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Design of A Decision Support System for Recipients of the Family Hope Program Assistance using the Topsis Method In Kambata Village, Bundung

Riswan Sulia Njurumana[1], Yustina Rada[2], Hawu Yogia Pradana Uly[3]

Program Studi Teknik Informatika, Universitas Kristen Wira Wacana Sumba,
riswansulianjurumana@gmail.com[1*], yustinarada@unkriswina.ac.id[2], hawuyogiapradanauly@unkriswina.ac.id[3]

Abstract

Poverty is still a problem in Indonesia, and the Family Hope Program (PKH) is one of the government's efforts to overcome it. This program provides conditional cash assistance to poor families registered in the Integrated Social Welfare Data (DTKS). Although PKH has succeeded in reducing the poverty rate, there are problems in determining the target of aid recipients, namely not on target in distributing aid. This can result in untargeted assistance and trigger a sense of injustice. Kambata Bundung Village is one of the villages with 159 PKH recipients (83 males and 76 females). To overcome this problem of not being on target, this study aims to design a decision support system (SPK) using the TOPSIS method. The TOPSIS method was chosen because of its ability to solve multi-criteria problems by considering conflicting criteria. This SPK is expected to help PKH companions in this research is expected to help the village government in ensuring that PKH assistance is on target and beneficial for poor families who really need it.
The success rate of black box testing has worked according to the expected specifications with a 100% success rate. No errors or bugs were found in this test, so the system can be declared ready to use.
From the results of the black-box and SUS tests, the design of the decision support system for the recipients of the Family Hope Program using the TOPSIS method, it can be concluded that the system built has met the needs of the system, which can be seen in the results of the black-box test where all the menus made are successfully accessed. This decision support system not only meets technical needs, but also provides a good user experience, as reflected in the final SUS calculation score of 86.5 which is in the excellent category.

Keywords: *Decision Support System, Family Hope Program, Information System, TOPSIS.*

1. Introduction

Poverty in Indonesia is one of the obstacles faced by the current government where most people are still classified as poor who require special handling and programs from the government. To reduce poverty, the government has budgeted a social program as an effort to build a protection system for the poor in order to maintain and improve the social welfare of the poor as well as cut the poverty chain through the Family Hope Program.

According to BPS data in 2016, the Family Hope Program (PKH) aims to alleviate poverty to a minimum by maximizing its efforts, considering that 10.86% of the Indonesian population, or 280.01 million people, as of March 2016 [1], [2] the Indonesian government has set a poverty alleviation target of 7 to 8 percent by 2024.

Kambata Bundung Village is one of the villages that budgeted the number of PKH program recipients of 159 consisting of 83 men and 76 women consisting of several categories of recipients that have been determined by the government, namely: People with Disabilities, Pregnant Women, Postpartum Mothers, Breastfeeding Mothers, Toddlers or Children Aged 5-7 Years Who Have Not Entered Elementary School, Elementary School Children, Junior high school, and high school/vocational school, elderly 60 years and above. In the process of distributing assistance, it was found that many PKH recipients did not meet the terms and conditions from the government. [3], [4]. In decision-making, there are often many criteria to consider. The absence of a systematic method often leads to less than optimal and unobjective decisions in calculating data on PKH aid recipients in Kambata Bundung Village [5], [6], [7].

The TOPSIS method is one of the multi-criteria decision-making techniques that uses an approach to choose the best alternative based on the proximity to the positive ideal solution and the furthest distance from the negative ideal solution. This method is very suitable for situations with many complex criteria [8], [9].

2. Research Flow

In this section, a flowchart of the research flow is displayed and then followed by an explanation of each stage passed [10], [11], [12], [13].

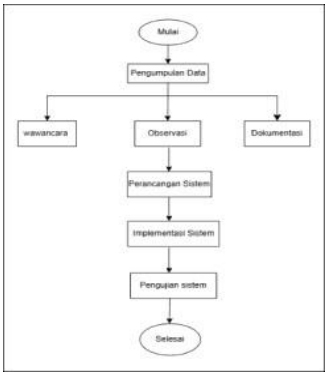


Fig. 1: Research Flow

This stage includes three main methods for gathering the necessary data.
Interview: Get information directly from relevant parties through a Question and answer session.
Observation: Make direct observations of a running process or system to understand workflows and needs.
Documentation: Collects data from relevant documents such as reports, forms, or other records.
System Planning Once the data is collected, the next process is to design the system based on the information that has been obtained. This involves creating a design of the system that will be used.
System Implementation At this stage, the system that has been designed is implemented in a real environment. This process includes software installation, user training, and system configuration.
System Testing The implemented system is tested to ensure that all functions are running properly as per the pre-defined requirements. This stage aims to find and fix errors. Finish After all the stages are completed, the system is considered ready for full use.

