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Usability Evaluation and Recommendations for Improving the Geospasial Information System in Supporting the One Map Policy in Indonesia

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Abstract

The One Map Policy (OMP) is the government's strategic direction in fulfilling one map that refers to one geospatial reference in Indonesia. As a decision supporter for resolving land use discrepancies, the Information System for Indicative Maps of Overlapping Thematic Geospatial Information (SIPITTI) can accelerate the implementation of the OMP. This research aims to evaluate the usability of SIPITTI to support the resolution of overlapping land use in OMP and then design improvements to SIPITTI. This research was conducted using mixed methods, where quantitative data collection was carried out through questionnaires using the Post-Study System Usability Questionnaire (PSSUQ) and System Usability Scale (SUS). The qualitative data collection was done through usability testing. Nine respondents to the questionnaire and usability testing were involved in collecting initial needs data, which became input for the design. The results of the data analysis obtained a design that applied the principles of Shneiderman's Eight Golden Rules of Interface Design. Prototype improvements were evaluated through two techniques: usability testing and questionnaires:PSSUQ and SUS. The evaluation results using PSSUQ obtained an average value above the standard, namely overall (2.22), system usefulness (2.13), information quality (2.31), and interface quality (2.11). The SUS evaluation results amounted to 74; the value is included in the B- or Good category.

A. Introduction

The Indonesian government is committed to continuing the One Map Policy by issuing Presidential Regulation Number 23 of 2021 [1]. The One Map Policy (OMP) is a strategic direction in the fulfillment of one map that refers to one geospatial reference, one standard, one database, and one geoportal at a map accuracy level of 1:50,000 scale [2]. The government developed one of the general principles to organize quality and accountable data, which is based on the Indonesian geospatial information system [3]. This is because there have been differences in geospatial data and information between government institutions that have the same literacy and domain. In addition, OMP is both a necessity and a solution to realizing One Geospatial Data [4] .

Based on the strategic plan of the Coordinating Ministry for Economic Affairs 2020-2024, one of the policy directions is the realization of quality regional and spatial development policies through accelerating the completion of map synchronization and resolving overlapping land use through accelerating OMP [5].

Geospatial data includes information related to locations on the earth's surface [6]. Every level of government, from district to provincial and central levels, requires geospatial data [7]. Indicative Map of Overlapping Thematic Geospatial Information (PITTI) synchronization results show a 9% reduction in overlapping or equivalent to 29.5 million hectares of land in Indonesia over the last three years from 2019-2023. As a decision supporter for the resolution of space utilization discrepancies, the Coordinating Ministry for Economic Affairs uses the Indicative Map Information System for Overlapping IGT (SIPITTI) to encourage the acceleration of OMP implementation [8]. SIPITTI has the function of displaying the distribution of PITTI nationally, provincially, and in regency/city.

The process of synchronizing OMP between Ministries/Institutions and Local Governments through SIPITTI as a decision support for resolving discrepancies between Spatial Policies, Forest Areas, Permits, and Land Rights has not been completed in all regions of Indonesia. Even the available spatial data is incomplete and difficult to access and difficult to integrate [9]. Ministries/Institutions (K/L) and Local Governments (Pemda) regularly send reports on the progress they have made as material for the Coordinating Ministry for Economic Affairs to monitor and evaluate the completion progress. The target for the settlement of licensing discrepancies and PITTI land rights is expected to be achieved by 40.6%. However, the settlement of licensing discrepancies and PITTI land rights in the last three years has been achieved by 9%.

OMP is an effort to realize One Geospatial Data as part of One Data Indonesia in accordance with Presidential Regulation 39/2019. Based on this, it can be seen that the function of SIPITTI has not been optimal in supporting the completion of PITTI at OMP. This shows that the usability that already exists in SIPITTI is not enough to help users from ministries/institutions and local governments complete PITTI at OMP. Therefore, it is necessary to evaluate SIPITTI to find out what things can be improved and help users in completing PITTI at OMP.

Based on the background and exposure of the problem formulation previously stated, the following research questions were formulated. How are the usability evaluation and recommendations for improving the interface of the Information System for Indicative Maps of Overlapping Thematic Geospatial Information

(SIPITTI) related to efforts to improve the PITTI completion process in the One Map Policy?

