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Usability testing of the Si Salto application using the heuristic evaluation method

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ABSTRACT

Si Salto application is one of the platforms used to make the process of ordering services online, with this system the process of ordering services will be well planned. By paying attention to the user, an appropriate and appropriate information system can be created for the user, so that it will lead to satisfaction by the user. This technology needs to be continuously evaluated using the Heuristic Evaluation method by testing sample users whose results will then be verified and validated using the Heuristic Evaluation technique. With this evaluation, it is hoped that problems related to deficiencies in usability will be found which will then be used as a reference in drawing recommendations to improve the quality of the application. Usability evaluation to measure efficiency, effectiveness, and assess user satisfaction. User experience is several important factors in building an application. Without the right appearance and user experience, it can result in users switching to other similar applications. This study has a target to evaluate the user experience of the Si Salto application using the Heuristic Evaluation and Usability Testing methods.

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1. INTRODUCTION

Si Salto or Mutual Help Information System is an application that aims to provide information about service providers who are (currently only) located in Palembang City and its surroundings to its users. There are various choices of service providers, ranging from Building Services, Cleaning Services, Service Services, and many more. After the user finds the service he needs, communication only occurs between the service user and the service provider. The Si Salto developer does not have any authority to interfere with communication between the two and does not have any real or material responsibility if something undesirable happens in the communication process between the two. By paying attention to the user, an appropriate and appropriate information system can be created for the user, so that it will lead to satisfaction by the user.

One of the problems encountered in application development is related to the interface or interface design. One way to evaluate the interface design is by using the usability Heuristic Evaluation test. Heuristic Evaluation is a method for measuring the

extent of a software usability problem in interface design. Identification of usability problems is in the field of human-computer interaction. Heuristic Evaluation Method with 10 usability criteria, namely visibility of system status, match between system and the real world, user control and freedom, consistency and standards, recognition rather than recall, flexibility and efficiency of use, aesthetic and minimalist design, help users recognize, diagnose and recover from errors, help and documentation (Jacob Nielsen, 2022). The aim of the research I conducted was to identify problems and find out the factors that significantly influence consumers by applying the Heuristic Evaluation method.

The results of this study are expected to be useful for system developers to obtain recommendations for improving the Si Salto application system based on usability testing, so that improvements can be made to the part of the system in question and can assist in evaluating the Si Salto application.

2. RESEARCH METHOD

In this study using quantitative research. Quantitative research is a research method based on the philosophy of positivism which is used to examine populations in certain samples, sampling techniques are generally carried out randomly, data collection is carried out using research instruments, data analysis is quantitative/statistical in nature with the aim of testing predetermined hypotheses (Sugiyono, 2017).

The definition of usability according to ISO 9241:11 (1998) is knowing the level of success in developing a product form that can be used by the user to achieve the target as desired, such as aspects of effectiveness, aspects of efficiency and achieving user satisfaction in certain cases. According to Nielsen (2018) Heuristic Usability, also known as Heuristic Evaluation, is an evaluation system for user-based computer software. This system involves evaluators to provide input which is then categorized in heuristic principles. Although considered as an informal method of assessing the usefulness of a software or application. The approach created by Nielsen in 1990 is a fairly reliable way of evaluating in today's New Media world.

*Heuristic Evaluation*are guidelines, general principles, or rules that can guide design decisions or be used to criticize an existing decisiontaken (Dalimunthe, Nurmaini, et al: 2019). The Heuristic Evaluation proposed by Nielsen and Molich, is almost the same as the Cognitive Walkthrough but is slightly structured and slightly directed (Geasela, Yemima Monica, et al.: 2018). In this approach, a set of usability criteria or heuristics is identified and design is implemented where the criteria are violated. The purpose of the heuristic evaluation is to improve the design effectively. The evaluator evaluates through the performance of a series of tasks by design and sees compliance with the criteria for each level. If any errors are detected then the design can be reviewed to fix these problems before the implementation level. Heuristic evaluation is very well used as a design evaluation technique, because it is easier to find or determine usability problems that arise.

*Usability Evaluation*is a process that involves users so that they can study and use the product in order to achieve aspects of user convenience such as effectiveness, efficiency, and user satisfaction with the system as a whole (Aziza 2019).