Insert Translations of and conjunction

1. Begin
   The process begins by defining the goals and needs for system development.
2. Data Collection
   This stage includes three main methods for gathering the necessary data.
   a. Interview: Get information directly from relevant parties through a Question and answer session.
   b. Observation: Make direct observations of a running process or system to understand workflows and needs.
   c. Documentation: Collects data from relevant documents such as reports, forms, or other records.
3. System Planning
   Once the data is collected, the next process is to design the system based on the information that has been obtained. This involves creating a design of the system that will be used.
4. System Implementation
   At this stage, the system that has been designed is implemented in a real environment. This process includes software installation, user training, and system configuration.
5. System Testing
   The implemented system is tested to ensure that all functions are running properly as per the pre-defined requirements. This stage aims to find and fix errors.
6. Finish
   After all the stages are completed, the system is considered ready for full use.

3. System Design

3.1. Use Case

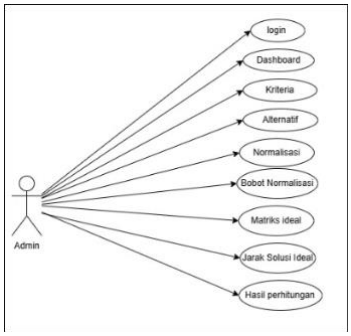


Fig. 2: Use Case Diagram

Login: Admin logs in to the system using a registered account. Dashboard: The main page that provides access to system features, such as criteria data management, alternatives, and calculation results. Criteria: Admins manage the criteria used in the calculation process, including adding, changing, or removing criteria. Alternative: Admin enters alternative data (e.g. prospective PKH recipients) to be evaluated. Normalization: The system normalizes the data to equalize the scale of each criterion. Normalized Weights: Admin manages or specifies weights for each criterion according to its level of importance. Ideal Matrix: The system calculates the positive (best) and negative (worst) ideal solutions from the processed data. Ideal Solution Distance: The system calculates the distance of each alternative of the ideal solution positively and negatively. Calculation Results: The system displays the final results in the form of preference scores and alternative rankings based on the TOPSIS method**.** alternative of the ideal solution positively and negatively. Calculation Results: The system displays the final results in the form of preference scores and alternative rankings based on the TOPSIS.

3.2. Activity Diagram Login

Admin accesses the login page, then the system will display the login page then the admin enters the username and password then the system will check whether the username and password entered are correct or incorrect then the system will validate, if it is invalid the system will return an error message, and the Admin is asked to try to log in again. If valid, the System allows the Admin to continue the login process

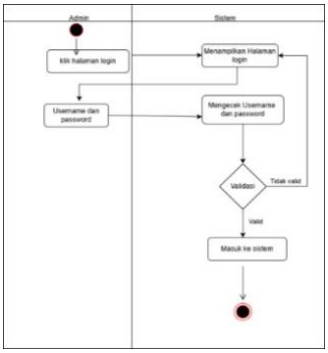


Fig. 3: Activity Diagram Login

3.3. Activity Diagram dashboard

The process starts when the Admin accesses the Dashboard menu. After the Admin selects the Dashboard menu. The system then processes the command and displays the Dashboard menu according to the Admin's request. On this Dashboard menu, Admin can see information such as themes, refresh features, updates, and options to add new data. This process ensures that Admins can easily manage and monitor key system information through the interface provided by the Dashboard menu.