The purpose of this research is to evaluate the usability of SIPITTI to support the completion of PITTI at OMP. The research will also design improvements to SIPITTI. The final result of the research is the evaluation of SIPITTI, which the Coordinating Ministry for Economic Affairs can implement in the future.

B. Research Method

This study aims to evaluate the usability of information systems contained on the SIPITTI website and compile design improvement suggestions. Unrau and Kray [10] suggest developing customized heuristics and usability guidelines for information system, as complex tasks often require complex user interfaces that must conform to web design standards. The method used to develop the improvement suggestions is the user-centered design approach so that the prototype is in accordance with user needs. This research utilizes a mixed-method approach, which integrates both qualitative and quantitative methods in the research process. At the usability testing stage, this research adopted a qualitative method by carrying out task scenarios with users with the aim of identifying user needs related to the design of the SIPITTI information system. To obtain user feedback on the design of the geographic information system, this research applied quantitative methods using usability evaluation questionnaires such as the Post-Study System Usability Questionnaire (PSSUQ) and the System Usability Scale (SUS).

This research process begins with recognizing the source of the problem based on the data that has been collected. Information is obtained through a study of internal organizational documents and interviews with resource persons involved in the organization. After formulating research questions, the next step is to conduct a literature review that is relevant to the research questions that have been made. At this stage, knowledge about the research topic was explored, especially in the context of usability evaluation and the SIPITTI information system. The research instruments include task analysis to be used in the usability testing stage for improvement design, as well as PSSUQ and SUS questionnaires that will be used in the identification of user issues and assessment of recommended improvement designs.

Table 1. Research Design

Attributes	Information
Classifications	Mixed method research
Category	Case study
Paradigm	Evaluative
Purpose	Conduct usability evaluation of the SIPITTI information system
Results	Design recommendations for improving the SIPITTI information system
Data collection	Quantitative: PSSUQ and SUS questionnaire. Qualitative: usability testing, open-ended questions
Sampling strategy	Purposive sampling

Participants were asked to run through prepared task scenarios, while feedback and issues raised were explored in more depth through interviews. Participants who had completed usability testing in the previous phase continued to participate in the questionnaire. The list of issues that have been identified will be

mapped using a combination of heuristic evaluation principles. After understanding the usability problems and mapping results, the next step is to analyze to find improvements that can be applied. The improvement analysis is done by referring to Shneiderman's eight golden rules of interface design [11]. The task analysis instrument is carried out by users and supported by PSSUQ and SUS questionnaires, which aim to assess the prototype that has been made.

The PSSUQ questionnaire will be applied in two phases of this research. The initial phase is to evaluate the performance of the current information system. After that, the questionnaire will be applied to evaluate the design of improvements to the SIPITTI information system. The third version of the PSSUQ questionnaire consists of 16 question components [12]. The survey was completed using a seven-point Likert scale to rate each indicator, with a range of values from 1: strongly agree to 7: strongly disagree. The final questionnaire score is determined by averaging the scores of each category [13].

In addition to the PSSUQ questionnaire, this study will also apply the SUS questionnaire to obtain more specific evaluations of the geographic information system. The independence between sample size and reliability enables SUS to yield reliable results even when applied to very small sample sizes [14]. The survey questionnaire uses a five-point Likert scale to evaluate each indicator, with a value range from 1: strongly disagree to 5: strongly agree. The SUS questions [15] use a list of questions adapted to Indonesian [16].

Open-ended Questions

Open-ended questions will be given to questionnaire respondents to gain a deeper understanding from users regarding the user experience, user interface, and functionality of the information system. The list of open-ended questions is listed in Table 2.

Table 2. List of Open-ended Questions

No	Questions
1	What difficulties did you experience when using the information system features?
2	Did you find certain parts of the interface confusing?
3	Did you find any features or functions difficult to use or not working properly?
4	Did the system respond quickly to your actions?
5	What do you think about the reliability of the system in accomplishing your tasks?
6	What aspects do you feel need to be improved or enhanced to increase your satisfaction?
7	How would you rate the information system user manual provided for the system?
8	What changes would you suggest to make the system easier to use and more effective?

Task Scenarios

Task scenarios are instruments used to assist questionnaire participants in achieving certain goals during usability testing. This instrument is applied when conducting the first assessment evaluation of the current information system. This task analysis aims to understand user needs for SIPITTI features. The list of tasks can be seen in Table 3.

