Improving the Usability User Experience of Peduli Lindungi Application based on Heuristic Evaluation

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Abstract-Peduli Lindungi is an application developed to help relevant government agencies in tracking to stop the spread of COVID-19. Peduli Lindungi is expected to help the government in the tracking process to facilitate the detection of the reach of COVID19. However, over time, many complaints about the user experience written by users in the App Store and Play Store applications. This study uses the Heuristic Evaluation method to analyze usability. This method is used to get an evaluation of the shortcomings of usability. In this study, it was found that the usability of the Peduli Lindungi Application was good enough. However, there are still aspects that require improvement. This aspect is the Flexibility and Efficiency of Use with a severity rating of 3.8 and Aesthetic and Minimalist Design with a severity rating of 3.4. So that design improvements are made based on these aspects. The test was carried out and found that the Flexibility and Efficiency of Use had a severity rating of 1.5. While Aesthetic and Minimalist Design with a severity rating of 2.6. It is concluded that the design is better than before.

Keywords: Peduli Lindungi; Heuristic Evalution; Usability; User Experience; Severity Rating

1. INTRODUCTION

Coronavirus, or severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is a virus that attacks the respiratory system under the name COVID-19[1]. The virus causes several disorders ranging from mild respiratory system disorders to severe lung infections and even death. According to data released by the Task Force for the Acceleration of Handling COVID-19, the number of confirmed positive cases as of November 4, 2021, is 4,246,802 people, with a death toll of 143,500. This figure shows that the death rate from COVID-19 is around 3.4%[1].

With the increasing number of positive confirmed cases due to the coronavirus, the government has to take serious steps. One of the government's efforts to help reduce the spread of the coronavirus is to develop the Peduli Lindungi application to track the spread of Coronavirus Disease (COVID-19). This application relies on community participation to share location data while traveling so that contact history tracing with COVID-19 sufferers can be carried out. Users of this application will also get a notification if they are in a crowd or are in a red zone, which is an area where it has been recorded that there are people infected with COVID-19 positive or there are patients under surveillance[2].

Indirectly, the government requires the public to be able to use the application as an effort to stop the spread of Coronavirus Disease (COVID-19). There are rules in some crowded locations that you must scan the barcode to be able to enter the place using the Peduli Lindungi application. Therefore, the Peduli Lindungi application plays an essential role in the daily life of the Indonesian people. However, based on the author's initial observations of user reviews on the App Store and Play store, it was found that many users gave low ratings and negative comments. From the user review, the authors conclude that the Peduli Lindungi application has a display that is not user-friendly, some of the main features required are too many steps, and the lack of information about the features available in the application. Based on the user review, it causes inconvenience & delays for users to use the application. User dissatisfaction will have an impact on accessing caring and protecting mobile applications, which will experience a decrease in users[3]. To see the quality of a product, especially a mobile application, by hearing the opinions of users directly with a user experience approach or user experience and user interface or appearance[4]. The improper interface can cause users to leave the application[5]. This is what happens to Peduli Lindungi apps. Therefore, it is necessary to measure the usability of the Peduli Lindungi application.

Usability is a component that makes up the quality to state whether the user interface is easy to use. Heuristic evaluation refers to expert-based methods to find usability problems in user interface design. The heuristic evaluation aims to find usability problems in existing designs so they can be improved[6]. By using the heuristic evaluation method by Nielsen, it is hoped that researchers will be able to find quality and evaluate usability errors & deficiencies in care and protect applications. From these tests, it can be concluded that the lack of application as an evaluation material for the Peduli Lindungi application is to be used as the basis for the redesign process so that users can get a better experience and pleasurable when using the application. So, it can be used as input for a Peduli Lindungi developer.

Several studies have been done before. First, it was conducted in 2021 by Muhammad Subhan and Aries Dwi Indriyanti, who analyzed the user interface and user experience on the BCA Mobile application using the heuristic evaluation method. From this research, the evaluation of the user interface design and user experience of

