflects the evolution of Indonesians' digital behavior, who now prefer services that are fast, easy, and accessible anytime, anywhere. As a result, telecommunications companies must provide more sophisticated services in the form of applications that display remaining quotas, credit, data packages, card validity periods, and other information in real-time. These applications are designed to make it easier for users to access and utilize these services. Thus, smartphone users no longer need to make calls using special codes such as *888#, *123#, and so on [1].

According to information from Telkomsel's official website, the company was established on 26 May 1995. Telkomsel was the first to introduce 2G, 3G, and 4G LTE networks in Indonesia and is poised to be the first to trial 5G services in Indonesia. Data from APJII, cited in a study [2], show that 41.94% of internet users utilise Telkomsel's services. This is in line with the Speedtest Awards report from Telkomsel's official website, which shows that Telkomsel outperforms other operators such as IM3, 3, XL, and Smartfren, winning the Speedtest Awards Indonesia for mobile network speed during Q1-Q2 2024 with a speed score of 42.33 and a median speed of 31.95 Mbps.

The MyTelkomsel app is an application developed by PT Telkomsel, one of the largest mobile operators in Indonesia. This app provides various services for users, ranging from checking quotas to purchasing data packages, as well as information about card validity periods. As the main bridge between users and Telkomsel services, the user experience in

using its features determines how the quality of this app is evaluated. Although Telkomsel is one of the largest operators in Indonesia, several previous studies have revealed complaints related to user experience, and there are gaps that require in-depth analysis of the user experience. Based on the number of downloads on Google Play Store, the MyTelkomsel app has a very large number of users, making the quality of the user experience a very important aspect to analyse. Applications with a large user base generally have more diverse features, so any usability issues, such as unclear navigation or unstable system performance, can have an impact on users. Usability evaluation is essential to ensure that the application not only functions well technically but also provides an effective, efficient, and satisfying experience for all users.

The results of the study [3] show that users have difficulty finding the vouchers they want because they are too far from the main page and tend to be very crowded on the point exchange page. This indicates the need for further evaluation of the MyTelkomsel application. Research by [4] states that based on the MeCUE 2.0 method calculation, MyTelkomsel has a usefulness score (6.31) and usability score (6.25), but the commitment (4.64) and intention to use (4.74) scores are at a lower level, indicating that the success of the application is not only through ease of use but also requires a more comfortable and consistent experience for users. Additionally, research from [5] found that MyTelkomsel's System Usability Scale score was only 41.75, which is a grade F. Complaints included slow loading, confusing menus, frequent app crashes, and inaccurate information, such as remaining credit and points. These findings are consistent with research [6], which confirms that aspects such as learnability, efficiency, satisfaction, error, and memorability have a significant influence on user satisfaction.

The collection of studies shows that even though MyTelkomsel has a large number of users and strong infrastructure support from Telkomsel, the user experience on the MyTelkomsel app still faces unresolved difficulties. Previous studies evaluated the MyTelkomsel application the SUS and MeCUE methods, but in-depth evaluation after use with PSSUQ is still rarely used in the MyTelkomsel app. In fact, many of the complaints that emerged in previous findings stemmed from more detailed issues: confusing menus, inaccurate information, or interface quality that caused cognitive load when navigating. This study also added a usability testing approach with think-aloud to observe user behavior directly, so that the results obtained were more objective and in-depth.

[7] explains that user experience (UX) evaluation plays a very important role in every interactive application. User experience (UX) not only focuses on how users can learn, use, and feel satisfied with a product or system, but also focuses on the level of satisfaction felt by users when using a system. In the context of application development, according to [8], usability and user experience (UX) are the main considerations in any design intended for user consumption, as both play a crucial role in ensuring that the application is satisfactory for users.

International standards such as ISO 9241-11 have become the main reference in defining usability, which covers three main aspects, namely effectiveness, efficiency, and user satisfaction [9]. Research conducted [9]shows that the aspects of usability that are often evaluated in mobile applications are efficiency, satisfaction, effectiveness, ease of learning, ease of remembering, cognitive load, and errors. One tool that is often used for usability evaluation is the Post Study System Usability Questionnaire developed by [10]. To date, no studies have been found that evaluate the user experience of MyTelkomsel using the Post-Study System Usability Questionnaire (PSSUQ) and usability testing using the think-aloud method. The PSSUQ is a questionnaire package used in usability assessment and is used to assess user satisfaction with the system being used [11]. The PSSUQ instrument has the ability to evaluate system usability (SysUse), information quality (InfoQual), interface quality (InterQual), and overall satisfaction (Overall).

Meanwhile, usability testing is a measure of a characteristic that refers to how a user can learn and use a system or product to achieve their goals and satisfaction with its use [11]. According to [12], usability testing is carried out by involving real users and observing them while interacting with the system to perform a series of specific tasks. According to [13], there are five indicators of usability testing, namely learnability, memorability, efficiency, errors, and satisfaction. Think Aloud is used because it can recapitulate the problems encountered and recommendations given by users during usability testing [14], [15]. The think-aloud method is a proven testing technique for studying human thought processes [16]. With users providing verbal comments, observers can understand which aspects of the interface need improvement. The entire “Think Aloud” session is recorded to note crucial points that support the analysis process [17].

This combination of approaches can evaluate user experience more deeply, especially in terms of details that are often a source of user discomfort. Therefore, the use of PSSUQ and usability testing with think-aloud in the context of MyTelkomsel is relevant to complement previous research methods and open up areas of analysis on usability factors, information quality, and interface quality that affect user experience.

The main objective of this study is to evaluate the quality of the application from the perspective of the overall user experience and identify areas that still cause discomfort. To keep the analysis focused, this study will be limited to evaluating the user experience of the MyTelkomsel application without evaluating Telkomsel's network performance or other external factors unrelated to user interaction with the application, using PSSUQ instruments and usability testing with think-aloud. With these limitations, it is hoped that this study can provide a clearer map of the aspects that need to be improved in MyTelkomsel. In addition to providing direct input for application development, this

study also provides an additional perspective that can be used as a basis for continuous improvement, so that MyTelkomsel can better respond to the needs and expectations of its users.

