User Interface Analysis of PeduliLindungi Application to Improve User Experience with The Heuristic Evaluation Method

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ABSTRACT

The Covid-19 pandemic limits human activities every day. The spread of the virus is uncontrollable, it can attack anyone, anytime, and anywhere. As a solution, the use of the PeduliLindungi application technology developed by the Ministry of Communication and Information in collaboration with other relevant Ministries and Institutions is used to help track the spread of viruses and understand preventive measures to stop their spread. Research was conducted on the appearance of the application's User Interface using the Heuristic Evaluation method to measure its usefulness. However, there are several problems experienced by users, namely the information is not updated (vaccines and Covid-19 tests), the language used is inconsistent, and others. Questionnaire testing with 10 questions based on 10 Heuristic Evaluation criteria was distributed via Google Form to 33 respondents. Then, carry out validity and reliability tests with the research results obtained Valid and Reliable. as well as testing the hypothesis of all Learnability, Efficiency, Memorability, and Error Prevention factors, based on usability and user satisfaction aspects, questionnaire items all test results are accepted and there are no serious problems. However, there are a number of things that need to be improved so that the application can run more optimally.

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1. INTRODUCTION

Until now the Covid-19 pandemic is still an epidemic that limits human activities every day. This virus continues to mutate and has many variants. There are negative impacts on all sides of the virus. Every activity that humans do to interact must adapt to existing conditions [1]. This virus has shaken the world, including Indonesia. The spread of the virus is uncontrollable, it can attack anyone, anytime, and anywhere, so we need the right way to respond [2]. Today's digital technology can be used to help track the spread of viruses and understand preventive measures to stop their spread [3].

The Ministry of Communication and Information is collaborating with other relevant Ministries and Institutions in developing an application known as "PeduliLindungi". This application aims to make the public aware of information and movement of people in Indonesia who may be infected with Covid-19 [4]. In developing applications, the quality of the User Interface (UI) and User Experience (UX) is very important to improve user friendliness when using the application [5]. UI is the interaction between the system and the user through commands, entering data, and using content to achieve goals [6]. Analysis of UX is related to knowing the level of user satisfaction and the problems or shortcomings of the products they use [7]. Based on the observations made, the application is still being developed with various new features and information available. However, there are several problems experienced by users, namely the information is not updated (vaccines and Covid-19 tests), the language used is inconsistent, and others.

The benchmark for the success of an application is the ease with which the user can use or interact with the application. Ease of interaction can be measured by usability [8]. Usability is a qualitative analysis technique to determine how easy the application can be used by users [9]. The measurement of the application is seen from 5 aspects of its usefulness, namely learnability, efficiency, memorability, errors and satisfaction [10]. An application needs to be evaluated according to standardization to find out its condition [11].

One of the subtypes of usability is Human Computer Interaction (HCI) [12]. HCI is a science that studies how to design a computer screen display on an information system so that it is comfortable for users to use [13]. In analyzing the UI using the Heuristic Evaluation method. Heuristic Evaluation is a usability evaluation method to improve UI design, there are 10 principles including visibility of system status, match between system and the real-world, user control and freedom, consistency and standards, error prevention, recognition rather than recall, flexibility and efficiency of use, aesthetic, and minimalist design, help user recognize, diagnose, and recover from errors, and help and documentation [14]. Therefore, in this study, an analysis will be carried out on whether the PeduliLindungi application has a UI design with clear information, easy to use, and works well for users so that the analysis results obtained can provide appropriate recommendations for further application development.

2. LITERATUR REVIEW

2.1. User Interface & User Experience

User Interface is an important part of HCI that is controlled by the user in achieving and performing the functions of a system [15]. UI is a graphical display (text, images, instructions, buttons) that has a direct relationship with the user. The function of the UI is to connect the user with the system [16]. A system that is said to be easy to use has a good appearance, easy to understand by users in terms of appearance [17]. A good system with a User Interface means that the system is user friendly. Not infrequently the system also has a UI that is difficult for users to understand [18].

