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Usability Testing to Analyze the Quality of Android-Based Acupressure Smart Chair

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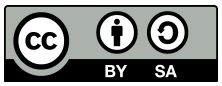
ABSTRACT

Smart chairs are designed for people who are phobic about acupuncture needles by replacing these needles with waste tires. This smart chair is equipped with an application directly connected to Android. The smart chair application is an android-based remote control where users can control the application remotely. However, the application has not been tested, so it is not yet known how effective and efficient the use of the application is. The importance of this test is to find weaknesses in the application. Therefore, an update can be made to fix any issues that have arisen. This researcher uses usability testing methodology to test. A usability testing method is used to measure an implemented application's usability. 115 people were tested in this study to examine the effectiveness of the smart chair application. After the test, 115 people completed a survey. The results of this study showed that a variable learnability value was 65%, while the efficiency variable got a value of 74%. In terms of memorability, its value was 59%, then the Errors variable value was 74%, and the last variable, satisfaction, reached 74%.



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1. INTRODUCTION

Android is an operating system that is Open Source, which gives freedom for developers to develop an application, with the advantages of the Android operating system that will help Android-based smartphone users to be able to enjoy various applications [1]. According to [2], an application is a program (software) created for Android users to manage documents, manage and execute commands, and play games as an entertainer in their spare time. One of the uses of Android-based usage is the acupressure smart chair. The acupressure smart chair is a smart reflexology chair that utilizes tire waste as an alternative to acupressure. The smart chair is designed to make it easier for people who need an automatic acupressure massage device at home. This smart chair is equipped with an application connected directly to the user's Android. The smart chair application is an Android-based remote control where users can control the use of a smart chair using an application remotely. However, this application has not been evaluated, so it is not yet known how effective and efficient the quality of the application is. Therefore, evaluation is carried out to analyze the quality of the application; if no evaluation is carried out, then the developer does not know the application's deficiencies. One of them is the appearance of the application, which is not good enough, the application which is not optimal, and complaints experienced by users [3]. For this reason, it is necessary to analyze the quality of the acupressure smart chair application.

It is necessary to analyze the quality of smart chairs through usability testing. The test results become recommendations for improving the smart chair application so that the application can achieve the goals or objectives of the application as expected. Based on the description above, the researchers have explained several studies on usability testing methods to analyze the quality of smart chair applications.

This Usability testing method has been used in previous studies, including an evaluation of the Rembang local government web system using the usability testing method where evaluation is carried out to determine service quality. The results obtained by the Rembang regency website are categorized as good, with a value of 0.68 [4]. Another study evaluated usability aspects in the Simalu application, which this research conducted to improve User Experience [5]. Furthermore, in other studies, this method was used to measure the quality of public service websites at the Pontianak Convention Center (PCC) Online Building [6]. This research was usually done by distributing a questionnaire to respondents directly to find out how easy it is for users to learn the application. The questionnaire given contained questions based on the five evaluation variables above.

Research [7] conducts tests to find errors provided by the website and avoid losses to the company. The results obtained for the E-commerce website product of Buleleng MSME craftsmen resulted in a positive assessment. This study only uses the Satisfaction variable, so the value is only from one variable. Other studies use usability testing only to find satisfaction [8, 9], and the results are also good. Then another study [10] evaluates play anywhere. The results of the usability testing analysis on the Nowhere game can show that the usability evaluation results on the Nowhere game have fulfilled the usability criteria, namely ease, efficiency, error, and security, as well as user satisfaction in running the Nowhere game. This study uses four variables: learnability, efficiency, error, and satisfaction. Then another study [11] tested companies' supply and order systems. The results of this study state that the system is very easy to use, learn and remember how to use it in terms of learnability, memorability, error, and satisfaction. Some of these studies do not use all variables in usability testing. This is because the research object has already been applied. In this study, all variables are used because the smart chair application is currently in the development stage, which must be thoroughly tested so that the use of the application can run properly.

Previous researchers have carried out several methods to analyze the application, namely, knowing customer satisfaction using the System Usability Scale application. The results obtained from this satisfaction showed good results [7]. Then another study using the Usability method to evaluate the Go-Jek application obtained very satisfactory results on usability, and satisfaction levels reached 60-70% [12]. Another method that can be used to analyze the McCall application is used by researchers to analyze the quality of academic information system software. The results of the system still have deficiencies in terms of correctness, efficiency, and integrity [9], then other researchers also use Servqual to know the quality of SPADA DIKTI services. The result is that several indicators must be improved in the system [13]. The last is DeLon-McLean which is used by other studies to analyze the level of objectivity of Edom filling, the results are quite good, but there are several strategies that must be carried out in Edom system improvement [14].