the BCA Mobile application was obtained using the heuristic evaluation method. Thus, it can be part of the redesign process[4]. The second research was conducted in 2019 by Ika Richa Savitri, who evaluated the user experience of the BRI Internet Banking application against the perspective of the Madurese community using the heuristic evaluation method. From the results of this study, it was concluded that almost all parts of the BRI internet banking application had problems but did not interfere with user comfort and did not need to be repaired[7]. Third, research was conducted in 2018 by Annisa Hardianty Nasution, who evaluated the usability of the HKBP Nommensen University library website using the heuristic method. Based on the calculation of 10 heuristic aspects, the average value for each point is 83%, indicating that the library website's usability has been categorized as good and successful[8]. Furthermore, research was conducted in 2019 by Mumtaz Haya Waralalo, who analyzed the user interface and user experience at AIS UIN Jakarta using heuristic evaluation and Webuse methods with ISO 13407 standards. This study found that AIS UIN Jakarta still has an ordinary appearance, lacking attractiveness to unattractive, with a total interface and usability value of 46.33%. So, these results make recommendations for AIS UIN Jakarta using the same methods and standards. Furthermore, these recommendations were measured, and the results showed that the respondents considered the AIS academic information system to have a good scale, namely the interface and usability values of 96%[9]. The previous research was conducted in 2018 by Yemima Monica Geasela, French Ranting, and Johanes Fernandes Andry with the title user interface analysis of E-Learning-based websites with heuristic evaluation methods. This study shows that, in general, an assessment of the interface design and ease of use of an e-learning-based website found that the website is quite good. However, some things still need to be improved, especially the comfort of use characteristics[10].

2. RESEARCH METHODOLOGY

2.1 Research Stages

In this study, the method that will be used to analyze the usability of user experience is heuristic evaluation. Heuristic evaluation is one of the evaluation methods to find usability problems of computer software by referring to 10 heuristic aspects to obtain improvements[11]. While the method used to do the redesign is User-Centered Design (UCD). UCD is a method that focuses on potential users in creating a product[12]. The flow of the research method can be seen in Figure 1.
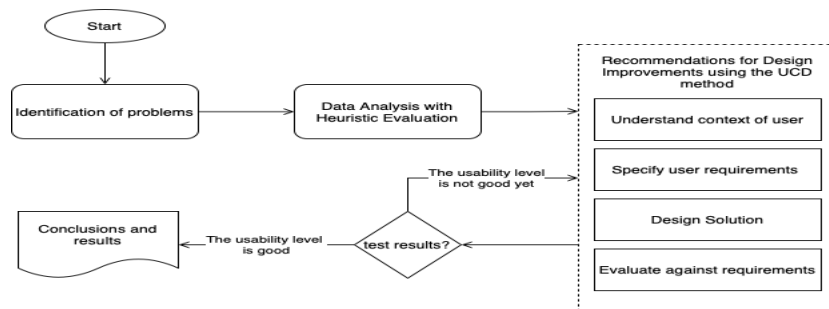

Figure 1. Research Flow

2.2 Problem Identification

At this stage, the author determines the studied object and looks for references related to the problem. Furthermore, the authors look for problems that often appear on these objects through user reviews on the app store and play store applications. The author chose to use the heuristic evaluation method. However, the author has previously determined the procedure to be used. Among the methods of Think Aloud Evaluation (TA), Cognitive Walkthrough (CW), and Heuristic Evaluation (HE). Heuristic Evaluation is a method that can produce the most usability problem findings compared to other methods [13].

2.5 Data analysis based on heuristic evaluation

Data collection is done by distributing questionnaires to evaluators. By Nielsen's principles, several things that will be assessed are aesthetics, control, and efficiency of product use. The appraiser consists of 5 evaluators because this number is proven to find about 75% of all product usability problems. Each evaluator must deeply understand digital product development and come from a related background, for example, UI/UX design[14].

Table 1. List of Question

No	List of Questions
1.	The application displays information about a specific condition.
2.	The application displays feedback after the command is completed.

No	List of Questions
3.	The display of the Peduli Lindungi application uses an easy-to-understand language.
4.	The "Back" button is easy to find.
5.	The language used is consistent on all pages.
6.	Icons displayed have the same meaning on all pages.
7.	There is an information message so that no errors occur.
8.	The use of icons in the Peduli Lindungi application is easily understood.
9.	The Peduli Lindungi application features easy-to-understand design patterns.
10.	There are shortcuts to make it easier for users to find a feature.
11.	The UI design of the Peduli Lindungi application looks attractive and not boring.
12.	Some icons cannot be used or are rarely used (only interfere with the display).
13.	The application displays a notification message for errors that occur.
14.	The application displays a choice of solutions for the error that occurs (for example, when you forget the password, there is an option to update the password).
15.	The "Help" menu is easy to find.