II. METHODOLOGY

This study uses a mixed quantitative and qualitative method. With two approaches, namely the Post Study System Usability Questionnaire (PSSUQ) and usability testing with think-aloud. The quantitative approach through the PSSUQ questionnaire is used to assess user satisfaction levels, while the qualitative method with usability testing directly monitors how users interact with the application. The combination of these two approaches provides deeper insights into the user experience of the MyTelkomsel application.

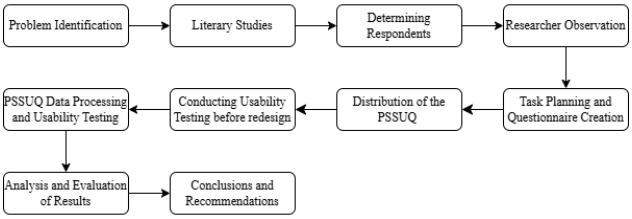

Figure 1. Research design

Figure 1 shows the research design flow, starting from problem identification, literature study, determining respondents, researcher observation, task design and questionnaire creation, PSSUQ questionnaire distribution, usability testing implementation, PSSUQ and usability testing data management, analysis and evaluation results, and finally conclusions and recommendations.

A. Research Implementation Stages

The first stage began with identifying problems experienced by MyTelkomsel app users, particularly related to usability, information quality, and interface quality. These problems were identified based on user complaints, such as confusing menus and inaccurate information, requiring in-depth evaluation using observation and questionnaires for app users to obtain valid data. A literature study was then conducted to strengthen the theoretical basis and determine relevant research methods. The literature study was conducted by reviewing various previous studies related to user experience evaluation using the PSSUQ method and usability testing with think-aloud. This study focused on active MyTelkomsel users. The number of respondents in this study was determined by the simple random sampling formula, as this formula is suitable for populations whose exact numbers are unknown. The Lemeshow formula (1997) calculation is as follows [18], [19]:

$$n = \frac{z^2 p(1-p)}{d^2} \quad (1)$$

$$n = \frac{1{,}96^2(0{,}5)(1-0{,}5)}{0{,}1^2} \quad (2)$$

$$n = \frac{0{,}9604}{0{,}01} \quad (3)$$

$$n = 96 \quad (4)$$

With the following parameters:

$n =$ represents the number of samples
$z =$ indicates a standard value of 1.96
$p =$ maximum estimate set at 0.5
$d =$ sampling error rate of 0.10

The results of the simple random sampling calculation above show that the sample size for an unknown population is at least 96 respondents and will be used in the PSSUQ questionnaire in this study. Determination of the number of usability testing participants in this study was used by [12], calculated as follows:

$$Found(i) = N(1-(1-k)^i) \quad (5)$$

$$Found(5) = 100(1-(1-0.31)^5) = 84.3 \quad (6)$$

With the following parameters:

$Found =$ number of usability issues found
$(i) =$ user
$N =$ total number of issues in the system
$k =$ the average probability of one user finding one issue

Based on empirical results [12], the average value is 0.31, so that by involving 5 users, approximately 84% of the main interface problems can be found. Then the researcher will conduct observations to understand the flow of use, available features, and find out what could potentially cause obstacles for users. The results of these observations then form the basis for developing task scenarios. After that, the researcher creates tasks for the usability testing process and a questionnaire compiled using Google Forms containing questions that refer to the Post-Study System Usability Questionnaire (PSSUQ) method. The researcher then distributes the questionnaire. In Google Forms, respondents were first asked to select whether they had ever used the MyTelkomsel application. If they answered "yes," they would proceed to the next question, while if they answered "no," the questionnaire would be completed immediately. After that, usability testing was conducted with active MyTelkomsel users as participants. At this stage, users were asked to complete several scenarios and tasks. During this process, the researchers observed user interactions to identify difficulties, errors, task completion times, and their reactions to the application display.

The combination of the PSSUQ method and usability testing was carried out to anticipate weaknesses that arise when using only one evaluation method. In previous research [20], researchers combined PSSUQ and usability testing to evaluate the Getcontact application and obtained more focused evaluation results because it produced two forms of data, namely quantitative and qualitative. PSSUQ produces quantitative data in the form of numbers that indicate user satisfaction with the system, but does not explain the obstacles experienced by users when interacting with the application. Meanwhile, usability testing with think-aloud produces qualitative data where researchers directly observe how users use the application when completing tasks, including the obstacles faced by users. Thus, with the combination of these two methods, the quantitative data from PSSUQ can be

clarified through the results of usability testing with think-aloud, so that the research not only displays user satisfaction scores but also provides an explanation of the factors that influence these results.

B. Research Instrument

The main methods used in this study were the PSSUQ and usability testing with a think-aloud protocol. The PSSUQ is a questionnaire developed by [10] to assess user experience after they have finished using a system. This study used a PSSUQ containing 16 questions adapted from previous researchers [19] who established the PSSUQ in the mobile application category. The 16 questions cover four dimensions, namely system usability (sysuse), information quality (infoqual), interface quality (intqual), and overall, in accordance with the PSSUQ developed by Lewis in 1995. Thus, although the number of questions was adapted from previous research, the aspects measured still refer to the main dimensions of the PSSUQ as developed by [10].