This study focuses on the analysis of the application of the acupressure smart chair using the usability testing method. The usability testing method is a technique for evaluating an application by testing it directly to the user. This method is carried out to find out how effective and efficient an application is [8]. Usability testing also looks at the level of ease and convenience of applications that have been used by users, which will be measured by five evaluation variables, namely learnability, efficiency, memorability, error, and satisfaction. Researchers use usability testing because the usability testing method covers all evaluation variables, not only in terms of usability, namely efficiency, effectiveness, and satisfaction [10], but includes five evaluation variables, namely learnability, efficiency, memorability, error, and satisfaction [4]. Moreover, this method is most often used to analyze web usability, software, and cost-effectiveness. Another convenience is that usability testing can use wireframes from applications that have been made [5].

This usability testing method has been used in previous research, including this method used to evaluate the Prambulih local government website with the usability testing method where the evaluation is carried out to determine the ease of use for new visitors when studying the Prambulih local government website [6]. As for other research, namely evaluating the usability aspects of the Simalu application where this research was carried out to improve the user's User Experience [15]. Moreover, in other studies, this method was used to measure the quality of public service websites at the Pontianak Convention Center (PCC) Online Building [16].

The results of this study recommend improving the smart chair application so that the application can achieve the goals or objectives of the application as expected. Based on the description above and the researchers have presented several studies on usability testing methods to analyze the quality of smart chair applications.

2. RESEARCH METHOD

This research was carried out by distributing questionnaires to respondents directly to find out how easy it was for users to learn the application. The questionnaire given contains questions based on the five evaluation variables above. This study uses a qualitative method to do what the study relates to the behavior, motivation, perceptions, and actions of subjects [15].To facilitate this investigation, researchers used usability testing methods [5]. This method is used to create surveys to be answered by respondents consisting of students and the general public. Figure 1 shows the research flow used in this study.