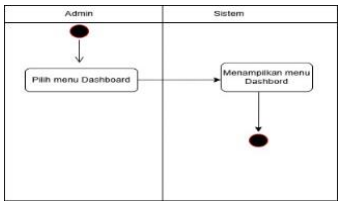
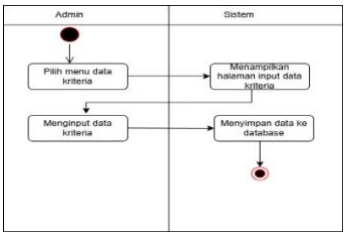


Fig. 4: Activity Diagram Increase Income

3.4. Activity Diagram Criteria

The process starts when the admin logs in to the system using a username and password. After success, the admin accesses the Select criteria data menu, and the system displays the criteria data input page. The admin then fills in the criteria data such as the name of the criterion, the type of criterion, and the weight of the criterion. Once the data is inputted, the system validates and stores the data into the database. This process ensures that the criteria data is well stored and ready to useFig



3.5. Activity Diagram Alternative

The process starts when the Admin has logged in to the system and accessed the alternative menu, then the system displays the alternative page. On this page, admins can perform various actions such as adding, editing, changing, and deleting alternate data. After the action is taken, the system will process and store the data into a database to ensure that the changes are stored properly.

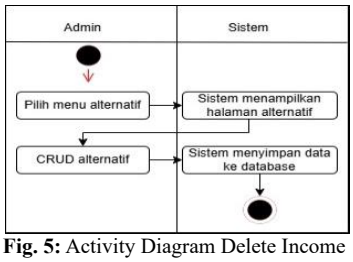


Fig. 5: Activity Diagram Delete Income

3.6. Activity Diagram Normalization

When the admin is accessing the system, the admin opens the normalization menu, then the system displays a normalization weight page which contains a table of normalized aid recipient data that includes criteria such as severe disability, the elderly, pregnant women, early age, elementary school children, junior high school children, high school students

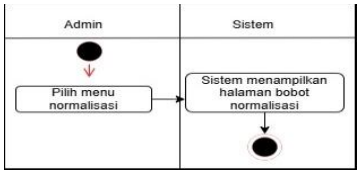


Fig. 6: Activity Diagram View Income

3.7. Activity Diagram Weight Normalization

When the admin is accessing the system, the admin can enter the normalization weight menu then the system will display a normalization weight page that contains information as well as options to manage the normalization weight of the criteria, displaying a page with a table or form that lists the normalization weight of each criterion.

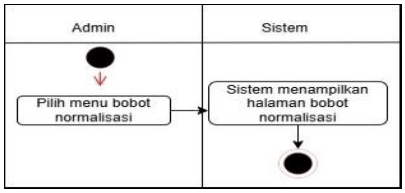


Fig. 7: Activity Diagram Increase Expenditure

3.8. Activity Diagram Matrix Ideal

The process starts when the Admin is accessing the PKH system and wants to enter the ideal matrix menu, the admin selects the Ideal Matrix menu. After that, the system will process the request and display a Positive and Negative Matrix page containing information related to positive and negative ideal values. These values are the result of calculations using the formula of positive and negative ideal matrices.

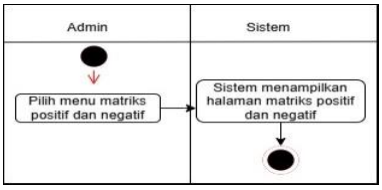


Fig. 8: Activity Diagram Edit Expenses

3.9. Activity Ideal solution distance diagram

When the admin is accessing the system, the admin can select the ideal solution distance menu and then the system displays the ideal solution distance page, if it is successfully displayed, a table of ideal solution distance values will be displayed. This value is the result of calculations using the ideal solution distance formula

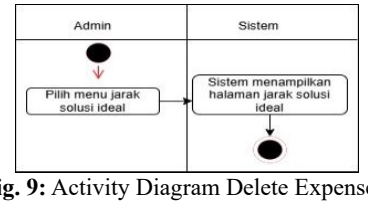


Fig. 9: Activity Diagram Delete Expenses

3.10. Activity Calculation Result Diagram

When the admin is accessing the system, the admin can select the results menu and then the system will display the results page. On this page there is a button to calculate the results, if clicked, the system will calculate the results, then the system displays the results in the form of a table. There is also a button to export data to pdf