User Experience is the overall process that users do in using a product or service, they provide feedback on their experience. To get a good UX, there are several elements including product features that are made according to user needs, ease of use for the first time so that users have a good impression, and products or services that are made to help users complete their work [19]. UX is an experience that has to do with people's reactions, perceptions, behaviors, emotions, and thoughts when using the system. Each user has different impressions or experiences [20]. UX will assess how much satisfaction and comfort a person uses in using a product or service [21].

2.2. Heuristic Evaluation

Heuristic Evaluation is an evaluation method to examine and describe usability problems in UI design [22]. According to Nielsen (1994), the Heuristic Evaluation method is used to determine usability problems in UI Design, therefore, this method can be included as part of the iterative design process. According to Nielsen and Molich (1990), Heuristic Evaluation in general has disadvantages including how to use the application, information can be trusted, provide various positive conditions

[23] and advantages including easy evaluation process, fast evaluation process, and low cost [24]. There are 10 criteria in the Heuristic Evaluation, as follows [25]:

1. Visibility of system status: Assessment of whether the application can provide clear information and respond in real time.
2. Match between system and the real-world: Assessment of whether the application uses language (words, phrases, concepts) that are familiar to users.
3. User control and freedom: Assessment of whether the application can be freely used by users such as being able to do undo and redo.
4. Consistency and standards: An assessment of whether the application does not create ambiguity for users such as the use of words and icons that can make users make mistakes.
5. Error prevention: An assessment of how the application can handle or prevent errors made by users.
6. Recognition rather than recall: Assessment of whether the application is able to make users remember and use the application easily as in the meaning of images, choices, and other information.
7. Flexibility and efficiency of use: An assessment of whether this application can make the work done by users faster.
8. Aesthetic and minimalist design: Assessment of whether this application has information that is not really necessary for the user's needs.
9. Help user recognize, diagnose, and recover from errors: Assessment of whether the application can display clear error messages so that it is easy for users to handle.
10. Help and documentation: Assessment of whether the application can be operated easily by the user without reading the help or documentation section.

2.3. PeduliLindungi

PeduliLindungi is a smart mobile application created by the Ministry of Communication and Information of the Republic of Indonesia (KOMINFO) in collaboration with the Ministry of Health and the Ministry of State-Owned Enterprises (BUMN) [26]. This application is supported by the government as a means of tracing and tracking to stop the spread of Covid-19 [27]. PeduliLindungi works by involving people in Indonesia to share data about the locations visited during the trip so that the history of contacts with virus sufferers can be traced. Users will be notified if they are in a crowded, red zone, infected positive area, and if there are patients under surveillance so they can be aware of it [28].

3. RESEARCH METHOD

In this case, researchers used the Heuristic Evaluation method to improve User Experience on the application User Interface by evaluating the usability of the system [29]. Quantitative descriptive is the method used in research. Descriptive method is an investigation of an event, then the results will be presented in the form of a report to support data analysis. The data described in the form of numbers [30], [31]. Figure 1 shows the research flow used.
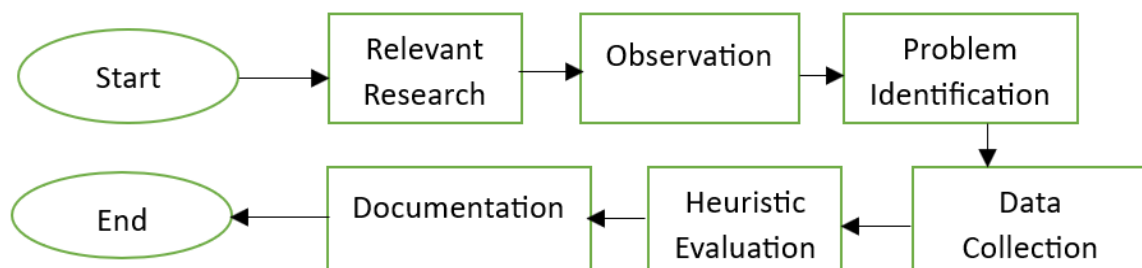

Figure 1. Research Flow [32]

3.1. Relevant Research

To solve the problem and support the data obtained, a literature study was carried out as a reference with several theories used related to the User Interface, User Experience, and Heuristic Evaluation. In addition, comparisons were also made with previous studies.