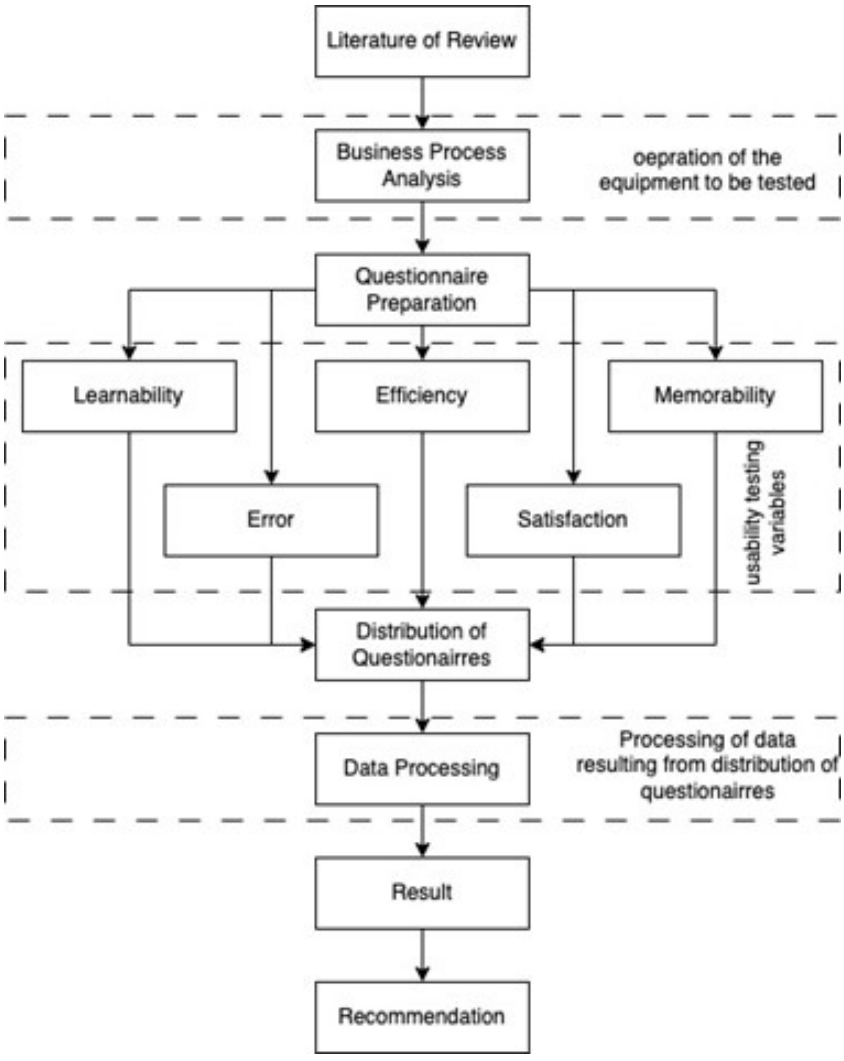

Figure 1. Stages of Research

2.1. Literature Review

The literature review was carried out to study studies that have been carried out by previous researchers related to the case studies obtained. The literature review will be useful as a guide in conducting and completing this research, starting from determining the topic, determining problems, data collection techniques, and so on.

2.2. Business Process Analysis

Figure 2 is the business process of the acupressure smart chair application. This analysis was made to find out the processes that users of the acupressure smart chair application passed.