The results of the sub-aspects obtained from statements or questionnaires from the evaluator will be calculated using equation (1). So the value obtained is the severity rating (SR) score for each sub-aspect. Where these sub-aspects will be used to find the severity rating value of the usability aspect using equation (2) (SUMITRO, Arif Hadi: 2018).

Calculations on the Heuristic Evaluation use equation (1):

$$\sum Hx = (0\ x) + (1\ x) + (2\ x) + (3\ x) + (4\ x) \text{ …….*****} \quad (1)$$

Information :

$\sum Hx$ = the total rating score of the sub-aspects*usability*in every aspect of usability (H1, H2,....., H10)

x = point*usability*

Next to generate values*severity rating*from each aspect of usability using equation (2):

$$Sv = \sum \frac{Hx}{n} \ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

Information :
Sv = Results of severity rating in one aspect of usability
n =Value scale in every aspect of usability

Table 1. Severity Rating Scale

Severity Rating	Information
0	No problems or deficiencies were found in usability
1	In the cosmetic problem category, the problem does not need to be fixed unless the project time is still available.
2	Minor usability problem category, small usability problem, this fix is given a low priority
3	The major usability problem category, the main usability problem, important improvements are made, therefore it is given high priority.
4	The usability catastrophe category, this repair problem must be done before the product is launched.

source: researchgate.net

3. RESULTS AND DISCUSSIONS

In this phase the researcher will explain some of the findings after completing the evaluation. The evaluator evaluates with a questionnaire prepared by the researcher, there are 10 principles that must be evaluated (*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, Dialogue, and Recover from Errors,Help and Documentation*). The use of these 10 principles refers to usability aspects in the heuristic evaluation method according to Jacob Nielsen which is explained in the literature review of the Usability sub-chapter. This finding is calculated using the average value of the severity rating which uses a scale of 0-4, where the severity rating is used to indicate usability problems based on their severity to be repaired before finally being used (Jacob Nielsen, 2022). After conducting a heuristic evaluation with 3 expert usability evaluators, they produced 10 findings. Determining the number of evaluators themselves refers to the recommendations of the heuristic evaluation study, namely 3-5 evaluators (Jacob Nielsen, 2022).

To validate the data, the researcher will calculate the average value of the severity rating given by each evaluator, so that it will produce numbers that are used to classify categories from the severity rating.

3.1 Visibility of system status

Table 2. Calculation of the 1st Usability Aspect

Usability Aspect	Usability subaspect		SR					Number of SRs	SR value
			0	1	2	3	4		
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(i)	(J)	
1	1	0	0	0	0	3	12	4	
	2	0	2	1	0	0	4	1.33	
	3	0	3	0	0	0	3	1	
		0	5	1	0	3		6.33	

Calculation of the usability aspect uses the formula:

I= (0 C1) + (1 D1) + (2 E1) + (3 F1) + (4 G1).*****

Example of calculation with the formula for the 1st usability sub-aspect:
I1 = (0∗0) + (1∗ 0) + (2∗ 0) + (3∗ 0) + (4∗ 3)
= 0 + 0 + 0 + 0 + 12
I1 = 12
After getting the Total SR value or (I) we can continue to calculate the SR Value (J) where the total SR will be divided by the number of evaluators. Where in this study there are 3 evaluators, it will produce:
J1 = I1 : 3
=12 : 3
= 4
If you have got each SR Value, we can determine the average of the SR Value by dividing the total SR Value (J) by the number of Usability Sub-Aspects (B):
Average Severity Rating = total(J) : sum(B)
=6.33 : 3
= 2.11

3.2 Match between system and the real world

Table 3. Calculation of the 2nd Usability Aspect

Usability Aspect	Usability subaspect	SR					Number of SRs	SR value
		0	1	2	3	4		
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(i)	(J)
1	1	0	0	3	0	0	6	2
	2	0	0	0	2	1	10	3.33
	3	0	2	1	0	0	4	1.33
	4	0	3	0	0	0	3	1
	5	0	0	2	1	0	7	2.33
		0	5	6	3	1		10
		0	5	12	9	4		2

Calculation of the usability aspect uses the formula:

I= (0 C1) + (1 D1) + (2 E1) + (3 F1) + (4 G1).*****

Example of calculation with the formula on the 1st sub-aspect of usability:
I1 = (0∗0) + (1∗ 0) + (2∗ 3) + (3∗ 0) + (4∗ 0)
= 0 + 0 + 6 + 0 + 0
I1 = 6
After getting the Total SR (I) value, we can continue to calculate the SR Value (J) where the total SR will be divided by the number of evaluators:
J1 = I1 : 3
=6 : 3
= 2
If you have got each SR Value, we can determine the average of the SR Value by dividing the total SR Value (J) by the number of Usability Sub-Aspects (B):
Average Severity Rating = total(J) : sum(B)
=10 : 5
= 2

3.3 User control and freedom

Table 4. Calculation of the 3rd Usability Aspect

Usability Aspect	Usability subaspect	SR					Number of SRs	SR value
		0	1	2	3	4		

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(i)	(J)
1	1	2	1	0	0	0	1	0.33
	2	1	2	0	0	0	2	0.67
		3	3	0	0	0		1
		0	3	0	0	0		0.5

Calculation of the usability aspect uses the formula:

I = (0 C1) + (1 D1) + (2 E1) + (3 F1) + (4 G1).*****

Example of calculation with the formula on the 1st sub-aspect of usability:
I1 = (0∗2) + (1∗ 1) + (2∗ 0) + (3∗ 0) + (4∗ 0)
= 0 + 1 + 0 + 0 + 0
I1 = 1
After getting the Total SR value or (I) we can continue to calculate the SR Value (J) where the total SR will be divided by the number of evaluators:
J1 = I1 : 3
=1 : 3
= 0.33
If you have got each SR Value, we can determine the average of the SR Value by dividing the total SR Value (J) by the number of Usability Sub-Aspects (B):
Average Severity Rating = total(J) : sum(B)
=1 : 2
= 0.5

3.4 Consistency and standards

Table 5. Calculation of the 4th Usability Aspect

Usability Aspect	Usability subaspect	SR					Number of SRs	SR value
		0	1	2	3	4		
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(i)	(J)
1	1	0	0	0	0	3	12	4
	2	0	0	0	1	2	11	3.67
	3	0	0	0	3	0	9	3
	4	0	0	2	1	0	7	2.33
		0	0	2	5	5		13
		0	0	4	15	20		3.25

Calculation of the usability aspect uses the formula:

I = (0 C1) + (1 D1) + (2 E1) + (3 F1) + (4 G1).*****

Example of calculation with the formula on the 1st sub-aspect of usability:
I1 = (0∗0) + (1∗ 0) + (2∗0) + (3∗ 0) + (4∗ 3)
= 0 + 0 + 0 + 0 + 12
I1 = 12
After getting the Total SR (I) value, we can continue to calculate the SR Value (J) where the total SR will be divided by the number of evaluators:
J1 = I1 : 3
=12 : 3
= 4
If you have got each SR Value, we can determine the average of the SR Value by dividing the total SR Value (J) by the number of Usability Sub-Aspects (B):
Average Severity Rating = total(J) : sum(B)
=13 : 4
= 3.25

3.5 Error prevention

Table 6. Calculation of the 5th Usability Aspect

Usability Aspect	Usability subaspect	SR					Number of SRs	SR value
		0	1	2	3	4		
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(i)	(J)
1	1	0	0	0	0	3	12	4
	2	0	0	0	0	3	12	4
		0	0	0	0	6		8
		0	0	0	0	24		4

Calculation of the usability aspect uses the formula:

I = (0 C1) + (1 D1) + (2 E1) + (3 F1) + (4 G1).*****

Example of calculation with the formula on the 1st sub-aspect of usability:
I1 = (0∗0) + (1∗ 0) + (2∗ 0) + (3∗ 0) + (4∗ 3)
= 0 + 0 + 0 + 0 + 12
I1 = 12
After getting the Total SR value or (I) we can continue to calculate the SR Value (J) where the total SR will be divided by the number of evaluators:
J1 = I1 : 3
=12 : 3
= 4
If you have got each SR Value, we can determine the average of the SR Value by dividing the total SR Value (J) by the number of Usability Sub-Aspects (B):
Average Severity Rating = total(J) : sum(B)
=8 : 2
= 4

