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DESIGNING USER INTERFACE AND USER EXPERIENCE ON LAND MAPPING SYSTEM USING HUMAN CENTERED DESIGN APPROACH

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Abstrak

Desa Tanggung dengan segala kemajemukan masyarakatnya meniscayakan adanya kebutuhan tanah pertanian ini masih terbatas dikarenakan proses penyampaian informasi kepada masyarakat di Desa Tanggung terkait pemetaan tanah dan pembagian pupuk subsidi masih terbilang tidak maksimal. Dalam hal ini peneliti merancancang aplikasi Sistem Pemetaan Tanah (SIPETA) dengan User Interface yang mudah dipahami oleh pengguna masyarakat, untuk mendapatkan spesifikasi fitur yang sesuai dengan kebutuhan, Aplikasi SIPETA harus memiliki User Interface (UI) dan User Experience (UX) yang baik agar tidak menimbulkan problem baru dan perbedaan penafsiran dalam penggunaannya. Dengan menggunakan metode campuran, penelitian ini menerapkan Human Centered Design sebagai basis perancangan desain aplikasi yang diberi nama SIPETA (Sistem Informasi Pemetaan Tanah). Penelitian ini nantinya akan difokuskan pada dua persoalan utama yakni terkait proses perancangan user interface SIPETA dan analisis pengguna Sistem Informasi Pemetaan Tanah (SIPETA) dalam memberikan informasi pertanian kepada petani Desa Tanggung. Hasil dari penelitian ini merupakan aplikasi kongkrit yang dapat diterapkan pada proses pendataan tanah dan mempermudah perangkat Desa Tanggung untuk mengelolanya.

Kata Kunci : *User Interface; User Experience; SIPETA; Human centered Design.*

Abstract

Tanggung Village with all the diversity of its people requires that the need for agricultural land is still limited because the process of delivering information to the community in Tanggung Village regarding land mapping and distribution of subsidized fertilizers is still not optimal. In this case, researchers designed the Land Mapping System application with a User Interface that is easily understood by community users, to get feature specifications that are in accordance with the needs, the SIPETA Application must have a good User Interface (UI) and User Experience (UX) so as not to cause new problems and differences in interpretation in its use. Using mixed methods, this research applies Human Centered Design as the basis for designing an application design named SIPETA (Sistem Pemetaan Tanah). This research will focus on two main issues, namely related to the process of designing the SIPETA user interface and analyzing users of the Land Mapping Information System (SIPETA) in providing agricultural information to farmers in Tanggung Village. The result of this research is a

concrete application that can be applied to the land data collection process and makes it easier for the village officials to manage it..

Keywords **:** *User Interface; User Experience; SIPETA; Human centered Design*

1. INTRODUCTION

Tanggung Village is a village located in Turen District, with an area where the majority of the population has a profession as a farmer, tanggung village also has problems with the need for information about agriculture such as, land location, landowners, and the need for agricultural land that is less effective, this fact makes agricultural programs that have been launched by the village government such as the distribution of subsidized fertilizers, Therefore, the design of the SIPETA application was made, even though it has implemented requirement engineering to produce feature specifications that are relevant to the needs, the SIPETA application must have a good User Interface (UI) and User Experience (UX) so as not to cause new problems and differences in perception in its use. Based on the observations of researchers, the problem of consistency and standards in the use of the login page display and some features on the admin dashboard have not been applied well enough in the design of the SIPETA Application, Based on the above problems, the User Interface (UI) and User Experience (UX) of the Land Mapping Information System (SIPETA) application was designed because the improved appearance of the application also affects the level of ease of use using the Human Centered Design (HCD) method. Human Centered Design (HCD).