TABLE I
PSSUQ QUESTIONNAIRE QUESTIONS

No.	Question
Overall Satisfaction	
System Usefulness (SysUse)	
1.	Overall, I am satisfied with how easy it is to use the MyTelkomsel app
2.	It is very easy to use the MyTelkomsel app
3.	I can complete tasks and scenarios quickly using the MyTelkomsel app
4.	I feel comfortable using the MyTelkomsel app
5.	It is easy to learn the features of the MyTelkomsel app
6.	I am confident that I can quickly become productive when using the MyTelkomsel app
Information Quality (InfoQual)	
7.	The MyTelkomsel app provides error messages and clearly tells me how to fix the problem
8.	Whenever I make a mistake using the MyTelkomsel app, I can recover easily and quickly
9.	The information (such as online help, on-screen messages, and other documentation) provided by the MyTelkomsel app is clear
10	It is easy to find the information I need
11.	This information is effective in helping me complete tasks and scenarios on the MyTelkomsel app
12.	The layout of information on the MyTelkomsel app screen is well structured
Interface Quality (IntQual)	
13.	The interface/display design of the MyTelkomsel app is pleasant
14.	I like using the MyTelkomsel app interface/display
15.	The MyTelkomsel app has all the functions and capabilities (features) that I expect
Overall Satisfaction	
16.	Overall, I am satisfied with the MyTelkomsel app

Table I displays a list of questions from the PSSUQ questionnaire, which was used as the main tool in this study. These questions were specifically designed to ascertain users' views after using the MyTelkomsel application. The aspects covered include the usefulness of the system, the quality of information, and the interface design of the application.

TABLE II
PSSUQ RATING SCALE

Question Scoring	Lowest Score	Average	Highest Score
SysUse - 1-6	2.57	2.80	3.62
InfoQual - 7-12	2.79	3.02	3.24
InterQual - 13 – 15	2.28	2.49	2.71
Overall - 1 – 16	2.62	2.82	3.02

Table II contains the assessment scale rules for the PSSUQ. The limits of this scoring scale are derived from previous research [19]. There are three categories of assessment scale grouping: lowest score, which indicates the lowest assessment category; average, which indicates an assessment that is not too bad but still not perfect; and highest score, which can be categorised as perfect.

TABLE III
LIKERT SCALE

Skala Likert	Point
Strongly disagree	7
Disagree	6
Somewhat disagree	5
Neutral	4
Somewhat agree	3
Agree	2
Strongly agree	1

The criteria for interpreting PSSUQ scores are based on a scale ranging from 1 to 7, as shown in Table III, where lower values indicate higher levels of satisfaction. Scores are interpreted by looking at the position of the average value on the scale. Results closer to the lowest number on the scale indicate better usability because they show a high level of user satisfaction, as referred to in previous studies that used similar instruments [19].

The PSSUQ score is calculated using the average of each item based on the subscale, using a formula referenced in [21]:

$$Subscale = \frac{total\ respondent\ scores\ for\ each\ subscale}{number\ of\ items\ in\ each\ subscale} \quad (7)$$

Once all the data has been collected, the next step is to process the respondents' answers to see an overview of the application's usability level. The processing is carried out with reference to the Likert scale used in the questionnaire. The PSSUQ uses the principle that the lower the score, the better the user experience, so the calculation results will show which parts are still lacking according to users.

TABLE IV
TASK SCENARIO

Code	Task Scenario
T1	Check your remaining internet quota and credit balance on your account
T2	Check promotional notifications on your app
T3	Use the customer service feature on the app
T4	Access your purchase history on your account
T5	Purchase quota/credit

In addition to the PSSUQ questionnaire, Table IV shows a list of task scenarios used in usability testing with think-aloud. This study combines usability testing with think-aloud to obtain data from direct observation results. Usability testing is used to assess user performance when interacting with the application, while think-aloud is used as a qualitative approach that allows users to express their thoughts, opinions, or difficulties they experience during the testing process. This combination strengthens the analysis results with a combination of quantitative and qualitative data perspectives.

The data obtained was used to calculate effectiveness (task success rate), efficiency (time-on-task), and errors (error count), which were then analysed descriptively to assess the overall user experience. The results of the observations for each indicator were recorded and supplemented with qualitative data from the think-aloud process. The task success rate was calculated to determine the level of user effectiveness in completing the tasted task using the following formula:

$$TSR = \frac{Number\ of\ Successful\ tasks}{Total\ Number\ of\ Tasks} \times 100\% \quad (8)$$

Time on Task is used to assess the average speed of respondents in completing each task. Using the following formula:

$$ToT = \frac{\sum W_i}{n} \quad (9)$$

W_i = time to complete the task
n = Number of tasks

Error rate is used to measure the number of errors made during testing, with the formula:

$$ER = \frac{Number\ of\ Errors}{Number\ of\ Tasks} \times 100\% \quad (10)$$

In addition to the quantitative approach, data from think-aloud were analyzed using a qualitative descriptive approach, with transcripts described narratively to identify patterns in user experiences such as navigation difficulties, opinions on the interface, and ease of understanding information. This approach helps explain the factors behind the quantitative results, such as long task completion times or high user error rates.

By combining both instruments, the PSSUQ as a quantitative approach and usability testing with think-aloud as a qualitative approach can complement each other in providing a more comprehensive picture of the user experience of the MyTelkomsel application. The final stage is to summarize these findings into a complete evaluation result, so that it can provide input that can be considered in application development and further research.

III. Result And Discussion

A. Post-Study System Usability Questionnaire

This study successfully collected valid data from 110 respondents who are active users of the MyTelkomsel application through a questionnaire on Google Forms. This data will be processed using SPSS and analysed using the predetermined PSSUQ formula.

TABLE V
RESPONDENT CHARACTERISTICS

Characteristics	Category	Respondents	Percentage (%)
Gender	Male	12	10,9%
	Female	98	89,1%
Age	15 – 25	106	96,4%
	26 – 35	2	1,8%
	36 – 45	2	1,8%

Table V is the first step, which is to analyse valid respondent data based on the characteristics of the respondents' gender and age. The analysis results show that the majority of respondents are women aged 15–25 years, who are active users of digital applications. All respondents in this study are users of the MyTelkomsel application who had used the application before completing the questionnaire. Thus, the data obtained reflects the users' direct experience in interacting with the features available on the application.