3.2. Observation

Direct observations were made on the object of research, namely the PeduliLindungi application. Observations focused on User Interface design related to system usability.

3.3. Problem Identification

Finding problems in research that are used as problem formulations about how users use PeduliLindungi and analysis with Heuristic Evaluation methods. The variables to support the research are shown in Figure 2, namely:

a.   Independent variable: User Interface design

b.   Dependent variable: Usability

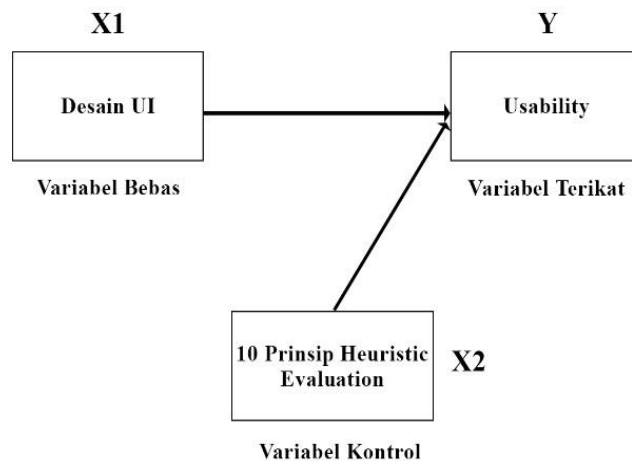c.   Control variables: 10 principles of Heuristic Evaluation

Figure 2. Research Variables

3.4. Data Collection

At this stage, activities must be carried out, starting from determining respondents, distributing questionnaires, to processing data. Respondents from this study were addressed to active students from all universities in Indonesia with a target of 33 people. The distribution of the questionnaire uses Google Form which is designed with 10 Heuristic Evaluation principles.

3.5. Documentation

The last stage in the research, namely by documenting the results obtained from the previous stages and compiling them into a report for publication.

4. RESULTS AND ANALYSIS

In this section, the results of the analysis that have been carried out by researchers based on the research method used. Relevant research uses several research journals related to UI, UX, and Heuristic Evaluation theories, these journals are used as writing references used in the literature review. Next, carry out the observation stage of the PeduliLindungi design UI display and adapt it to the usability of the application using the Heuristic Evaluation method based on 10 criteria.

4.1. Visibility of System Status

The application has implemented the visibility of system status criteria, which is shown in Figure 3, when the user selects the vaccination program menu and the covid-19 test results the application displays updated and real-time information that the user has the current green status and

the vaccine is in the third dose and the results of the covid-19 test observed within a certain period of time.

Figure 3. View of Visibility of System Status
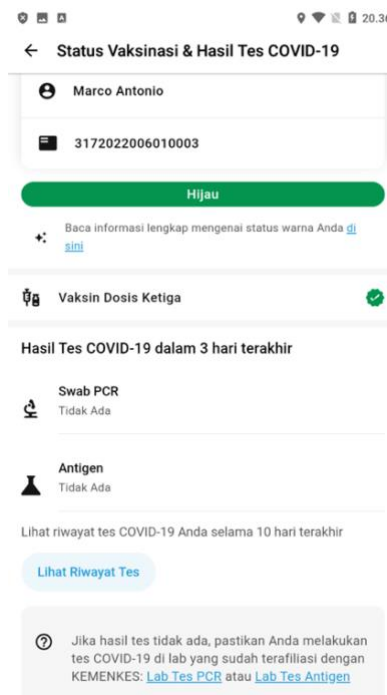
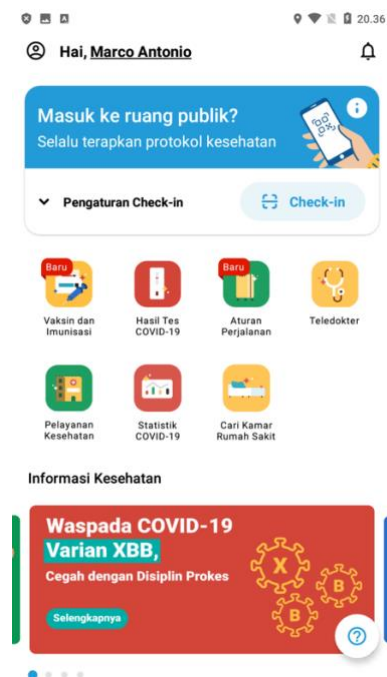## 4.2. Match Between System and The Real-world

Figure 4. View of Match Between System and The Real-world

The application has implemented the match between system and the real-world criteria, which is shown in Figure 4, the application display uses language or sentences that are easy to understand (familiar) by users. For example, "Masuk ke ruang publik ?" the check-in menu means

that at any time the user visits a public place, they can select this menu, scan the barcode that has been provided in order to enter the place.