2. LITERATURE REVIEW

2.1 User Interface

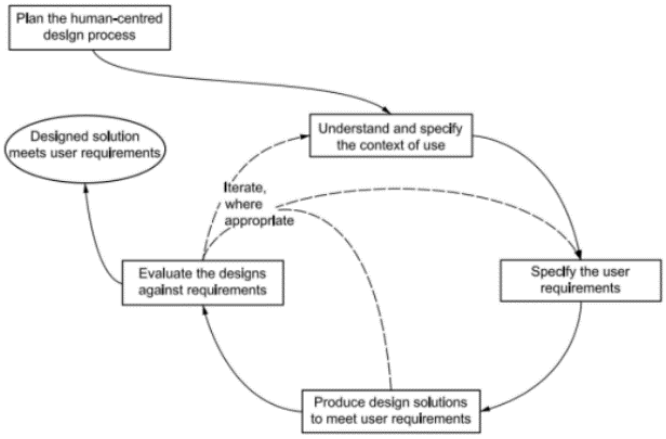
Conceptually, Mora describes the user interface as the design of the user interface display on the screen of a mobile device in the form of a tablet, smartphone, or similar electronic device. The focus of the user interface lies in how the entire appearance of the device or product can be seen and organized from the interface by all users. This aims to make it easier for users to operate the product.. (dalam Wahyuni & Dewi, 2018)

2.2 User Experience

According to (Jetter & Gerken, 2006) User Experience not only incorporates traditional qualities such as reliability, functionality, or usability, but also new and elusive concepts from visual or industrial design, psychology or marketing research, for example, attractiveness, stimulation, fun, coolness, sexiness, or successful delivery of a brand proposition.

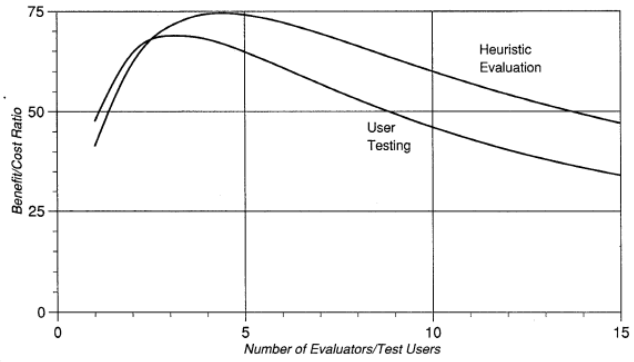
2.3 Human Centered Design

Human-Centered Design is an approach to developing interactive systems that aims to make the system easy to use and useful. Human-Centered Design, when applying its approach, focuses on users, their needs, ergonomics, and the science and engineering involved in usability. The Human-centered Design method aims to create products with high usability value. The usability value obtained from using the Human Centered Design approach will increase in three aspects: efficiency, effectiveness and user satisfaction.(ISO 9241-210, 2010).



The Human Centered Design Cycle (Widyono et al., 2019)

Usability evaluation contained in the Human Centered Design method focuses on aspects of efficiency, effectiveness, and user satisfaction. Efficiency is the accuracy and completeness of users in achieving goals based on certain indicators. Then for effectiveness can be seen from the accuracy and completeness of the user in achieving goals. Meanwhile, satisfaction leads to a feeling of freedom from discomfort and a positive attitude towards using the product. (ISO 9241-210, 2010). This Usability test is also used by (Maulani & Suprapto, 2021) to measure the user experience evaluation of the zonaprivat.com and superprof.co.id websites. This scenario task contains task scenarios that will be done by participants (users) related to applications that have been prepared by realistic researchers, creating tasks that ask users to practice performing actions, avoiding giving instructions and steps. (Pramono et al., 2019) The optimal number of evaluators ranges from 3-5 people. The result of the research is a recommended solution to solve usability problems.(Wahyuningrum, 2021). An additional evaluator or user will be less than the marginal cost of that evaluator or user. and shows an analysis for optimal use of the number of test users. (Nielsen & Landauer, 1993)



Number of source evaluators: (Nielsen & Landauer, 1993)