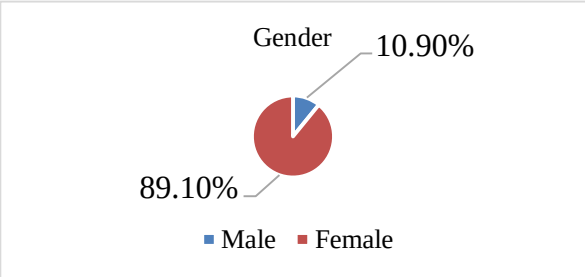

Figure 2. Gender Circle Diagram

Figure 2 shows that there were 110 respondents in total, with 12 (10.90%) being male and 98 (89.10%) being female. It can be seen that the respondents were predominantly female.

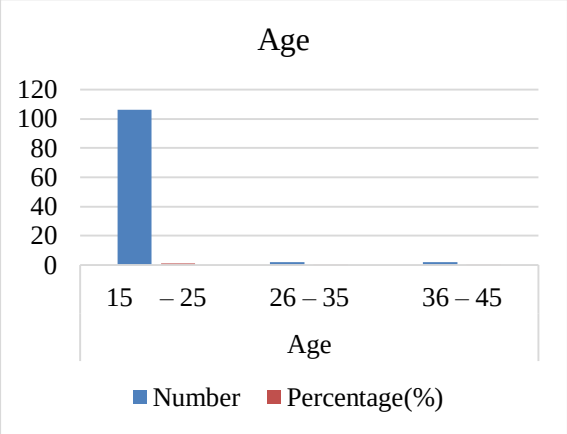

Figure 3. Age Bar Diagram

Figure 3 shows a bar chart of the age characteristics of 110 respondents. There were 106 respondents aged 15–25 (96.4%), 2 respondents aged 26–35 (1.8%), and 2 respondents aged 36–45 (1.8%). This shows that the respondents were predominantly young people or Generation Z.

B. Validity and reliability test

Validity testing is conducted to measure the accuracy of an instrument in measuring what it is supposed to measure. An instrument can be considered valid when the calculated r value is greater than the table r value. Conversely, an instrument is considered invalid when the calculated r value is less than the table r value [22].

TABLE VI
VALIDITY

Questions	*Corellation*	R-tabel	Description
P1	0.915	0.187	Valid
P2	0.911	0.187	Valid
P3	0.917	0.187	Valid
P4	0.903	0.187	Valid
P5	0.929	0.187	Valid
P6	0.834	0.187	Valid
P7	0.848	0.187	Valid
P8	0.882	0.187	Valid
P9	0.911	0.187	Valid
P10	0.930	0.187	Valid
P11	0.939	0.187	Valid
P12	0.926	0.187	Valid
P13	0.858	0.187	Valid
P14	0.899	0.187	Valid
P15	0.859	0.187	Valid
P16	0.955	0.187	Valid

In this study, the r-table value was 0.187. The results of the validity test for the entire instrument can be seen in Table VI. Based on Table VI, it can be seen that all questions had a correlation value greater than the r-table, indicating that all questions were valid.

TABLE VII
RELIABILITY

Cronbach's alpha	Number of questions
.986	16

Reliability testing refers to a test to measure the consistency and stability of respondents' answers. An instrument is considered reliable if its Cronbach's Alpha value is greater than 0.60 [22]. Based on the reliability in Table VII, it can be concluded that the 16 questions in the PSSUQ questionnaire are reliable.

C. Result of the Post-Study System Usability Questionnaire (PSSUQ) Analysis

The initial data consisted of 113 respondents, but after analysis, three responses were found to be invalid, leaving 110 valid responses from the online survey. PSSUQ questionnaire consisted of four subscales. The following are the results for each subscale.

TABLE VIII
SUBSCALE SCORES

Respondents	PSSUQ Subscale Scores			
	SysUse	*InfQual*	*IntQual*	*Overall*
1	5.17	4.83	3.67	4.81
2	1.00	3.00	3.67	2.31
3	1.00	1.00	1.67	1.19
4	1.67	1.33	1.00	1.38
5	1.67	2.33	1.33	1.81
6	2.00	1.50	2.00	1.81
7	3.17	3.83	3.33	3.44
8	2.00	3.17	2.33	2.50
9	2.50	2.83	2.33	2.63
10	4.67	4.50	6.33	5.00
…..	…..	…..	…..	…..
108	6.50	6.50	6.33	6.50
109	2.33	2.17	1.67	2.13
110	6.17	6.17	6.00	6.19
Average	**3.26**	**3.38**	**3.37**	**3.33**

Table VIII shows the results of processing the data for each respondent and then calculating the average for each subscale. Each subscale consists of System Usefulness

(SysUse), which assesses the ease, efficiency, and reliability of the system in assisting users, with an average of questions 1 to 6. Second, Information Quality (InfoQual) focuses on the clarity and accuracy of the information provided by the application, with an average of questions 7 to 12. Third, Interface Quality (IntQual) provides an overall picture of the extent to which the display and features are enjoyable, with an average of questions 13 to 15. Fourth, the overall average is the average of all 16 questions, which provides an overview of the overall level of user satisfaction.

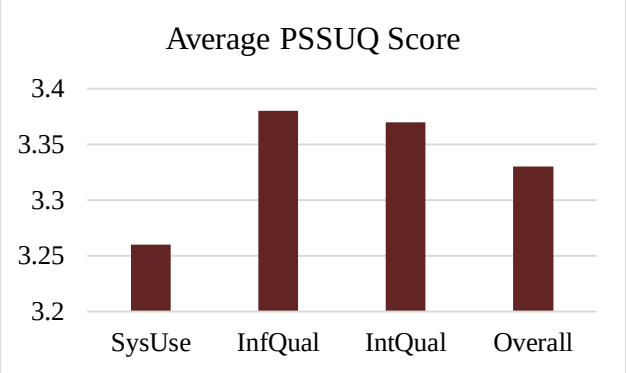

Figure 4. Average PSSUQ Score

Figure 4 shows a bar chart for each subscale, with sysuse having an average score of 3.26, infqual having an average of 3.38, intqual having an average of 3.37, and overall having an average of 3.33. Next, measure the average score limits for each subscale. This determines the quality of each aspect measured, so that the success of the system can be determined based on the PSSUQ standard.