4.3. User Control and Freedom
PeduliLindungi has implemented user control and freedom criteria, which is shown in Figure 4, there are menus such as vaccines and immunizations, covid-19 test results, travel regulations, telemedicine, healthcare facility, covid-19 statistics, find hospital bed, and others. other. The entire menu in this application can be accessed easily by the user.

4.4. Consistency and Standards
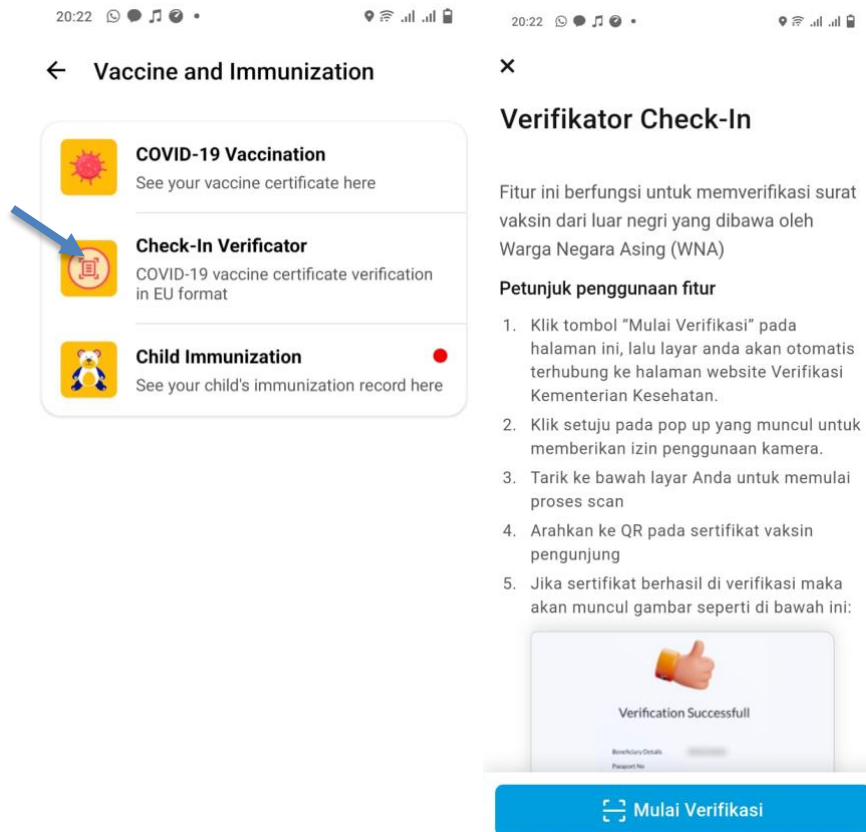
Figure 5. View of Consistency and Standards

PeduliLindungi still does not apply consistency and standards criteria, which is shown in Figure 5, it can be seen that on the first display in the application settings the language used is English, if the user selects the check-in verification menu, a second display will appear that uses Indonesian. Therefore, it appears that the language used is still less consistent and meets the standards.

4.5. Error Prevention
The application has implemented the error prevention criteria, which is shown in Figure 6, the user is notified of information in the form of an alert display with name and NIK data that must be filled in according to the user's ID card on the account information page. The alert appears because the user fills in a name and NIK that does not match the user's ID card.