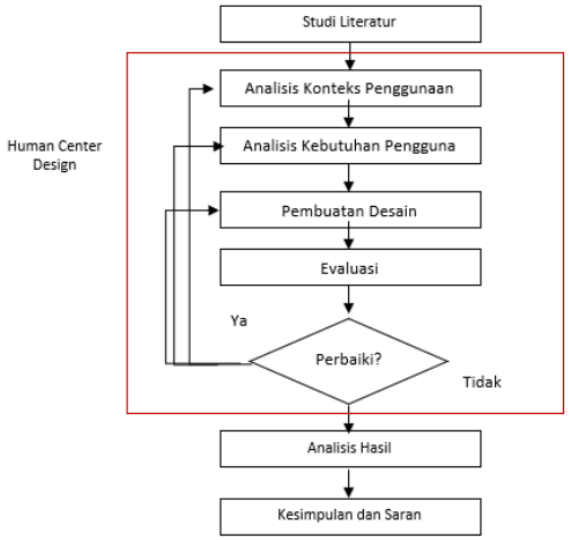
2.4 SIPETA

This research produced the SIPETA (Sistem Pemerataan Tanah) application, an application aimed at mapping agricultural land and distributing and distributing subsidized fertilizer rations in the Tanggung village in Turen district based on the web that can be used by the village secretary, farmers and the wider community. This web application was launched to provide information on agricultural land and the distribution of subsidized fertilizer in the area of Tanggung Village. In general, farmers and the public can access various information regarding agricultural land information and the status of their respective lands by looking at the

information available in this application. Because the selected menu is access to agricultural information and distribution of subsidized fertilizers, this application requires a sufficient internet connection because this application utilizes the Google Maps API in displaying geographic information services.

3. METHOD

Systematically, the research will begin with a literature study as an effort to deepen knowledge related to the method to be applied. Then the research will continue with the analysis of the context of use whose stages are carried out by analyzing the context of use to get the initial design. In a coherent manner, the next step to be taken is to analyze user needs which are carried out in multiple ways as well, then make an initial design, evaluate the initial design, analyze the context of use and user needs again, make a solution design, evaluate the solution design, and end with a conclusion. Translated with DeepL.com (free version)In summary, these stages can be understood in the flowchart below :



3.1 Literature Review

The first stage carried out before starting the research is a literature study. The purpose of conducting a literature study is to find information relevant to the theories related to the SIPETA application, User Interface, User Experience, Usability, and Human Centered Design.

3.2 User Context Analysis

In this section, researchers will conduct interviews aimed at village officials of Tanggung as application users. From this interview, it will also be obtained regarding user characteristics, tasks, and the intended system environment. For different purposes this context of use analysis will be done twice. The first analysis is for the initial design, and the second is for the solution design.

3.3 User Requirement Analysis

After determining user specifications and obtaining information about the needs in system design, the next step is to determine the needs of users and organizations for the SIPETA

application and the goals to be achieved. There are at least five important points that are needed as a reference (Azis et al., 2019):

3.4 Preliminary Design

The preliminary design referred to in this study is a design that has not implemented the Human Centered Design method, this design process The design process will be made as best as possible based on the analysis that has been done before, including the most important thing is the advice of stakeholders.

3.5 Design Evaluation

At this initial design evaluation stage using usability evaluation that can be run. Good usability can be seen from the extent to which the system can achieve goals according to what users need based on three factors. The three usability factors are efficiency, effectiveness, and satisfaction. Then for the UX evaluation the measuring instrument used is called the User Evaluation Questionnaire (UEQ). This UEQ is an instrument used to process survey data related to user experience that is easy to practice (Misfud, 2015).

$$Effectiveness = \frac{\text{Number of tasks completed successfully}}{\text{Total number of tasks undertaken}} \times 100\%$$

Equation of Source Effectiveness.(Misfud, 2015)