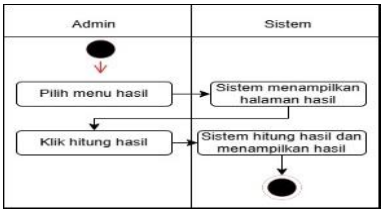


Fig. 10: Activity Diagram View Expenses

3.11. Class Diagram

Class Diagram describes the design of the system used to determine prospective recipients of PKH assistance based on certain criteria. In designing a system consists of several classes, each with specific attributes and functionality. The admin class functions to manage admin data such as IDs, usernames, and passwords, and provides features to change data. For the login process, there is a login class that stores information such as usernames and passwords, and has functions to log in to the system, log out, and reset passwords. Next, the dashboard class is used to display key information, with features to update the view, add data, or make updates. Criterion classes store information about the scoring criteria, such as the name of the criterion, its type, and weight, and have the function to edit or delete the data. Then, alternative classes are used to store data on prospective recipients of assistance, such as the name of the candidate, the condition of disability, the elderly, pregnant women, and the age of children at a certain level of education. This data will be further processed in the normalization and normalization classes, which have similar attributes to store the results of alternative data normalization based on predetermined criteria. The next process involves an ideal matrix class, which stores the positive and negative ideal values for each alternative. The results of the calculation of the ideal solution distance are stored in the ideal solution distance class, where the positive and negative distance data of the ideal solution are stored for each alternative. Finally, the calculation results are presented in the calculation results class, which displays the preference value to determine the priority of potential beneficiaries. Thus, this class diagram shows the system process flow starting from managing criteria and alternative data, normalizing weights, calculating the ideal solution distance, to generating preference values as the basis for decision-making.

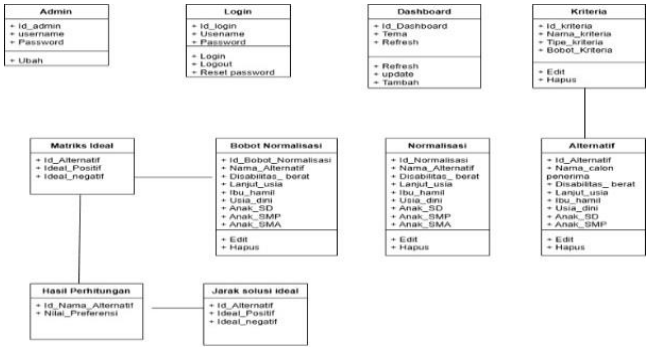


Fig. 11: Class Diagram

4. Implementation

4.1. Login Page

On the login page, there is a username and password input form from the user. Admin can input username and password. Then the system will validate the entered username and password. If it is true, it will enter the dashboard page. If it is incorrect, the admin is directed to re-enter the username and password.

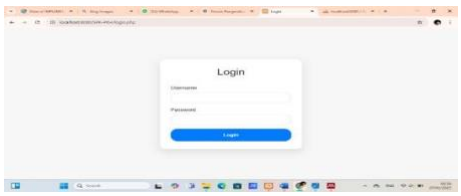


Fig. 12: Login Page

4.2. Dashboard Page

On the Dashboard page there is the name of the system and the *logout* button in the header. On the *Dashboard page*, there are 7 menus on the sidebar, including the criteria menu, the decision matrix menu, the normalization menu, the normalization weight menu, the ideal matrix menu, the ideal solution distance menu, and the calculation results menu. *Admins* can access each menu when they want to manage the data contained in each menu.

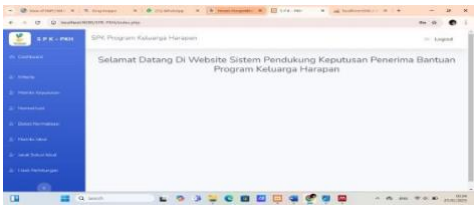


Fig. 13: Dashboard Page

4.3. Criteria page

In the criteria menu there is a table containing the attributes Criterion No., Criterion Name, Criterion Type, Weight and Action. Inside No. The criteria are a column of criteria sequence number. The name of the criterion contains the criteria for PKH assistance recipients. The type section contains benefits which means it costs money. Weights contain different weight values determined by how much each criterion costs. The action contains an edit button to delete and modify the data while Delete to remove the criteria.