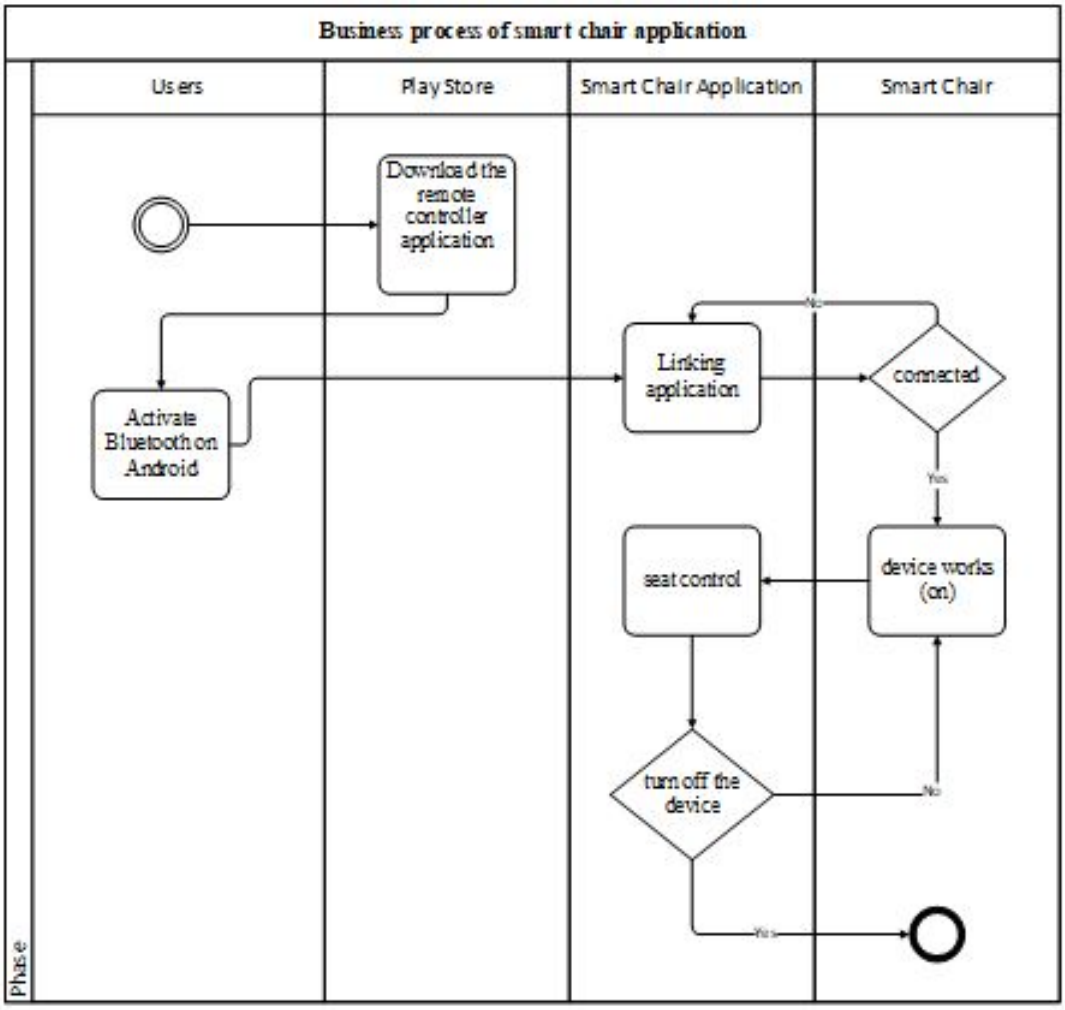

Figure 2. Business Process Analysis of the Smart Chair Acupressure application

2.3. Questionnaire Preparation

The preparation of a questionnaire was a step that was carried out after determining the variables of the study. The result of determining the variables that will create the questionnaire sheet. First, the statements on the variable. After determining the research variable, the next step was to determine the questions. Second, determining indicators. In determining the indicators from the statement, it was then described in detail with the subject and object. Then, determine the statements in the questionnaire. Statements in the questionnaire were obtained from indicators that were adjusted to the existing problem. Finally, conducting question selection. The next step was to make a selection of each question from each statement having the same meaning as each indicator.

Measurements in usability testing can be seen in table 1 below, which corresponds to the specified variability and the framework in the feeding of the questionnaire:

Table 1. Questionnaire Arrangement Characteristics

No.	Variables & questions	SD	D	N	A	SA
A	**Learnability**					
1	Is the appearance of the Acupressure Smart Chair App easy to understand?					
2	Can I use the Acupressure Smart Chair Application without written instructions/tutorials from other parties?					
3	Is the Acupressure Smart Chair App menu easy to use?					
B	**Efficiency**					
4	Is the button feature easy to use?					
5	Can the menu you click on work quickly?					
6	Does this app help control the Acupressure Smart Chair?					
C	**Memorability**					
7	Is the Smart Chair Application Interface very easy to understand?					
8	Is the button image on the Acupressure Smart Chair Application easy to understand?					
9	Is the design of the Acupressure Smart Chair App good?					
D	**Errors**					
10	Are there any application error problems when dismissing the feature when it does not match what to use?					
11	Are there any errors or bug issues on Acupressure Smart Chair App?					
12	12 is there any error problems when connecting the Smart Chair App with the user's Android?					
E	**Satisfaction**					
13	The information provided in the Acupressure Smart Chair Application is easier than a regular remote.					
14	I am very satisfied to use the Acupressure Smart Chair Application.					
15	All functions on the application are as you wish.					

2.4. Distribution of questionnaires

The distribution of questionnaires to respondents was by giving them leaflets. The step to distributing the questionnaire was to know the number of samples needed by determining the population. The population is a generalized area consisting of an object or subject with certain qualities and characters established by the researcher to be able to study and then draw conclusions. The population in this study was STMIK Amik Riau students in the sixth semester for the following reasons:

a. Students understood how the Analysis was done.
b. Students had understood what a system was.
c. Students understood how important a design was.

To find out the number of samples, the researchers added up the entire population of the 6th-semester batch of the entire study program. Table 2 is a table of data taken by researchers from the academic section of STMIK Amik Riau.

Table 2. Student Data for Semester 6 of STMIK Amik Riau

Study Program	Number of Students
Information Systems	57
Informatics Engineering	119
Informatics Technology	9
Total	185

a. Determining the number of samples. The sample is part of the number and characteristics possessed by the population. The samples in this study were students. The determination in sampling was with respondents from all STMIK Amik Riau students. The following samples were used with calculations using the slovin formula [16]:

$$n = \frac{N}{1 + Ne^2}$$
$$N = 185$$
$$e = 10\% = 0,1 \quad (1)$$
$$n = \frac{N}{1 + Ne^2} = \frac{185}{1 + 185(0,1)^2} = \frac{185}{1 + (185)(0,01)} = \frac{185}{1 + 1,85} = \frac{185}{2,85} = 64,9122807$$

So the sample used was as many as 65 students of STMIK Amik Riau.

b. Determining samples in the community. Researchers used the accidental sampling technique. Where this technique is a sampling technique in which we asked people we have just encountered to be the object of this study. Researchers found a sample of 50 respondents in the study.