Meanwhile, efficiency is measured in terms of task time, which is the time in seconds or minutes required for participants (users) to successfully complete the task as shown in the

$$Overall\ Relative\ Efficiency = \frac{\sum_{j=1}^{R}\sum_{i=1}^{N} n_{ij}t_{ij}}{\sum_{j=1}^{R}\sum_{i=1}^{N} t_{ij}} \times 100\%$$

equation below:

Equation of Source Efficiency.(Misfud, 2015)

3.6 Creating Solution Design

Basically, the design phase of a solution is a research phase that is purely a design process. This design is made based on the analysis of user needs. The specifications of the identified needs must be realized or simply refined in the form of a design to improve the user experience in the SIPETA application. The design of the designed solution is then carried out in the form of a prototype. Furthermore, prototyping is done to determine the content organization, navigation layout, structure, and layout of the design solution.

4. RESULTS AND DISCUSSION

4.1 User Context Analysis

The identification of users and stakeholders aims to find out who are the users and stakeholders of the SIPETA Application, the list of users and stakeholders is obtained from the results of discussions with the village secretary who is responsible for managing the application.

Tabel 1. SIPETA user managing the application

User	Desription
Local citizen	As a user who will get information about the results of land mapping and distribution of subsidized fertilizers.

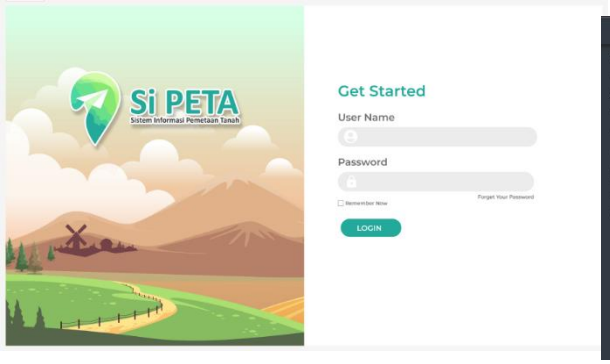
Stakeholder	Desription
SIPETA Admin	IT staff who understand land mapping information, subsidized fertilizer distribution and can use information technology.
Secretary of the Village	As a party who gives instructions, directions and opinions to field officers and administrators, and is the party who is given reports on land mapping and distribution of subsidized fertilizers.

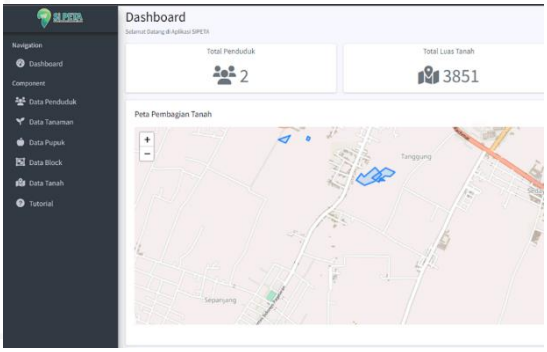
4.2 User Requirement Analysis

4.2.1 Creating The Persona

After conducting interviews, the data obtained will be processed into individuals representing each user group. SIPETA Personality generates some aggregated data, specifically demographic data.

4.2.2 Preliminary Design





4.3 Preliminary Design Evaluation

At this evaluation stage, there are 5 evaluators who are marked with the letter (P) and who are adjusted to the usability test criteria that the author has explained in section 2.7 The following is a table of evaluators:

Tabel 2. Evaluators

Respondents	Characteristics	Purpose
The Expert	Have understood usability aspects and have done system development	To test and evaluate the efficiency and effectiveness aspects of the initial design.

Then the tasks that will be given to each respondent in each user group. The creation of this task refers to the objectives obtained in the persona of each user group.