TABLE IX
AVERAGE COMPARISONS

Question Scoring	Lowest Score	Average	Highest Score	Respondent results
SysUse - 1-6	2.57	2.80	3.62	3.26
InfoQual - 7-12	2.79	3.02	3.24	3.38
InterQual - 13 – 15	2.28	2.49	2.71	3.37
Overall - 1 – 16	2.62	2.82	3.02	3.33

Table IX shows a comparison of the average scores for each subscale with the assessment standards for this method. SysUse has a score of 3.26, which can be categorised as an average score or middle score. InfoQual has a score of 3.38, which is categorised as the highest score, meaning it is in the highest score category. InterQual has a score of 3.37, which is also in the highest score category, and Overall has an average of 3.33, which is also in the highest score category.

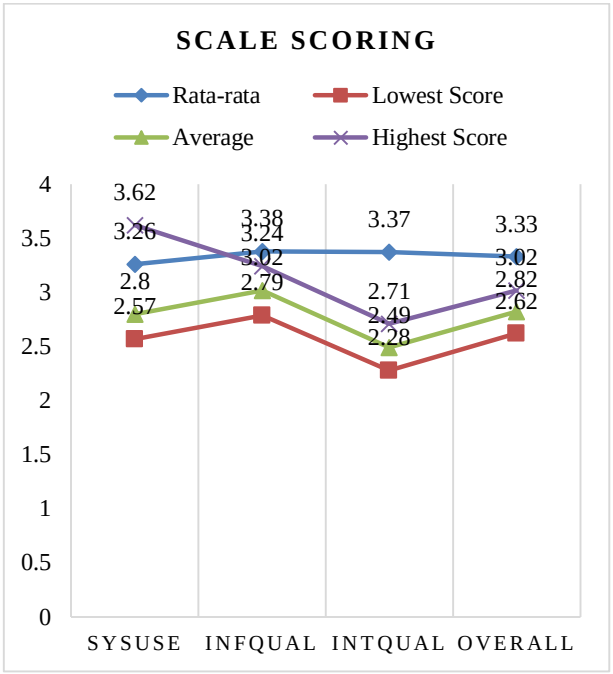

Figure 5. Scale Scoring

Figure 5 shows the scale scoring, with the blue line representing the average of each subscale. It can be seen that all scores are at the highest score, except for the Sysuse scale, which is at the average. Based on the results of the calculation analysis and scale scoring above, which are in accordance with the PSSUQ method reference, the overall average score is 3.33, which means that the level of user satisfaction can be categorised as the highest score. System Usefulness (3.26) indicates that users find the system easy to use, Information Quality (3.38) means that the information provided by MyTelkomsel is clear and relevant, and Interface Quality (3.37) indicates that the interface is considered attractive and easy to use.

All variables can be categorised as good, but System Usability has the lowest average compared to other dimensions. The System Usability sub-scale with the lowest score among the others, namely (3.26), is found in statement number 6, which is 'I am confident that I can work productively and quickly when using the MyTelkomsel application'. This finding is reinforced by the respondents' answers in the suggestion column of the questionnaire. Several respondents complained about frequent errors when logging in, occasional lag in the application's features, relatively long startup times, and frequent automatic logouts. Although the application's UI design is not a major problem, the performance and stability of the system are considered to need improvement. These suggestions indicate that issues with the app's stability and response speed affect user productivity, thereby impacting the low score for system usability. Overall, the results of this analysis show that the MyTelkomsel app has provided a fairly satisfactory user experience, but improvements are still needed in terms of system usability to increase overall user satisfaction.

D. Usability Testing Result

Usability Testing was conducted with 10 active participants who were users of the MyTelkomsel application to measure the level of effectiveness, efficiency, and errors. Calculations were made using SPSS, and participants were asked to complete five task scenarios. Measurements were based on three main parameters, namely Task Success Rate (TSR) for effectiveness, Time on Task (ToT) for efficiency, and Error Rate (ER) for the level of user errors.

1) *Effectiveness (Task Success Rate)*: According to Nielsen J., effectiveness involves criteria for measuring the level of success in completing tasks.

TABLE X
SUCCESS RATES

Success (S)	Indicates that the task test given to the participant was successfully completed or successfully achieved the objective and there were no errors in its completion.
Partially Successful (PS)	indicates that the task test given to the participant was successfully completed but errors were found during completion.
Fail (F)	indicates that the participant did not successfully complete the assigned test task.

Table X shows the criteria for the level of success in effectiveness [16]. The successful category has a value of 1, meaning that the task was completed without any obstacles. The successful category has a value of 0.5, meaning that the task was completed, but there were obstacles in completing it. The failed category has a value of 0, meaning that the participant failed to complete the task given.

TABLE XI
EFFECTIVENESS RESULTS

Participants	**T1**	**T2**	**T3**	**T4**	**T5**
R1	1	1	0.5	0.5	1
R2	1	0.5	0.5	1	1
R3	0.5	1	1	1	1
R4	1	0.5	0.5	1	1
R5	1	0.5	0.5	1	1
R6	1	1	0.5	1	1
R7	1	0.5	1	1	1
R8	1	1	0.5	1	1
R9	1	0.5	1	0.5	0
R10	0.5	1	0.5	0.5	1
Number of successful tasks					**40,5**

Table XI shows the effectiveness of each participant in completing the tasks, where code T1 means task 1 and R1 means participant 1. After grouping the effectiveness results, the number of successful tasks was found to be 40.5. This will then be calculated using a predetermined formula to find the task success rate in this study.

$$TSR = \frac{Number\ of\ Successful\ tasks}{Total\ Number\ of\ Tasks} \times 100\% \quad (11)$$

$$TSR = \frac{40,5}{50} \times 100\% = 81\% \quad (12)$$

The Task Success Rate of 81% indicates that most participants were able to complete the tasks smoothly without significant difficulties. However, some participants experienced difficulties in tasks 2 and 3, which measured user-friendliness (learnability) and effectiveness. This can be seen from T2 and T3, which mostly had a value of (0.5), indicating the possibility of confusion among users when using certain features. Thus, although the application is effective overall, improvements are still needed in terms of learnability and navigational flow so that users can complete all scenarios without obstacles.