Figure 6. View of Error Prevention

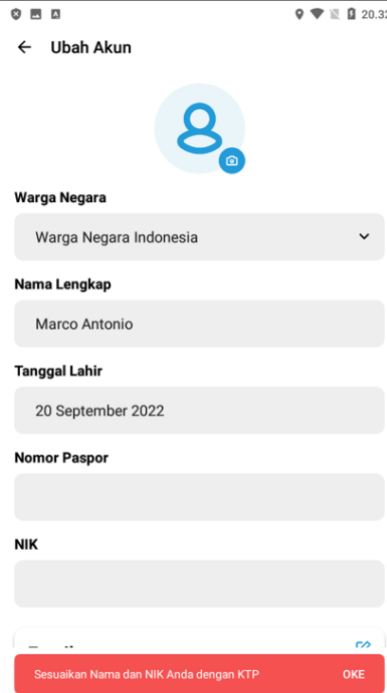## 4.6. Recognition Rather than Recall

PeduliLindungi has implemented recognition rather than recall criteria, which is shown in Figure 4, the icon of each menu in this application can be easily recognized by users because it has the appropriate meaning. For example, the vaccine card icon and the needle used in the vaccine and immunization menu options, this menu contains several menu sections consisting of vaccine certificates, vaccine certificate verification, and child immunization data. Users want to know information related to these things; they can access the menu that has been provided.

4.7. Flexibility and Efficiency of Use

Figure 7. View of Flexibility and Efficiency of Use

PeduliLindungi still not applying the flexibility and efficiency of use criteria, which is shown in Figure 7, some menus in the application have not been integrated with each other. For example, if a user selects the search menu for a hospital room, they will be directed to the SIRANAP website, which is a website outside of the application, not a single unit.

4.8. Aesthetic and Minimalist Design

The application has implemented aesthetic and minimalist design criteria, which is shown in Figure 4, the User Interface design in the application is well made, from language, font types, icons, and colors that are quite consistent on each page it has.

4.9. Help User Recognize, Diagnose, and Recover from Errors

PeduliLindungi has implemented the help user recognize, diagnose, and recover from errors criteria, which is shown in Figure 6, the application provides clear information to users when an error occurs, for example in entering data.

4.10. Help and Documentation

Figure 8. View of Help and Documentation

PeduliLindungi has implemented the help and documentation criteria, which is shown in Figure 8, the application has an FAQ menu consisting of a list of common questions commonly asked by users. This menu is very useful for users, especially to solve problems experienced when using the application.

After carrying out the observation stage, it is followed by data collection and documentation of the results obtained in testing the data. The questionnaire test conducted using Google Form as a research instrument was validated with 10 questions, compiled based on Heuristic Evaluation criteria, a research system using a linear scale in each question, and distributed to 33 respondents. The scale value is 1 – 5 with the following meaning:

1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

The following is a list of questions used, including:
HE1 = PeduliLindungi provides clear information to the user regarding the menu used by the user.
HE2 = The application provides user-friendly language.

HE3 = PeduliLindungi has features that are easily accessible to users.
HE4 = The application has a good display of language, font type, and consistent color on every page it has.
HE5 = The application provides notification when user enters wrong information.
HE6 = When the user first uses the PeduliLindungi, the user can recognize the function from the menu contained in the application.
HE7 = Various features in the application have a clear display, allowing users to carry out activities more quickly and precisely.
HE8 = The information provided in the PeduliLindungi is relevant and the interface used is familiar and easily accessible to users.
HE9 = The user can return to the correct state of the error that occurred for example in entering data, through the information provided.
HE10 = PeduliLindungi has a help menu to assist users in accessing the application.

The researcher analyzes the data obtained from the questionnaire results, determines the validity and reliability of the data using the IBM SPSS Statistics 25 application. The following are the tests carried out.

1. Validity test

Validity testing is carried out to determine whether or not the use of the Google Form questionnaire is valid in measuring user ratings of the PeduliLindungi application. The validity test is shown in Figure 9, based on the results obtained from 33 respondents (N) and 10 research questions, it can be seen that rcount > rtable which is "VALID", rcount is obtained from the TOTAL part of the Pearson correlation of each question and rtable is N = 33 = 0.344 (5% Significance).