2.5. Data Processing

Data collection for evaluation was carried out by testing the instruments used. Instrument activities included validity tests and reliability tests. If an instrument is declared valid, then the instrument can measure something precisely. The reliability test is to determine the consistency of the instrument as a measuring instrument so that the results of the measurement can be trusted. Thus, the requirements of the instrument of validity and reliability were already proven through a pilot study by distributing the questionnaires to respondents. After being filled in by the respondents and collected, the validity and reliability tests were determined. Test validity used the product moment correlation technique from each of the classes and the level of reliability. This data processing used SPSS version 26.

2.6. Data Analysis Results

At this stage, it was the result of the data processing above. The results of the data analysis contained data information and usability testing evaluation values. The analysis here looked at the responses of the sample, namely students and the general public.

2.7. Recommendations

At this stage, it was the conclusion stage of several calculation results from the usability evaluation data instrument so that it found out the value of the variable. After getting the results, the researcher recommended improvements to the developer of the acupressure Smart Chair Application to achieve the goals or objectives of the application.

3. RESULT AND ANALYSIS

This chapter discussed the result and discussion of student respondents and the public who had filled out the questionnaire and used the Chair smart application. This chapter discussed problem identification, distribution of questionnaires, testing questionnaire data, questionnaire results, and finally, recommendations from the results obtained. The first step in this research is identifying the problem. This study aimed to determine the quality of the acupressure smart chair application, where the researchers looked at the quality of the application in terms of learnability, efficiency, memorability, errors, and satisfaction. From the results obtained, the researcher later recommended improvements to the developer. The next step is distributing questionnaires. The distribution of questionnaires to respondents was distributed by using google forms. The researchers used google forms to make it easier for respondents to fill out questionnaire surveys. Respondents who filled out the questionnaire were divided into two groups, namely STMIK Amik Riau students and the community. The overall sample data was 115 respondents, of which 65 were from STMIK Amik Riau students and 50 respondents from the general public.

3.1. Questionnaire Testing

This study used validity and reliability tests using SPSS software.

a. Validity Test

Table 3. Validity Test Table

Variables	Indicator	r Table	Results	Description
X1: Learnability	X1.1	0,183	0,680	Valid
	X1.2	0,183	0,725	Valid
	X1.3	0,183	0,700	Valid
X2: Efficiency	X2.1	0,183	0,600	Valid
	X2.2	0,183	0,634	Valid
	X2.3	0,183	0,668	Valid
X3: Memorability	X3.1	0,183	0,703	Valid
	X3.2	0,183	0,691	Valid
	X3.3	0,183	0,725	Valid
X4: Errors	X4.1	0,183	0,707	Valid
	X4.2	0,183	0,677	Valid
	X4.3	0,183	0,741	Valid
X5: Satisfactions	X5.1	0,183	0,743	Valid
	X5.2	0,183	1	Valid
	X5.3	0,183	0,728	Valid

Table 3 shows that there are five variations of evaluation in usability testing methods that became the material for research. In the variable above, there are 15 question items that had been filled in by 115 respondents in this study. To find out the validity of the five variables above, it was necessary to conduct valid tests with the test conditions below [17]:
- If r count $>$ r table, then the question is valid
- If r count $<$ r table, then it is an invalid
question
From the table above, it can be concluded that all the variables on this questionnaire were declared valid.

b. Reliability Test

Table 4. Reliability Test Result

Reliability Statistic		
Cronbachs Alpha	Standardized Item	N of Items
.968	.970	15

Table 4 is the calculation of the reliability questionnaire. To measure the reliability of the questionnaire, the researchers used the Cronbach Alpha statistical test (), where a variable is said to be reliable if it gives a Cronbach Alpha value > 0.6 [18] From the results of the five evaluation variables above, a calculation of 0.968 was obtained in which the calculation results exceeded the number 0.6 so that the questionnaire variables were reliable.

c. Questionnaire results
Table 5 is the result of data that was obtained through validation questions in the questionnaire, which was distributed to 115 respondents.