After getting the results on a likert scale, the writer tested the validity and reliability.
A validity test is used to determine whether the data generated from a questionnaire is feasible or not[15]. Measurement of item validity by correlating the item score with the total item score[16]. Furthermore, a correlation coefficient (r) will be obtained to measure an item's validity level and determine whether it is valid or invalid. The following are the requirements for decision-making in determining the validity[17]:
- If r value > r table, it can be stated Valid question item
- If r value < r table, it can be stated that the question item is Invalid

Reliability testing is carried out to determine the consistency of an instrument for testing that is carried out more than once to determine the extent to which the instrument can be trusted[18]. Decision-making to determine reliability[19].
- If the Cronbach Alpha value > 0.600 is declared Reliable
- If the Cronbach Alpha value < 0.600 is declared Unreliable

Suppose the questions for the questionnaire are valid and reliable. Then the severity rating is calculated from each aspect to determine the assessment for each element of the Peduli Lindungi application. The evaluation is carried out using a scale of 1-5, with a value of 1 being the lowest usability problem and a value of 5 being the most significant usability problem. The severity rating value in one usability aspect is obtained from the average severity rating score for that aspect[20].

2.6 Recommendations for improvement based on User Centered Design

In the redesign process, the UCD method is used. By going through several stages such as understanding the context of the user, specifying user requirements, designing a solution, evaluating against requirements.

2.7 Trial of Design Recommendations

After the recommendation is successfully made, the evaluators will test the design. The trial will be tested by making a prototype feature simulation using Figma.

3. RESULT AND DISCUSSION

3.1 Data collection

This study uses a Likert scale of 1 to 5, with a value of 1 as the lowest usability problem and five as the most significant usability problem. The following is a description of the Likert scale used[4].

Table 2. Severity Rating[4]

Severity Rating	Description
1	No problems or flaws were found.
2	The problems found do not affect the application's users much.
3	There are potential problems that can make it difficult or annoying for users.
4	There is a problem that has the potential to make it difficult for application users.
5	There is a fatal problem that needs to be fixed on the application.

At this stage of data collection, it involved five evaluators who were experienced in the field. Evaluators are people who have worked in related areas from various agencies, with a gender percentage of 80% for men and 20% for women. The evaluator is also used to use Peduli Lindungi application. The results obtained from data collection according to the Table 3.

Table 3. Data Collection

List Evaluator	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15
E1	2	1	2	1	2	2	1	2	2	3	2	2	2	3	1
E2	2	1	2	1	3	2	1	1	2	3	2	3	2	4	1
E3	5	2	4	3	5	3	3	4	5	5	5	5	3	5	3
E4	4	2	3	2	5	3	3	3	3	4	3	5	3	5	2
E5	2	1	2	2	3	2	2	2	3	4	3	4	2	4	2

Before calculating the severity rating for each usability aspect, validity and reliability tests are carried out first.

3.1.1. Validity test

Validity testing is done by comparing the r value and r table. The r value can be obtained by correlating the item score with the total item score[16]. The authors rely on the SPSS software application with a bivariate analysis menu to facilitate the calculation. Meanwhile, the r table is obtained by looking at the r table product. For five evaluators, so that DF = 3 with a significance of 0.05 was obtained, the r table value was 0.878 a and the results of the validity test can be seen in the Table 4.

Table 4. Validity Test Results

The Question	r Value	r Table	Description
X1	0.961	0.878	Valid
X2	0.926	0.878	Valid
X3	0.953	0.878	Valid
X4	0.949	0.878	Valid
X5	0.937	0.878	Valid
X6	0.926	0.878	Valid
X7	0.955	0.878	Valid
X8	0.928	0.878	Valid
X9	0.930	0.878	Valid
X10	0.949	0.878	Valid
X11	0.930	0.878	Valid
X12	0.919	0.878	Valid
X13	0.926	0.878	Valid
X14	0.896	0.878	Valid
X15	0.949	0.878	Valid

Based on the calculation results, all question items have an r value that is greater than the r table, and it can be concluded that all question items in the questionnaire variable are declared valid.

3.1.2 Reliability Test

In this reliability test, Cronbach's Alpha method is used. Cronbach's Alpha value is obtained using SPSS software on the bivariate analysis menu. The results of the Reliability Test processed using SPSS according to the Table 5.

Table 5. Reliability Statistics

Cronbach's Alpha	N of the question
0,983	15

Based on the data processing results above, Cronbach's Alpha questionnaire value is 0.983. So it can be concluded that the questionnaire in the variable is declared reliable.

3.2 Design Improvement Analysis and Recommendations

In conducting the analysis, the author uses a questionnaire involving five people as evaluators with experience in the field of user experience and users of the Peduli Lindungi application. From the results of the questionnaire that has been obtained from the evaluators, then the severity rating is calculated for each aspect.