3.6 Recognition rather than recall

Table 7. Calculation of the 6th Usability Aspect

Usability Aspect	Usability subaspect	SR					Number of SRs	SR value
		0	1	2	3	4		
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(i)	(J)
1	1	0	0	1	2	0	8	2.67
	2	0	2	1	0	0	4	1.33
	3	0	0	1	2	0	8	2.67
		0	2	3	4	0		6.67
		0	2	6	12	0		2.22

Calculation of the usability aspect uses the formula:

I = (0 C1) + (1 D1) + (2 E1) + (3 F1) + (4 G1).*****

Example of calculation with the formula on the 1st sub-aspect of usability:
I1 = (0∗0) + (1∗ 0) + (2∗ 1) + (3∗2) + (4∗ 0)
= 0 + 0 + 2 + 6 + 0
I1 = 8
After getting the Total SR value or (I) we can continue to calculate the SR Value (J) where the total SR will be divided by the number of evaluators:
J1 = I1 : 3
=8 : 3
= 2.67
If you have got each SR Value, we can determine the average of the SR Value by dividing the total SR Value (J) by the number of Usability Sub-Aspects (B):
Average Severity Rating = total(J) : sum(B)

=6.67 : 3
= 2.22

3.7 Flexibility and efficiency of use

Table 8. Calculation of the 7th Usability Aspect

Usability Aspect	Usability subaspect	SR					Number of SRs	SR value
		0	1	2	3	4		
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(i)	(J)
1	1	0	0	0	0	3	12	4
	2	0	0	0	2	1	10	3.33
	3	0	0	0	3	0	9	3
		0	0	0	5	4		10.3
		0	0	0	15	16		3.44

Calculation of the usability aspect uses the formula:

I = (0 C1) + (1 D1) + (2 E1) + (3 F1) + (4 G1).*****

Example of calculation with the formula on the 1st sub-aspect of usability:
I1 = (0∗0) + (1∗ 0) + (2∗ 0) + (3∗0) + (4∗ 3)
= 0 + 0 + 0 + 0 + 12
I1 = 12
After getting the Total SR value or (I) we can continue to calculate the SR Value (J) where the total SR will be divided by the number of evaluators:
J1 = I1 : 3
=12 : 3
= 4
If you have got each SR Value, we can determine the average of the SR Value by dividing the total SR Value (J) by the number of Usability Sub-Aspects (B):
Average Severity Rating = total(J) : sum(B)
=10.3 : 3
= 3.44

3.8 Aesthetic and minimalist design

Table 9. Calculation of the 8th Usability Aspect

Usability Aspect	Usability subaspect	SR					Number of SRs	SR value
		0	1	2	3	4		
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(i)	(J)
1	1	0	0	0	0	3	12	4
	2	0	0	0	0	3	12	4
	3	0	0	0	1	2	11	3.37
		0	0	0	1	8		11.7
		0	0	0	3	32		3.89

Calculation of the usability aspect uses the formula:

I = (0 C1) + (1 D1) + (2 E1) + (3 F1) + (4 G1).*****

Example of calculation with the formula on the 1st sub-aspect of usability:
I1 = (0∗0) + (1∗ 0) + (2∗ 0) + (3∗0) + (4∗ 3)
= 0 + 2 + 0 + 0 + 12
I1 = 12
After getting the Total SR value or (I) we can continue to calculate the SR Value (J) where the total SR will be divided by the number of evaluators:
J1 = I1 : 3
=12 : 3

= 4

If you have got each SR Value, we can determine the average of the SR Value by dividing the total SR Value (J) by the number of Usability Sub-Aspects (B):

Average Severity Rating = total(J) : sum(B)

=11.7 : 3

= 3.89

3.9 Help User Recognize, Dialogue, and Recover from Errors

Table 10. Calculation of the 9th Usability Aspect

Usability Aspect	Usability subaspect	SR					Number of SRs	SR value
		0	1	2	3	4		
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(i)	(J)
1	1	0	0	3	0	0	6	2
	2	0	1	2	0	0	5	1.67
	3	1	2	0	0	0	2	0.67
		1	3	5	0	0		4.33
		0	3	10	0	0		1.44