Tabel 3. each respondent in each user group

Task Code	Tasks to do
T-1	Login with username and password
T-2	Input data on the resident menu and complete the biodata
T-3	Search for population data
T-4	Fill in the fertilizer data according to the crop data
T-5	Input land block data on API Maps and map the land according to the existing file

4.3.1 Evaluation Results of the Initial Design in the Effectiveness Aspect

The following is a table of observation results conducted on the effectiveness aspects of the SIPETA application admin in the initial design. The results of working on the task list carried out by respondents will be displayed in table 6. Researchers will give respondents numbers from 1 to 5 for the task list according to table 5. Then the researcher will code R1 for respondent 1 to R5 for respondent 5. The description of the success of the task list will be displayed in table 2 with alphabet S as Successful and alphabet F as Failed.

Kode Tugas	P1	P2	P3	P4	P5
T-1	S	F	F	F	F
T-2	F	S	S	S	F
T-3	S	F	S	S	S
T-4	S	S	F	S	F
T-5	S	F	S	S	F

The evaluation results on the effectiveness aspect of the initial design of the application are:

$$Efektivitas = \frac{14}{25} \times 100\% = 56\%$$

So the result of the calculation of the effectiveness aspect is 56%, this result is a reference for the effectiveness of the initial design.

4.3.2 Evaluation Result of Initial Design in Efficiency Aspect

After performing the previous steps, it is continued with recording the duration of the work. This recording begins with calculating the processing time using a stopwatch, then the efficiency value and average processing time spent by respondents will be calculated.

Task code	Tasks to do	Efficiency Score (percent)
T-1	Input data on the resident menu and complete the biodata	5%
T-2	Search for population data	22%
T-3	Fill in the fertilizer data according to the crop data	26%
T-4	Input land block data on API Maps and map the land according to the existing file	37%
T-5	Login with username and password	13%
Average Efficiency Score		20%

Through this data, an efficiency value of 20% is found when viewed from the table above. After knowing the value, we will calculate the average work of the task list. Here's the average results:

Tabel 2. Time-averaged results of efficiency values

Task code	Tasks to do	Average time (seconds)
T-1	Input data on the resident menu and complete the biodata	258
T-2	Search for population data	134
T-3	Fill in the fertilizer data according to the crop data	85
T-4	Input land block data on API Maps and map the land according to the existing file	137
T-5	Login with username and password	126
Average time		147 second

The overall average processing time is 147.

4.4 User Requirement Analysis

Based on the survey results from the first phase evaluation, 5 groups of problems were found.

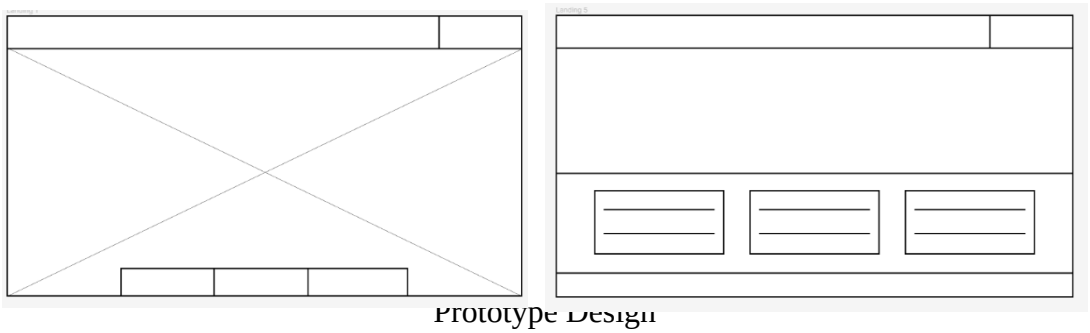
No	Problems	Requirement
1	Filling in population data is not effective because as the initial user to fill in the data is very slow (looking at the print file)	Data filling must use excel templates to facilitate data import.
2	Searching for data on the system is inefficient and local residents cannot access the system as users.	Data search should be embedded on the main landing page
3	No display of the amount and type of fertilizer available	Display the amount of fertilizer available and the type of fertilizer

4	The login display is not attractive, there is a bug in filling in the username password data and is not accompanied by a failure or success notification and the login process takes too long.	Added a landing page to improve the login page and to effectively convey information.
5	Inaccurate size of land mapping on API Maps	Increase the size of land mapping lines that synchronize with land data