2) Efficiency (Time on Task)*:* Efficiency in usability is defined as the resources used by users to achieve goals effectively and accurately ISO 9241-11 Efficiency is used to measure the time required by each participant to complete a task. The time required by respondents to complete the task is used to assess how efficient a system is in terms of ease of use. To make it easier for researchers to measure the time required to complete the task, a stopwatch on a smartphone is used.

TABLE XII
EFFICIENCY RESULTS

Participants	**Time (second)**				
	T1	**T2**	**T3**	**T4**	**T5**
R1	88	27.42	119	213	154
R2	75	69	64	49.68	24.46
R3	57.65	11.52	53.47	33.96	44.42
R4	27.07	13.77	40.24	17.78	27.29
R5	25.71	46.92	76	66	37
R6	39.28	36.12	39.74	11.63	21.03
R7	54.23	22.48	42.8	23.75	25.44
R8	57.76	16.21	65	23.94	33.11
R9	35.28	77	48	174	189
R10	47.06	33.18	88	118	38.02
Average	**50.70**	**35.36**	**63.63**	**73.17**	**59.38**

Table XII shows the efficiency results and task completion times of the participants. These completion times are the actual time required by participants to complete the tasks. Each time has been converted to seconds to facilitate the calculation process. To calculate the average task completion time, an initial calculation was made by adding up all the task completion times of all participants and then dividing them by the number of participants.

$$ToT_{T1} = \frac{88+75+57.65+27.07+25.71+39.28+54.23+57.76+35.28+47.06}{10} = 50.70 second \quad (13)$$

The above calculation is also applied to tasks 2 to 5, then finding the total Time on Task:

$$ToT = \frac{\sum W_i}{n} \quad (14)$$

$$ToT = \frac{50.704 + 35.362 + 63.625 + 73.174 + 59.377}{5} = 56.45\ second \quad (15)$$

The average task completion time was 56.45 seconds, indicating that participants. Generally managed to complete the task in less than a minute. Referring to the principle of efficiency based on ISO 1998 standards, time as a resource used to achieve a goal can be an indicator of the ease of use of a system. However, there are significant differences. The duration for some tasks, particularly task 4, was an average of 73.17 seconds, and some participants even took more than 2 minutes to complete it. This indicates that the efficiency of the application use is not uniform across all application functions and still requires improvement, especially in terms of loading speed.

3) Error Rate*:* In the error rate category, the analysis was conducted by calculating the number of errors made by participants during the testing process.

TABLE XIII
ERROR RESULTS

Participants	T1	T2	T3	T4	T5	T.Error
R1	0	0	2	3	0	5
R2	0	1	2	0	0	3
R3	0	0	0	0	0	0
R4	0	1	3	0	0	4
R5	0	2	1	0	0	3
R6	0	0	1	0	0	1
R7	0	0	0	0	0	0
R8	0	0	0	0	0	0
R9	0	0	0	1	1	2
R10	2	0	1	4	0	7
T. Error	**2**	**4**	**10**	**8**	**1**	
Total Number						**25**

Table XIII shows the errors made by participants during the task completion process. The context of the errors includes clicking on the wrong menu, selecting a menu that does not match the task objective, and repeatedly clicking due to confusion with the navigation. Therefore, if during task 1, before the participant completed the task correctly, the participant made two incorrect clicks, then two errors were counted, and so on. The total number of errors made was 25, and the total number of tasks was 50, obtained from 10 participants, and then multiplied by 5 tasks.

$$ER = \frac{Number\ of\ Errors}{Number\ of\ Tasks} \times 100\% \quad (16)$$

$$ER = \frac{25}{50} \times 100\% = 50\% \quad (17)$$

An error rate of 50% indicates that the error rate made by participants when performing tasks can be categorized as high and requires improvement. Based on Table XIII, the errors frequently made by participants occurred when performing T3 with a total of 10 errors, followed by T4 with 8 errors. T2 had 4 errors, T1 had 2 errors, and T5 had the lowest number of errors, namely 1 error.

Task 3 had a high number of errors, indicating that participants experienced difficulties with learnability and effectiveness. Most errors occurred because participants had difficulty finding the purchase history feature hidden in the account/profile menu, as it was not immediately visible on the main page. Participants tended to click on the wrong menu before finally finding the feature. Task 4 was more related to efficiency and memorability. Some participants had to navigate repeatedly because they could not remember the location of the feature they were looking for. In addition, the icons were too close together, causing several misclicks during the task.

Based on the usability testing results, effectiveness showed a result of 81%, efficiency of 56.45 seconds, and an error rate of 50%. It can be seen that there are significant differences in effectiveness and error rate. The task success rate of 81% indicates that the majority of participants successfully completed the given task scenario, but the error rate of 50% indicates that participants experienced difficulties during the task scenario process. This indicates that even though the task was completed, participants experienced confusion in navigation. The most common error was participants clicking incorrectly due to difficulty in finding the purchase history feature, and the icons being too close together, causing many participants to accidentally click the wrong icon. These results reveal that effectiveness in task completion does not fully reflect ease of use, as the high error rate indicates a need for improvement on the main page and icon placement.

E. Analysis of Think Aloud Results

The next assessment was conducted using a qualitative approach with the think-aloud technique on 10 participants. During the think-aloud process, the researcher recorded all responses and comments given by participants while completing the task. The use of the think-aloud method in usability evaluation has been widely applied to identify user interaction problems, especially those related to navigation clarity, system messages, and task efficiency, because this method captures the spontaneous thoughts of users during task execution [23]. After the think-aloud process was completed, all data obtained was analyzed qualitatively by grouping participants' statements based on problems in each task. The analysis process refers to the structured text analysis procedure in think-aloud research, in which verbal data is systematically evaluated through coding stages to extract usability issues explicitly and with less ambiguity [24]. The analysis was conducted by identifying common obstacles,

such as confusing navigation, icons that were too small, hidden menu locations, and, most frequently, system performance issues. The results of the grouping were then listed in Table XIV to clarify the obstacles and recommendations provided by the participants.