Correlations

		HE1	HE2	HE3	HE4	HE5	HE6	HE7	HE8	HE9	HE10	TOTAL
HE1	Pearson Correlation	1	.435*	.626**	.248	.000	.280	.251	.441*	.426*	.300	.608**
	Sig. (2-tailed)		.011	.000	.164	1.000	.114	.158	.010	.014	.090	.000
	N	33	33	33	33	33	33	33	33	33	33	33
HE2	Pearson Correlation	.435*	1	.432*	.592**	.245	.415*	.300	.397*	.241	.162	.660**
	Sig. (2-tailed)	.011		.012	.000	.170	.016	.090	.022	.177	.367	.000
	N	33	33	33	33	33	33	33	33	33	33	33
HE3	Pearson Correlation	.626**	.432*	1	.277	.042	.424*	.212	.367*	.306	.016	.580**
	Sig. (2-tailed)	.000	.012		.119	.815	.014	.237	.036	.083	.928	.000
	N	33	33	33	33	33	33	33	33	33	33	33
HE4	Pearson Correlation	.248	.592**	.277	1	.379*	.386*	.345*	.378*	.387*	.180	.671**
	Sig. (2-tailed)	.164	.000	.119		.029	.026	.049	.030	.026	.316	.000
	N	33	33	33	33	33	33	33	33	33	33	33
HE5	Pearson Correlation	.000	.245	.042	.379*	1	.239	.374*	.266	.459**	.196	.523**
	Sig. (2-tailed)	1.000	.170	.815	.029		.180	.032	.134	.007	.275	.002
	N	33	33	33	33	33	33	33	33	33	33	33
HE6	Pearson Correlation	.280	.415*	.424*	.386*	.239	1	.489**	.445**	.085	.281	.668**
	Sig. (2-tailed)	.114	.016	.014	.026	.180		.004	.009	.637	.114	.000
	N	33	33	33	33	33	33	33	33	33	33	33
HE7	Pearson Correlation	.251	.300	.212	.345*	.374*	.489**	1	.697**	.206	.572**	.717**
	Sig. (2-tailed)	.158	.090	.237	.049	.032	.004		.000	.251	.001	.000
	N	33	33	33	33	33	33	33	33	33	33	33
HE8	Pearson Correlation	.441*	.397*	.367*	.378*	.266	.445**	.697**	1	.321	.695**	.785**
	Sig. (2-tailed)	.010	.022	.036	.030	.134	.009	.000		.068	.000	.000
	N	33	33	33	33	33	33	33	33	33	33	33
HE9	Pearson Correlation	.426*	.241	.306	.387*	.459**	.085	.206	.321	1	.129	.550**
	Sig. (2-tailed)	.014	.177	.083	.026	.007	.637	.251	.068		.473	.001
	N	33	33	33	33	33	33	33	33	33	33	33
HE10	Pearson Correlation	.300	.162	.016	.180	.196	.281	.572**	.695**	.129	1	.545**
	Sig. (2-tailed)	.090	.367	.928	.316	.275	.114	.001	.000	.473		.001
	N	33	33	33	33	33	33	33	33	33	33	33
TOTAL	Pearson Correlation	.608**	.660**	.580**	.671**	.523**	.668**	.717**	.785**	.550**	.545**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.002	.000	.000	.000	.001	.001	
	N	33	33	33	33	33	33	33	33	33	33	33

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 9. Validity Test Results

2. Reliability Test

Reliability testing was conducted to measure the consistency or inconsistency of the use of the Google Form questionnaire in the study. The reliability test is shown in Figure 10, the alpha value is set at 0.60, based on the results obtained by Cronbach's alpha > 0.60 which means "CONSISTENT".