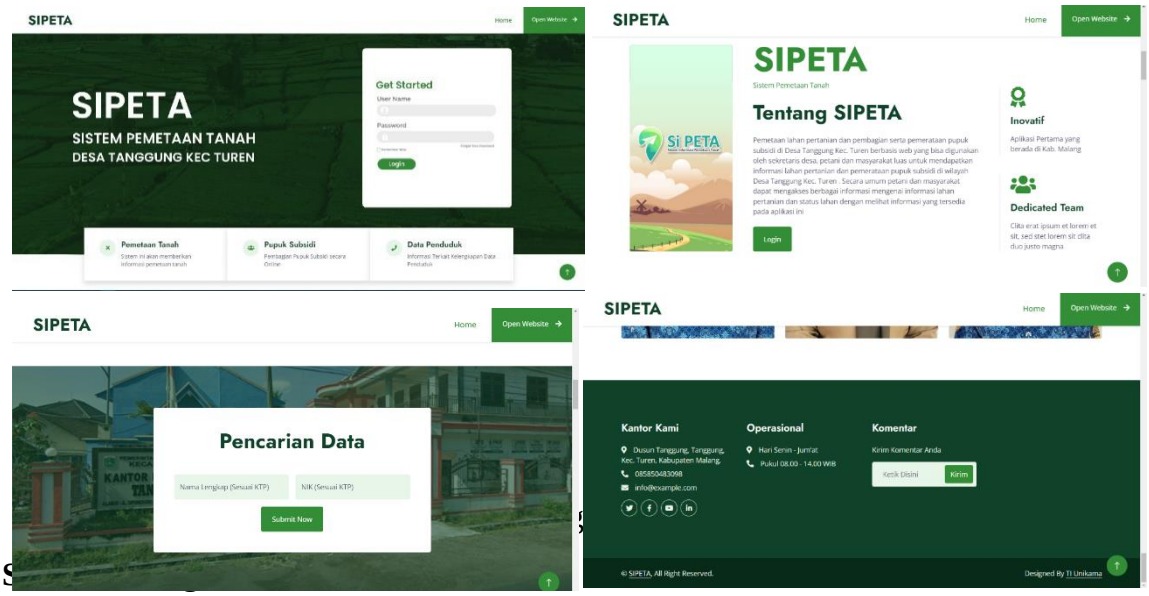
User Requirement

4.5 Creating Solution Design

The solution design was created based on the results of the constraints found by reviewing the prototype and the guidelines used by the author. Figure 8 shows the proposed solution design for the evaluated pages.



Prototype Design



4.6 Solution Design Evaluation

Solution Design Evaluation on Effectiveness Aspect

Task Code	P-1	P-2	P-3	P-4	P-5
T-1	S	S	S	S	S
T-2	S	S	S	S	S

T-3	S	S	S	S	S
T-4	S	S	S	S	S
T-5	S	S	S	S	S

$$Efektivitas = \frac{25}{25} \text{ x } 100\% = 100\%$$

So the result of the calculation of the effectiveness aspect is 100%, this result is a reference for the effectiveness of the solution design.

4.6.1 Solution Design Evaluation Results: Efficiency Aspect

After the researcher records the processing time, then to find out the efficiency value will use equation 2, here are the results:

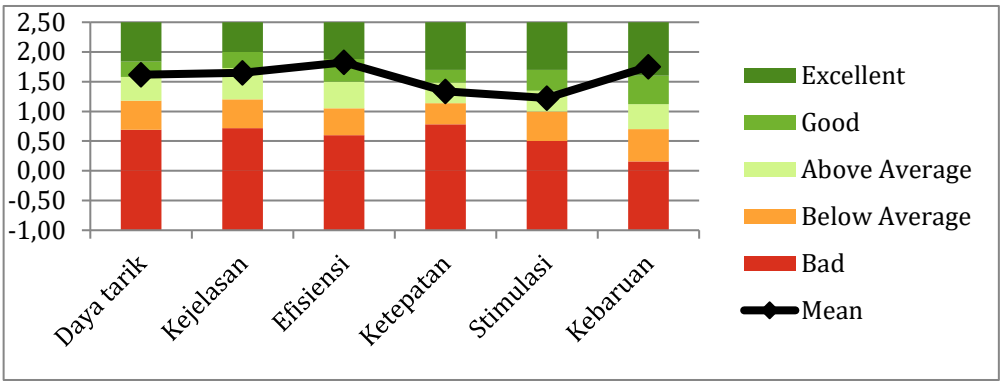
No.	Tasks to do	Efficiency Score (percent)
1	Login with username and password	100%
2	Input data on the resident menu and complete the biodata (with improvements using the import . xlsx feature)	100%
3	Search for population data	100%
4	Fill in the fertilizer data with the adjusted amount	100%
5	Input land block data on API Maps and map the land according to the existing file	100%
Average Efficiency Score		100%

4.6.2 Solution Design Evaluation Results: User Satisfaction Aspect

The data obtained from the distribution of questionnaires will be processed using excel tools which contain many calculations needed to analyze User Experience Questionnaire (UEQ) data. There are 6 (six) scales tested, namely attractiveness, depth, effectiveness, reliability, stimulation and novelty. The test results in Picture 9 show that all six scales are positive. This is because if the test result has a scale of zero then the test result is said to have positive qualitative aspects. Meanwhile, if the value is less than 0, the result is negative. Specifically, the measurement results are as follows:

Scale	Average	Comparisson to benchmark
Attractiveness	1,62	**Good**
Clarity	1,65	**Above Average**
Efficiency	1,83	**Good**
Accuracy	1,34	**Above Average**
Stimulation	1,23	**Above Average**
Kebaruan	1,75	**Excellent**

Hasil rata – rata Benchmark measurement results



4.6.3 Analysis of Evaluation Results of Preliminary Design with Solution Design

Testing Type	Results
Preliminary Design Testing	56%
Solution Design Testing	100%
Upgrades	44%

Comparison of Usability Testing Results for Effectiveness Aspects

Task Number	Average percentage (%)		Average Time (second)	
	Preliminary Design	Solution Design	Preliminary Design	Solution Design
1	5%	100%	258	11
2	22%	100%	134	13
3	26%	100%	85	28
4	37%	100%	137	23
5	13%	100%	126	8
Average	20%	100%	147	27

Comparison of Usability Testing Results for Efficiency Aspects

Rating Scale	Benchmark Solution Design
Attractiveness	Good
Clarity	Above Average
Efficiency	Good

Accuracy	Above Average
Stimulation	Above Average
Kebaruan	Excellent

Hasil Pengujian *Usability* Aspek Kepuasan Pengguna

No	Preliminary Design Evaluation	Solution Design Improvements
1	Data search is still manual	Added data search on the main page / landing page
2	There are some application user login bugs	Added landing page (SIPETA application information) with login page
3	Upload data using a data input system per column	Added data upload feature via Excel
4	Applications that are not yet informative	Responsive and informative application

Comparison of Initial Design and Solution Design Comparison Results

5. CONCLUSION

The design of the User Interface of the SIPETA application begins with conducting interviews with users and stakeholders related to the need for user needs information for the purposes of User Experience analysis, as well as researchers determining the needs of personas and designing design models. Testing is carried out to evaluate the design designed using the usability test method and user experience quisionere (UEQ) in the usability test the score of the effectiveness aspect gets 100%, the score of the efficiency aspect gets 100% and the value of the user satisfaction aspect with the UEQ method gets a score of Below Average to excellent.

The suggestions obtained from this research, namely: (1) Adding some features for further development, so that the SIPETA startup continues to grow. (2) The next system should add a few more features so that the application implementation becomes more perfect.

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