Table 6. Severity Rating Processing Results

No	Aspect	S
1.	Visibility of system status	2.2
2.	Match between system and the real world	2.6
3.	User Control and Freedom	1.8
4.	Consistency and Standards	3
5.	Error Prevention	2

No	Aspect	S
6.	Recognition Rather Than Recall	2.7
7.	Flexibility and Efficiency of Use	3.8
8.	Aesthetic and Minimalist Design	3.4
9.	Help users recognize, diagnose, and recover from errors	3.3
10.	Help and Documentation	1.8

Based on the calculation of the severity ratings above, the evaluators can tolerate several aspect points. The higher the severity rating value means, the more needed for improvement. The highest severity ratings were found in the aspect of Flexibility and Efficiency of Use, with a value of 3.8. The following are the results of the complete user experience analysis questionnaire data processing for the Peduli Lindungi application.

In the questionnaire, in addition to the statement above, the author will also provide a section for respondents to use to fill in subjective assessments and details regarding criticism when using the Peduli Lindungi application. From several questions regarding each aspect of heuristic evaluation, the following are some aspects with the highest severity rating value:

a. Aspects of Flexibility and Efficiency of Use
   Flexibility and Efficiency of Use have the highest severity rating value of 3.8. In this aspect, evaluators think that several essential features lack efficiency.

b. Aspects of Aesthetic and Minimalist Design
   Aesthetic and Minimalist Design has a severity rating of 3.4. In this aspect, evaluators think that the design is not simple, so the care in the Peduli Lindungi application design should look more aesthetic.

In addition, the author provides a field for filling in the questionnaire so that evaluators can offer suggestions to recommendations for improving the Peduli Lindungi application design. The following are some points of advice given by respondents:

a. The COVID-19 certificate & test result in the display feature is placed in an easily accessible position.
b. The use of more minimalist icons so that they are suitable for all groups.
c. Consistency of language used on all pages.

Based on the analysis by the evaluator on the evaluation of user experience, several problems were concluded. With the regulations that require the use of the care in Peduli Lindungi application, evaluators need to rely on the care in Peduli Lindungi application features to be used efficiently and have an aesthetic appearance. Therefore, the author recommends designing the Peduli Lindungi application display according to the UCD method.

Figure 2. Splash Screen

The Peduli Lindungi application splash screen is the initial display of the application when the user opens the application.
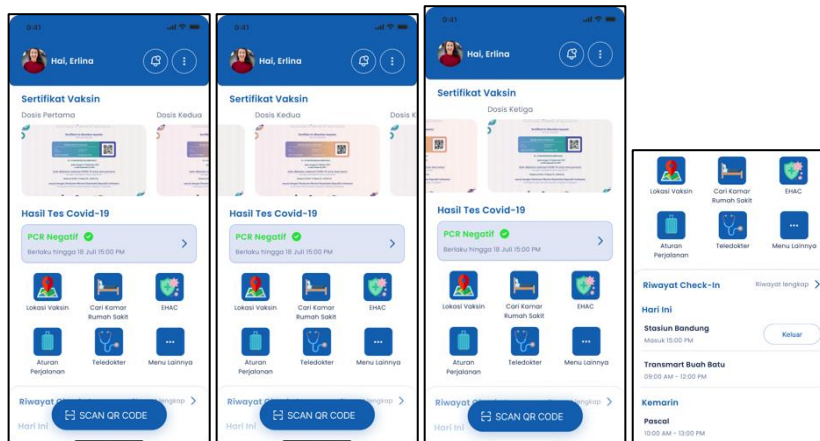

Figure 3. Main Page

On figure 3, there are several features to access several services, especially the check-in button, first dose certificate, and COVID-19 test results, to make it easier for users who rely on these features in their daily activities. Here, there are several features to access services, especially the check-in button, second dose certificate, and COVID-19 test results, to make it easier for users who rely on these features in their daily activities. To view the second and third dose certificates like the second and third pictures above, users can swipe them by swiping right. The image on the far right is the display. If the user scrolls down on the main page, the user's "Check-in History" will be seen.
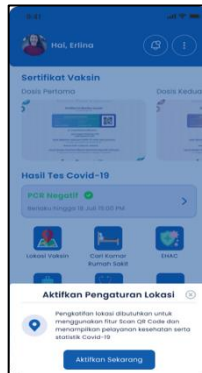
Figure 4. Location Settings Page

After pressing the "Scan QR Code" button, a screen like a figure 4 will tell the user to activate the location setting.
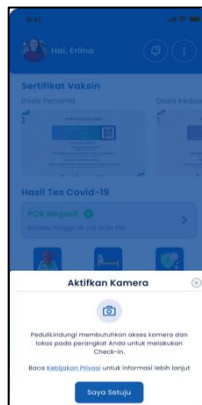