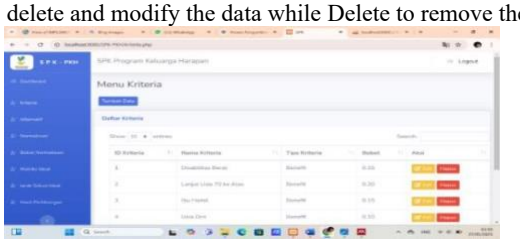


Fig. 14: Criteria Page

4.4. Alternate Pages

On the display of the alternative menu, there is a table of alternative numbers, names of prospective recipients of assistance, severe disabilities, the elderly, pregnant women, early age, elementary school children, junior high school students, high school children and actions. An alternate number contains an alternate sequence number. The names of prospective recipients contain the names of potential recipients. Severe disability, the elderly, pregnant women, early age, elementary school children, junior high school children, high school children contain the numbers 0 and 1. A 0 means that the criteria are not met. The number 1 means that the criteria are met.

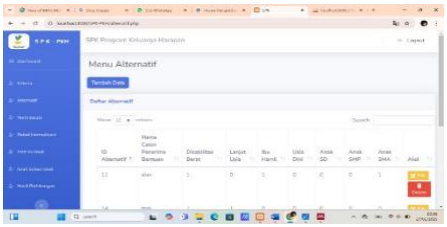


Fig. 15: Alternate Pages

4.5. Normalization Page

The normalization page contains a table containing normalization numbers, alternative names, severe disabilities, the elderly, pregnant women, early age, elementary school children, junior high school children, high school students. The normalization number contains the normalization sequence number. Severe disability, the elderly, pregnant women, early age, elementary school children, junior high school children, high school children are the results of normalization of the data in the alternative table.

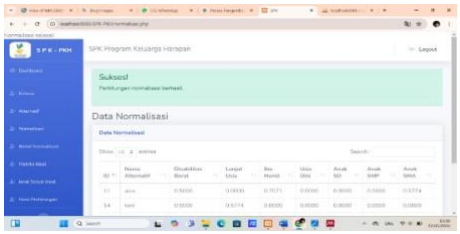


Fig. 16: Normalization Page

4.6. Normalized Weight Page

The normalized weight page display contains a table of normalized weight No, alternative names, severe disability, elderly, pregnant women, early age, elementary school children, junior high school children, high school students. The normalized weight number contains the normalized weight sequence number. Alternate names contain the name of each alternate. Severe disability, the elderly, pregnant women, early age, elementary school children, junior high school children, high school children are the results of the normalization weight calculation from the data in the normalization table.

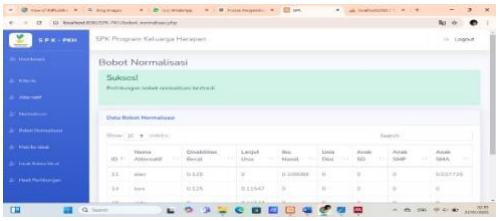


Fig 20: Normalized Weight Page

4.7. Ideal Matrix Page

Is an ideal matrix page view that contains a table of criteria, positive ideal solutions and negative ideal solutions. The criteria column contains criteria data taken from the criteria table. The positive ideal solution and the negative ideal solution are the results of the calculation of the ideal matrix of the data in the normalization weight table.

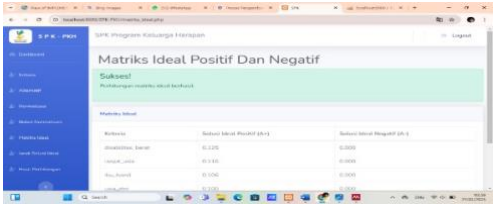


Fig 21: Ideal Matrix Page

4.8. Ideal Solution Distance Page

Is an ideal solution distance page view that contains tables of Alternative Nos, positive distances and negative distances. In the alternative no column contains the alternative sequence number. Positive distance and negative distance are the result of calculating the ideal solution distance from the data in the ideal matrix table.

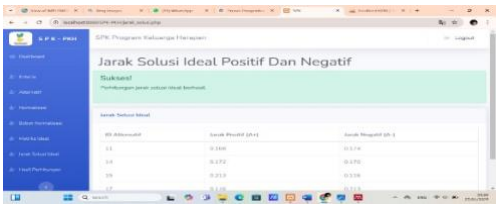


Fig 22: Ideal Solution Distance Page

4.9. Calculation Results Page

View the calculation results page that contains the decision matrix number table, alternate name, and preference value. The column contains the sequence number of the decision matrix. Alternate names contain the name of each alternative. The preference value is the result of the calculation of the data from the ideal solution distance table.