TABLE XIV
THINK ALOUD RESULTS

Task	Challenges	Participants	Recommendations
T1	The credit check and quota check menus have the same design, so it seems pointless to have two menus if they look the same. The plus icons next to the quota and credit checks are too close together, causing participants to complain about accidental clicks	R1, R2, R4, R10	Differentiate between the two menus. The plus icon is slightly spaced apart from the quota and credit check
T2	The UI for checking promo notifications is not very good, but it is too cramped at the top	R2, R3, R5	The promo notification icon is placed on the bottom bar
T3	The customer service icon is too small, but the customer service design is good. It is difficult to find the customer service menu because the icon is too small and is not usually located on the top bar next to the bell icon. The microphone icon does not work properly	R1, R2, R3, R4, R5, R7, R8, R10	The customer service icon is enlarged like other internet applications. The customer service icon should be placed at the bottom with a larger icon size to make it easier for users to find the menu. It is more appropriate to give the customer service icon a headset like the usual customer service icon
T4	Users stated that the purchase history menu is hidden and new users will definitely have difficulty finding it. There are difficulties in searching for transaction history, so it takes a long time to find the menu because it is hidden	R1, R2, R3, R8, R9, R10	The transaction history menu should be placed on the main page
T5	When purchasing data/credit, participants reported very poor performance and slow loading times. Even though the signal was stable, loading the menus took a very long time, causing respondent 9 to fail to complete one task	R1, R5, R9	Improve the performance of the MyTelkomsel app by learning from other apps that perform better

Table XIV summarizes feedback from 10 participants who experienced difficulties and provides recommendations for each task that has been completed. Based on the think-aloud results, obstacles were frequently encountered in tasks 3 and 4. In task 3, when participants were asked to access the customer service feature, several participants paused for a moment and tried several icons before finding the menu. Participants stated that the customer service icon was too small and that this feature was not usually located in the top navigation bar, making it difficult to find. This situation caused some participants to click on the wrong icons before finding the correct feature. In task 4, participants had difficulty finding the purchase history menu. Some participants searched directly on the main page but did not find the menu, then searched several pages until they finally found it in the profile menu. Participants stated that the purchase history menu was hidden and not immediately visible on the main page, making it take longer to find.

In addition to navigation issues, in task 5, participants complained about slow application performance, especially when purchasing quotas. Although the network used by participants was stable, the page loading time was considered quite long, so participant 9 was unable to complete task 5. Overall, the think-aloud results revealed complaints about the quality of the interface and system performance, which greatly affected the success of completing the task. Participants suggested improvements to the interface and changes to important icons that were difficult to find. Not only that, but participants also hoped that the performance of the

MyTelkomsel application could be improved so that it would be faster in accessing all menus. These findings reinforce the results of measurements using the PSSUQ method and usability tests, which showed similar problems. Thus, the application is generally still usable by users, but there is still room for improvement in terms of navigation, icon clarity, and system response.

The results of this study can be linked to previous studies that examined the usability of similar mobile applications, namely MyTelkomsel and MyIM3, using scenario testing. In study [25], the MyTelkomsel application showed a higher completion speed than MyIM3, with an average task completion time of 29 to 32 seconds. Then, in the [3] study, the longest testing time was 60.10 seconds. In this study, the average task completion time of 56.45 seconds was longer than in the first study, but still not much different from the [3] study. These findings align with this study, which identifies completion time as a key factor in evaluating the efficiency of mobile operator application usage. In previous studies and this study, navigation and system response also influence the perception of ease of use, indicating that menu structure and application performance are crucial factors in designing mobile operator applications.

F. Improvement Recommendations

Based on the evaluation results using the PSSUQ questionnaire, the lowest score was obtained in the system usefulness dimension, indicating that the system does not fully assist users in completing tasks effectively and efficiently. This finding is reinforced by the results of usability testing and think-aloud, where some participants needed more time to find certain features and required additional steps before reaching their goals. To ensure that the improvements have a clear theoretical basis, these findings were mapped according to the 10 principles of Heuristic Evaluation introduced by Jakob Nielsen. HE is a usability evaluation method introduced by Jakob Nielsen and Rolf Molich that is carried out by observing an interface and providing opinions regarding the interface [26], [27].

TABLE XV
HEURISTIC INDICATORS

Heuristic Indicators	Definition
Visibility of System Status	The system should always inform users about what is happening in real time and the activities that are currently taking place
Match Between System and the Real World	The system should use human language or language that is understood by users and design concepts that are familiar to users
User Control and Freedom	Users should be given the freedom to choose in undesirable situations
Consistency and Standards	Users should not have to question the meaning of available words, situations, or actions
Error Prevention	Prevention of errors or problems that users might make
Recognition Rather Than Recall	Notifications regarding buttons, symbols, and actions must be made clear and visible to minimize the difficulty for users in remembering
Flexibility and Efficiency of Use	Alternatives or shortcuts that can speed up the activities being carried out
Aesthetic and Minimalist Design	The interface should not contain irrelevant information
Recognize, Diagnose, and Recover from Errors	Error messages must use language that users can understand, inform them of the problem, and provide suggestions for resolution
Help and Documentation	Help and documentation are needed to assist users in understanding how to complete tasks using the existing system

Table XV lists the heuristic principles used to analyze usability issues. These principles, though not always seriously violated, served as guidelines for clear, grounded improvements. Using them, redesign decisions stayed aligned with ease of use, feature visibility, and a simpler, structured interface.