Figure 5. Camera Settings Page

After pressing the "Activate Now" button on the previous page, a page like the one in figure 5 will appear. This page aims to inform the user about camera access permissions. This page also has a "Privacy Policy" menu regarding application documentation.
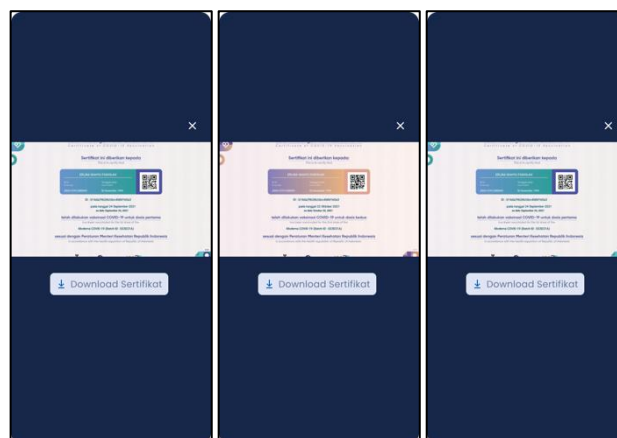

Figure 6. Certificate Print Page

This screen will appear if the user presses one of the required certificates. In addition, users can also download the desired certificate by pressing the "download" icon.

Figure 7. QR Code Scan page

The page shown in figure 7 has a button to display the documentation on "Using Scan QR Code." When going to check in, users can press the "Scan QR Code" button and point the camera at a QR Code at a location. In addition, users can choose to check in individually or in groups.
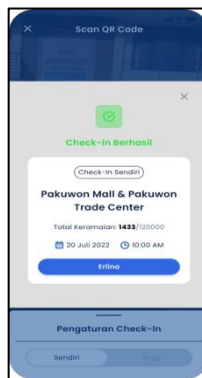

Figure 8. Check in Success Page

After the user has successfully checked in, the following screen, like figure 8, will appear that provides information if the user has successfully checked in. In addition, it also includes information about the user name, check-in location, time, and total crowd.
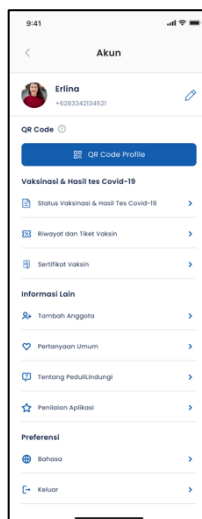

Figure 9. Menu Page

Users can access other features not displayed on the main page, like figure 9.

3.3 Improvement Testing

After getting the prototype for improvement recommendations, a simulation is carried out using the Figma software. The trial was carried out on evaluators who had previously provided an assessment of the data collection process. The author gives the evaluators a task to access the entire prototype design. Then, the evaluators were

asked to fill out a questionnaire according to the heuristic evaluation by providing an assessment using a Likert scale. The results of the improvement testing can be seen in Table 7.

Table 7 Severity Rating Improvement Testing

No	Aspect	S
1.	Visibility of system status	1.6
2.	Match between system and the real world	1.6
3.	User Control and Freedom	1.6
4.	Consistency and Standards	2
5.	Error Prevention	2
6.	Recognition Rather Than Recall	2.3
7.	Flexibility and Efficiency of Use	1.5
8.	Aesthetic and Minimalist Design	2.6
9.	Help users recognize, diagnose, and recover from errors	2.3
10.	Help and Documentation	2

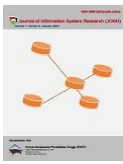The following is the assessment given by the evaluator objectively:
a. The interface is quite attractive & straightforward to make it easier for users
b. The interface has better consistency than before
c. The "Covid-19 Test Results" feature on the homepage makes it easier for users when needed at certain times.

4. Conclusion

This research uses the heuristic evaluation method. The heuristic evaluation aims to find usability problems in the design so they can be fixed. In the heuristic evaluation, there are ten assessment points, namely Visibility of System Status, Match between System and The Real World, User Control and Freedom, Consistency and Standard, Error Prevention, Recognition Rather Than Recall, Flexibility and Efficiency of Use, Aesthetic and Minimalist Design, Help Users Recognize, Diagnose, and Recover from Errors, Help and Documentation. Based on the results of this study, eight aspects are considered not problematic or do not interfere with users. However, there are two aspects with the highest severity rating value, which is more than 3, which means that the points are complex or disturbing to the user. The 2 points are Flexibility and Efficiency of Use with a severity rating of 3.8 and Aesthetic and Minimalist Design with a severity rating of 3.4. So it is necessary to redesign based on these 2 points. This point also covers issues in the App Store and Play Store user reviews. The results of the prototype redesign did not change significantly. After that, it was tested and produced a better design than before.

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