Table 5. Questionnaire Results

No.	Variables & Questions	Average Value
A	**X1: Learnability**	
1	Is the appearance of the Acupressure Smart Chair App easy to understand?	3.34
2	Can I use the Acupressure Smart Chair Application without written instructions/tutorials from other parties?	2.87
3	Is the Acupressure Smart Chair App menu easy to use?	3.54
B	**X2: Efficiency**	
4	Is the button feature easy to use?	3.58
5	Can the menu you click on work quickly?	3.61
6	Does this app help control the Acupressure Smart Chair?	3.60
C	**X3: Memorability**	
7	Is the Smart Chair Application Interface very easy to understand?	3.00
8	Is the button image on the Acupressure Smart Chair Application easy to understand?	3.01
9	Is the design of the Acupressure Smart Chair App good?	2.90
D	**X4: Errors**	
10	Are there any application error problems when dismissing the feature when it does not match what to use?	3.71
11	Are there any errors or bug issues on Acupressure Smart Chair App?	3.65
12	Are there any error problems when connecting the Smart Chair App with the user's Android?	3.78
E	**X5: Satisfaction**	
13	The information provided in the Acupressure Smart Chair Application is easier than a regular remote.	3.64
14	I am very satisfied to use the Acupressure Smart Chair Application.	3.71
15	All functions on the application are as you wish.	3.76

After collecting answers from respondents, the researchers calculated all the recapitulation values of respondents answers for the total and average values of each variable by using SPSS. Table 6 is a table of recapitulation of questionnaire respondents:

Table 6. Table Recapitulation of respondents

No.	Variable	Number of respondents	The Smallest value	The Largest value	Number of values	Average
1.	Learnability	115	3	15	1121	9.75
2.	Efficiency	115	3	15	1282	11.15
3.	Memorability	115	3	15	1025	8.91
4.	Errors	115	3	15	1282	11.15
5.	Satisfactions	115	3	15	1278	11.11

After the recapitulation of the answers from the respondents, the table below is the result of the calculation of the questionnaire results. The calculation of this questionnaire was done to obtain the usability testing variable obtained through the average value divided by the number of respondents. Table 7 is a table of respondents average answers:

Table 7. Value Table of Variable Mean

Variable	Average Percentage	Description
Learnability	65%	Easy
Efficiency	74%	Easy
Memorability	59%	Easy enough
Errors	74%	Easy
Satisfaction	74%	Easy

The Learnability variable obtains a value of 65%, which means that most respondents agree that the smart chair application is easy to use. However, this variable is included in the category of a low value. It indicates that these variable needs improvement in terms of learnability. Meanwhile, the efficiency variable gets a value of 74%, signifying that most respondents agree that smart chair applications have the ability to present information quickly. In terms of memorability, with a value of 59%, it suggests that half of the respondents agree that the smart chair application is quite easy to learn and remember. However, this value is the lowest value of other variables, so there is a need for quality improvement in overcoming the memorability experienced by users. The error variable value is 74% which implies that some of the respondents agree that the smart chair application does not experience errors. The last variable is satisfaction, which gets a score of 74%, where some respondents agree that the smart chair application is satisfactory. This research is a continuation of previous research [19], which designed a smart chair. The smart chair was then tested according to ISO 25010, but the results were unsatisfactory because it was still

below the set standards [20]. The test results for the smart chair system are good, with 74% satisfaction with the application. However, there are some things that need to be fixed so that the system becomes better than before.

3.2. Recommendations

After obtaining the results of this study, an overview of the user's point of view on the smart chair acupressure application could be seen through the presentation of the average value of the variables studied. Based on the results of testing questionnaire data on the smart chair application, this study recommended several recommendations as follows: Improving optimization on learnability variables, namely adding instructions/tutorials so that users can understand the Smart Chair application, Improving the terms of memorability because the interface design of the smart chair application is less interesting.

4. CONCLUSION

From the presentation and discussion of results, the conclusion of this study is that respondents' perceptions of smart chairs are of high quality. In the previous panel, the test results indicated that all were suitable for the inspected object, but since previous studies have focused only on certain parts, usability variables in his test were not sufficient and not utilized. Therefore, in this study, we used all variables to find weaknesses in smart chair applications and find improvement solutions from various aspects to make the application run optimally. These results are relevant to the research being conducted, thus strengthening that research and discovering new improvements. The shortcomings of smart chair applications for acupressure are the lack of tutorials/guides on how to use the application and the lack of user interface design. This study suggests that to overcome its shortcomings, adding instructions or tutorials to the Smart Chair application would make it easier for new users to utilize the application. Respondents said the survey was not enough, apart from improving the design of the interface.

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