Calculation of the usability aspect uses the formula:

I = (0 C1) + (1 D1) + (2 E1) + (3 F1) + (4 G1).*****

Example of calculation with the formula on the 1st sub-aspect of usability:

I1 = (0∗0) + (1∗0) + (2∗ 3) + (3∗0) + (4∗ 0)

= 0 + 0 + 6 + 0 + 0

I1 = 6

After getting the Total SR value or (I) we can continue to calculate the SR Value (J) where the total SR will be divided by the number of evaluators. Where in this study there are 3 evaluators, it will produce:

J1 = I1 : 3

=6 : 3

= 2

If you have got each SR Value, we can determine the average of the SR Value by dividing the total SR Value (J) by the number of Usability Sub-Aspects (B):

Average Severity Rating = total(J) : sum(B)

=4.33 : 3

= 1.44

3.10 Help and Documentation

Table 11. Calculation of the 11th Usability Aspect

Usability Aspect	Usability subaspect	SR					Number of SRs	SR value
		0	1	2	3	4		
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(i)	(J)
1	1	2	1	0	0	0	1	0.33
	2	3	0	0	0	0	0	0
	3	3	0	0	0	0	0	0
		8	1	0	0	0		0.33
		0	8	0	0	0		0.11

Calculation of the usability aspect uses the formula:

I = (0 C1) + (1 D1) + (2 E1) + (3 F1) + (4 G1).*****

Example of calculation with the formula on the 1st sub-aspect of usability:

I1 = (0∗2) + (1∗1) + (2∗ 0) + (3∗0) + (4∗ 0)

= 0 + 1 + 0 + 0 + 0

I1 = 1
After getting the Total SR value or (I) we can continue to calculate the SR Value (J) where the total SR will be divided by the number of evaluators. Where in this study there are 3 evaluators, it will produce:
J1 = I1 : 3
=1 : 3
= 0.33
If you have got each SR Value, we can determine the average of the SR Value by dividing the total SR Value (J) by the number of Usability Sub-Aspects (B):
Average Severity Rating = total(J) : sum(B)
=0.33 : 3
= 0.11

Table 12. Research result

No	Variable Indicator	SR value
1	Visibility of system status	2
2	Match between system and the real world	2
3	User control and freedom	0
4	Consistency and standards	3
5	Error prevention	4
6	Recognition rather than recall	2
7	Flexibility and efficiency of use	3
8	Aesthetic and minimalist design	4
9	Help User Recognize, Dialogue, and Recover from Errors	1
10	Help and Documentation	0

By obtaining the SR value for each aspect contained in Table 4.11. From the results of the study it can be concluded that the results of the evaluation of the Mutual Assistance Information System application (Si SalTo) have the largest value among the existing variable indicators, namely Error prevention and Aesthetic and minimalist design with a value of 4 which means it is mandatory to make changes to these variables. That way the recommendations will focus on variables that have high values which require changes to the design of the User Interface (UI) and the User Experience (UX).