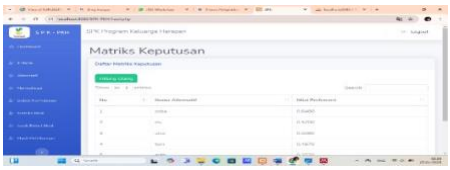


Fig 23: Calculation Results Page

5. Testing

5.1. Black Box Testing

Table 1: Black Box Testing

It	Input	Function	Expected results	Conclusion
1	Admin	Log in by entering Username and Password	If the username and password enteed are incorrect, the system will automatically ask for a new one password. If the username and password in enter it correctly then Automatically log in Go to the Dashboard page	Succeed
2	Dashboard	Displays the main page of the website and menu icons	The Dashboard page appears with menu icons.	Succeed
3	Criterion	Click the criteria menu	The Criteria page appears along with sub-sub menus.	Succeed

4	Alternative	Click the alternate menu	Alternate page appearances	Succeed
5	Normalisasi	Click the normalization menu	Normalization page display	Succeed
6	Weight Normalisasi	Click the normalization weight menu	Page display weights Normalisasi	Succeed
7	Ideal matrix	Click the ideal matrix menu	Displays the ideal matrix page	Succeed
8	Solution distance Ideal	Click the ideal solution distance menu	Featured page spacing ideal solution	Succeed
9	Result account	Click the calculation results menu	Display calculation results page	Succeed

The success rate of black box testing has worked according to the expected specifications with a 100% success rate. No errors or bugs were found in this test, so the system can be declared ready to use.

5.2. SUS Testing.

Table 2: SUS Testing

No	Question	STS	ST	RR	S	SS
1	I think Will use this system	1	2	3	4	5
2	I feel this system is complicated to use	1	2	3	4	5
3	I feel this system is being used	1	2	3	4	5
4	I need help from others using this system	1	2	3	4	5
5	I feel that the features of this system are working well	1	2	3	4	5
6	I feel that there are many things that do not fit in this system	1	2	3	4	5
7	I think other people understand how to use this system	1	2	3	4	5
8	I think this system is confusing	1	2	3	4	5
9	I feel that there are no obstacles in using this system	1	2	3	4	5
10	I need to get used to using this system	1	2	3	4	5

Respondent's Original Data

Table 3: sus Score

R	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
R1	4	1	4	1	4	2	4	3	5	1
R2	5	1	4	3	5	1	4	3	4	2
R3	4	1	5	1	5	2	5	3	4	2
R4	5	1	4	1	5	1	4	2	5	1
R5	5	1	4	1	4	1	4	3	5	1

SUS Calculation Result Data:

Tabel 4: SUS Calculation Result Data

R	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Jml	(jml x 2.5)
R1	3	4	3	4	3	3	4	2	4	4	34	85
R2	4	4	3	2	4	4	3	2	3	3	32	80
R3	3	4	4	4	4	3	4	2	4	3	35	87,5
R4	4	4	3	4	4	4	3	3	4	3	36	90
R5	4	4	3	4	4	4	4	2	4	4	36	90

Calculating the average SUS:

1. Sum up all SUS scores: 85 + 80 + 87.5 + 90 + 90 = 432.5
2. Calculate SUS average

Rat-rat SUS = $86.5\frac{432,5}{5}$

The average SUS score of 5 respondents was 86.5

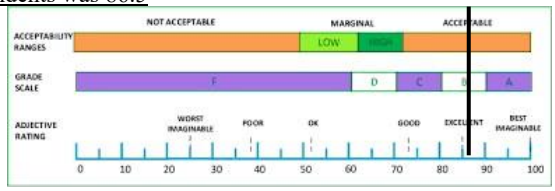


Fig. 17: SUS Score

6. Conclusion

The results of the evaluation of the system usability scale (SUS) showed a score of 86.5, which was in the excellent category. This score indicates that the designed decision support system has a very high level of ease of use according to respondents. On the SUS scale, a score above 80 indicates that the system is not only functionally acceptable, but also provides a positive user experience. Factors that support this high score include a simple system interface, intuitive navigation, and fast system response times. This shows that the system design has met user expectations, both in terms of appearance and usability.

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