Reliability Statistics

Cronbach's Alpha	N of Items
.830	10

Figure 10. Reliability Test Results

3. Hypothesis Test

Hypothesis testing was carried out from 10 questionnaire questions using the validity test shown in Table 1. The hypothesis will be accepted if rcount > rtable. The research of the hypothesis was carried out based on the correlation of factors with the items shown in Figure 11.
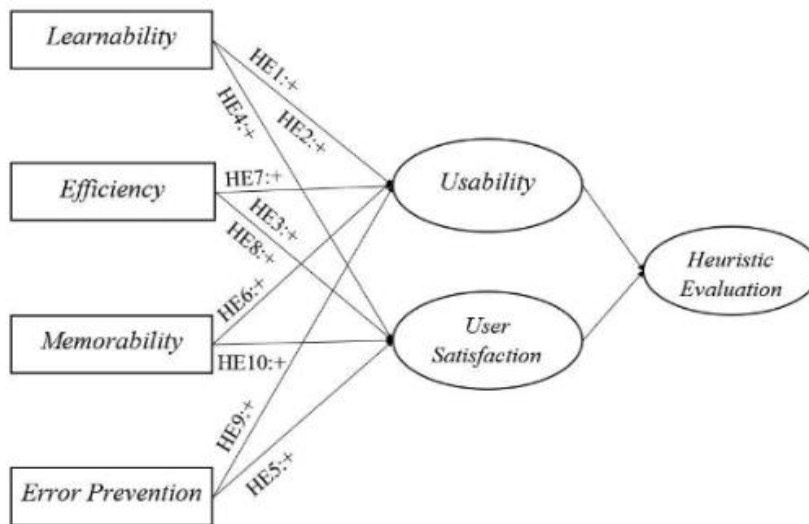

Figure 11. Factor Correlation with Items

Based on Figure 11, the factor correlation with the following items is explained:

1. H1: The Learnability factor has a positive effect on the Usability aspect for the HE1 and HE2 questionnaire items, as well as on the User Satisfaction aspect for the HE4 questionnaire items on the Heuristic Evaluation UI of the PeduliLindungi application.
2. H2: The Efficiency factor has a positive effect on the Usability aspect for the HE7 questionnaire items and on the User Satisfaction aspect for the HE3 and HE8 questionnaire items on the Heuristic Evaluation UI of the PeduliLindungi application.
3. H3: The Memorability factor has a positive effect on the Usability aspect for the HE6 questionnaire items and on the User Satisfaction aspect for the HE10 questionnaire items on the Heuristic Evaluation UI of the PeduliLindungi application.
4. H4: The Error Prevention factor has a positive effect on the Usability aspect for the HE9 questionnaire items and on the User Satisfaction aspect for the HE5 questionnaire items on the Heuristic Evaluation UI of the PeduliLindungi application.

Table 1. Hypothesis Test Result

Hypothesis	Aspect	Validity			Result
		Item	rcount	rtable	
H1: Learnability	Usability	HE1	0,608	0,344	Accepted
		HE2	0,660	0,344	Accepted
	User Satisfaction	HE4	0,671	0,344	Accepted
H2: Efficiency	Usability	HE7	0,717	0,344	Accepted
	User Satisfaction	HE3	0,580	0,344	Accepted
		HE8	0,785	0,344	Accepted
H3: Memorability	Usability	HE6	0,668	0,344	Accepted
	User Satisfaction	HE10	0,545	0,344	Accepted
H4: Error Prevention	Usability	HE9	0,550	0,344	Accepted
	User Satisfaction	HE5	0,523	0,344	Accepted

Based on Table 1 of the results of hypothesis test, it was found that all factors, aspects, and items in the questionnaire were related to one another for one purpose in research, namely UI analysis of the PeduliLindungi application using the Heuristic Evaluation method. All test results are accepted and there are no serious problems in the application either from the appearance of the UI design or usability.

5. CONCLUSION

From the research, there is an effect of the PeduliLindungi User Interface display, measurement using the Heuristic Evaluation method on the usability of the application. Many features have been provided for users such as Covid-19 test results, travel regulations, telemedicine, healthcare facilities, and others. This application is very useful, especially for those of us who are facing pandemic problems, limiting activities every day. Researchers have tested users to measure the level of satisfaction using the application. Valid and consistent validity and reliability test results were obtained from 33 respondents and 10 questions. All of the hypothesis testing that was carried out resulted in acceptable results. Although it has quite a lot of features and is able to meet the needs of today's users, this application still has many shortcomings, both in terms of appearance and usability. The HE5 item is declared to be deficient because it has the lowest rcount value compared to the other HE item rcount. However, there are no serious problems with the application. In order for PeduliLindungi to work optimally and be able to meet the needs of users in the future, it is necessary to conduct more extensive research, for example with other methods.

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