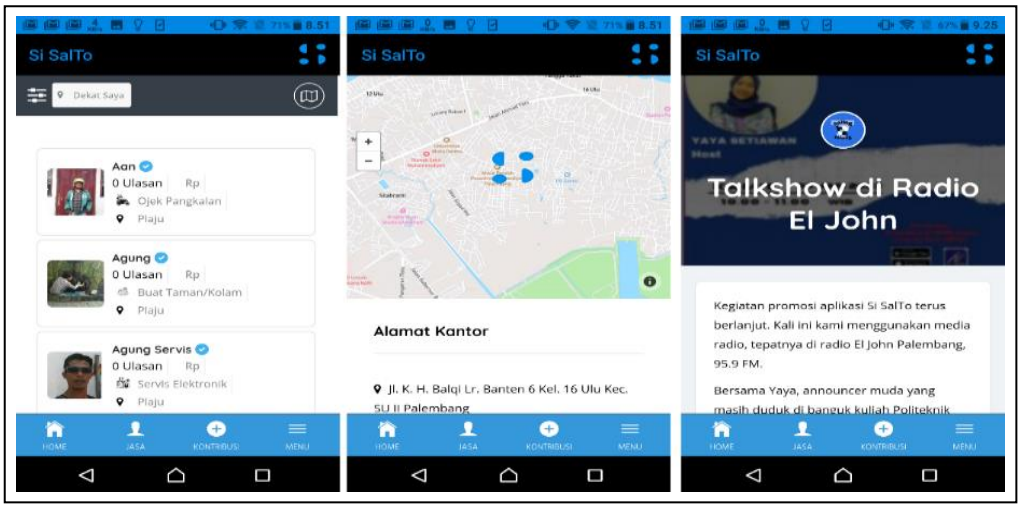

Figure 1. Header on every page

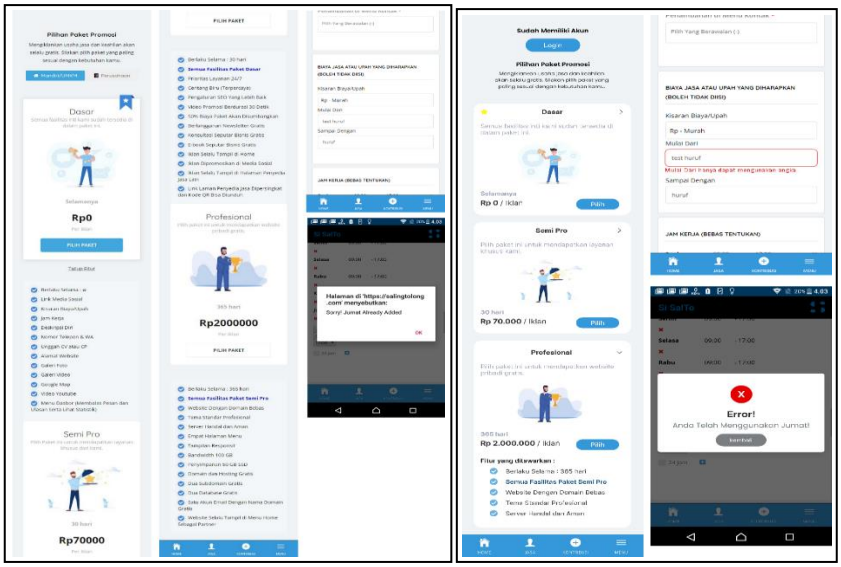

Figure 2. Contributor page and contributor registration form

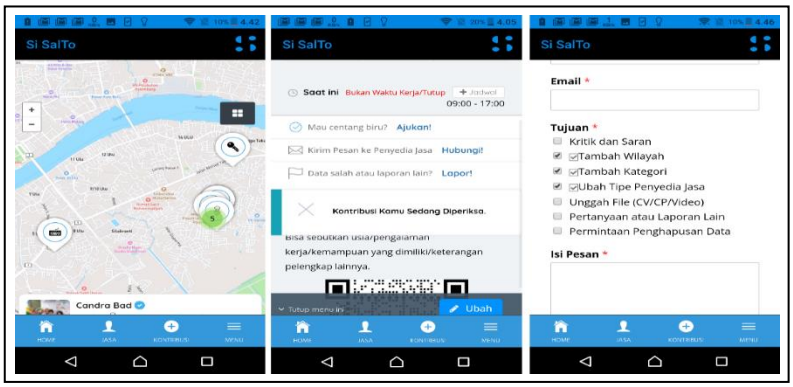

Figure 3.Components that have Overlap

4. CONCLUSION

Based on the results of the analysis and discussion of the tests described above. So, conclusions can be drawn. After conducting a heuristic evaluation with 3 expert usability evaluators, yielding 10 findings, in principle problem findings, in principle H-1 (Visibility of system status) found 1 problem. In the H-2 principle (Match between system and the real world) found 1 problem. Then on the H-3 principle (User control and freedom) no problems are found. In H-4 (Consistency and standards) 3 problems were found. Then on H-5 (Error prevention) 3 problems were found. Then for H-6 (Recognition rather than recall) 1 problem was found. Then for H-7 (Flexibility and efficiency of use) 2 problems were found. And in H-8 (Aesthetic and minimalist design) 4 problems were found. While on H-9 (Help users recognize, diagnose, and recover from errors) 4 problems were found. And finally, for the H-10 principle (Help and documentation), no problems were found that did not comply with the H-10 principle.

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