TABLE XVI
MAPPING OF USABILITY ISSUES

Usability Issues	Related Heuristic Principles	Improvement Implementation
The purchase history feature was difficult to find because it was located in the profile menu and was not visible on the main page	Recognition Rather Than Recall	The purchase history feature was moved to the main page and integrated into the bottom navigation bar to make it more visible and reduce the burden on users' memory
Participants often clicked on the wrong menu before finding the feature they were looking for	Match Between System and the Real World	The menu structure was simplified and reorganized to better match the general mindset and expectations of users
The Customer Service icon is placed at the top navigation bar, making it less visible and difficult to find	Visibility of System Status	The CS icon is moved to the bottom navigation bar so that it is more accessible and immediately visible to users
The distance between icons is too close, causing misclicks during task execution	Error Prevention	The distance between icons is widened to minimize the possibility of misclicks when users select menus
During the task completion process, users often complain	Visibility of System Status	The “secure your credit” feature is placed in a more accessible position to

that their credit is automatically used up when their quota runs out and request that the "secure your credit" feature be placed on the main page		make it easier for new users
The interface display on the profile menu looks crowded and contains irrelevant elements, which reduces user focus	Aesthetic and Minimalist Design	Unnecessary elements are reduced and the layout is improved to make the display more concise and structured
The menu grouping is not clearly organized, making users hesitant when moving between menus	Consistency and Standards	The structure and grouping of the menu are reorganized to be consistent and follow the patterns commonly used in similar applications

Based on the mapping in Table XVI, the redesign was carried out to address obstacles that affected task completion speed and user experience. Improvements focused on placing features so that they were more visible, reorganizing the menu structure to make it clearer, and reducing errors when users interacted with the system. These changes were expected to improve the usability of the system and help user complete tasks more smoothly.

Of the ten heuristic principles used as the basis for analysis, six principles were directly used as the basis for the redesign process, namely Recognition Rather Than Recall, Match Between System and the Real World, Visibility of System Status, Error Prevention, Aesthetic and Minimalist Design, and Consistency and Standards. These six principles were chosen because they are directly related to the problems found during usability testing and think-aloud sessions, especially those that affect navigation efficiency, visibility of important features, and click errors when performing tasks.

Meanwhile, the other four principles, namely User Control and Freedom, Flexibility and Efficiency of Use, Recognize, Diagnose, and Recover from Errors, and Help and Documentation, were not used as the main basis for the redesign because no significant problems related to these aspects were found during the testing process. In the tested task scenario, users did not encounter any obstacles in canceling actions or returning to the previous menu, did not encounter confusing system error messages, and did not show any need for additional help features. Therefore, these four principles did not emerge as factors that directly influenced task completion in the context of this study.

Figure 6. Main Page Before Redesign

The figure 6 shows the main page menu before the redesign to illustrate the initial condition during the testing process. In this view, the icons are still too close together and important features are not clearly visible, which affects the speed at which users can find the menus they need.

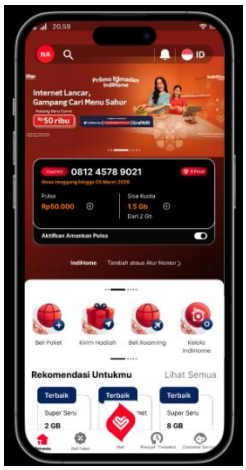

Figure 7. Home Page After Redesign

The figure 7 shows the improvement recommendations based on the issues found. The first change is to the CS icon, which was previously located in the top navigation bar. Based on the results of the think-aloud interviews, several participants needed more time to find it because it was too close to the notification icon and was not usually located in the top navigation bar. Therefore, it was improved and moved to the bottom navigation bar to make it easier to see and find. Second, the purchase history menu, which was originally difficult to find in the account menu based on the test results, has now been moved to the bottom navigation bar on the main page menu so that it can be found quickly when needed. Third, sufficient space has been provided between icons based on findings of accidental clicks during testing, thereby minimizing errors when users press the menu. Fourth, the credit protection feature has been placed on the main page so

that new users are aware of its existence, ensuring that credit remains secure and does not decrease even when the data quota has been used up.

Figure 8. Profile Menu Before Redesign

Next, the figure 8 shows the profile menu before the redesign. This display contains several menus, such as packages & subscriptions, account history, credit balance, and my themes, which should not be placed in the profile menu because these menus are considered important and frequently used. Based on the test results, this condition causes users to take longer to understand the menu contents.

Figure 7. Profile Menu After Redesign

The figure 9 shows the results of the profile menu redesign. Since the account history and credit balance features have been placed on the main page, the package & subscription and my theme features have been removed to simplify the design, making the display more concise and allowing users to find the main features more easily. Based on these changes, the redesign was carried out to simplify the display structure and improve access to important features. These improvements are expected to help users complete tasks more quickly and reduce the obstacles encountered in previous tests.

IV. CONCLUSIONS

In this study, which examined the MyTelkomsel application using quantitative and qualitative approaches, complementary findings were obtained. Quantitative analysis was conducted using the PSSUQ questionnaire and usability testing, with the PSSUQ questionnaire administered to 110 active users of the MyTelkomsel application, most of whom were aged 15-25 years, showed an overall variable score (3.33) in the highest score category. The system usefulness variable (3.26) was in the average category, while information quality (3.38) and interface quality (3.37) were in the highest score category, indicating user satisfaction. The usability testing results showed high effectiveness and efficiency, but the Error Rate (50%) indicated that there were still obstacles in navigation and interface design. The results of the think-aloud method show that users experience slight difficulties in running the application, especially obstacles such as icons that are too small, hidden menu locations, and poor application performance. This study found that the combination of the PSSUQ method, usability testing, and think-aloud method was effective in providing comprehensive information about the strengths and weaknesses of the application.

The impact of this research on the development of the MyTelkomsel application in general shows that improvements to the interface and performance of the application are key to improving quality. These findings highlight the importance of a simpler interface design with an efficient navigation layout, as well as placing important features such as customer service and purchase history in easily accessible locations. In addition, the size and spacing of icons also need to be adjusted so that users do not experience difficulties when interacting with the app. The performance of the application system also needs to be improved so that users are satisfied with the speed of the app. With these improvements, it is hoped that the MyTelkomsel app can provide a better, more efficient, and satisfying user experience for all its users.

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