Table 3. Task Scenarios

Functions	Goal	Scenario
Login	Users can log in to SIPITTI.	Now that you have reached the main page of the SIPITTI website, you want to report data. How do you enter SIPITTI?
Dashboard	The user sees the SIPITTI dashboard.	You have reached the reporter dashboard page. Now, you want to see a summary of updated information related to SIPITTI.
Infographic	The user sees SIPITTI infographics.	Next, you will see information on the PITTI One Map development graph.
Monitoring	The user will make a report through E-Monev SIPITTI (Reporter).	Next, you will upload reporting and supporting data for PITTI Non-Conformance of Permits, Concessions, Land Rights, and Management Rights.
Map	The user sees map data (Verifier, Admin, & Developer).	Then, you will see the GIS mapping of PITTI Non-Conformity of Permits, Concessions, Land Rights, and Management Rights.
Logout	The user logs out of SIPITTI.	Now, you have finished reporting your data. You may log out of your account.

Data Collection

Primary data collection was carried out in two phases in this study. The first phase was usability testing and interview sessions. Data was collected qualitatively through observations of questionnaire participants performing prepared task scenarios. Respondents must be representative users of Ministries/Institutions that have used SIPITTI. After that, the existing information system on the SIPITTI website will be evaluated. Participants in this step are usability testing participants in the previous step. Data was collected quantitatively through an online survey that included demographic questions and PSSUQ and SUS questionnaire instruments. In addition, there are eight open-ended questions to dig deeper into the problems experienced by users.

The second phase of data collection is to evaluate the design improvements that have been made through usability testing and interview sessions. The questionnaire at this stage also uses the PSSUQ and SUS questionnaires with open-ended questions to get the latest information related to respondents' feedback on the prototype made. Thus, it is expected to obtain usability comparison data, PSSUQ, and SUS questionnaire results before and after improvement.

Data Processing

Data processing in this study is divided into two parts, namely qualitative and quantitative-based data processing. The process of collecting data through usability testing and open-ended questions conducted qualitatively also requires a qualitative data processing approach. In qualitative research, coding is a series of steps that allow the collected data to be summarized, classified, and organized according to themes [17].

The first step taken was data reduction by selecting, coding, and grouping data. The coding process was carried out on transcripts of open-ended questions with users and video recordings of usability testing. The next step in qualitative data processing is the data presentation stage. Qualitative data obtained from the answers to open-ended questions are processed through transcription. The

transcription results were then analyzed using open coding techniques. The codes derived from the results of usability testing and open-ended questions are formed into metrics. Furthermore, these metrics need to be organized to identify patterns of usability problems expressed by users.

The last step in the data processing process is making conclusions. The information that has been described in the previous stage is then analyzed, and conclusions are drawn regarding the issues and needs conveyed by users regarding the features of the SIPITTI information system.

C. Result and Discussion

Initial data collection was carried out in two stages, namely, with usability questionnaires and usability testing. The usability questionnaire was distributed online from October 15, 2024, to November 03, 2024. The research instruments used in the usability questionnaire are PSSUQ and SUS.

Respondents involved in filling out usability questionnaires and participating in usability testing totaled nine people and were the target users of SIPITTI. It is important to highlight that the number of SIPITTI users is limited, with only 38 registered reporter accounts representing various agencies or institutions. The realization of usability questionnaire respondents who were successfully recruited according to the planned categories can be seen in Table 4. The categories of respondents who contributed to the usability questionnaire consisted of representatives of Ministries/Institutions related to SIPITTI.

Table 4. Realization of Recruitment of Usability Questionnaire Respondents

Method	Number of Ministries/Agencies	Number of Respondents
Usability Testing (Interaction based on task scenarios)	7	9
SUS, PSSUQ, dan Open-ended questions	7	9

The answers collected from the usability questionnaire stage were then processed in accordance with the questionnaire instruments used, namely, the PSSUQ and the SUS. The usability questionnaire results were analyzed on all nine usability questionnaire respondents. In SUS, the sample size to obtain an interval with a confidence level of 95% and a precision level of ±15 only requires a sample size of eight [18]. The independence between sample size and reliability enables SUS to yield reliable results even when applied to very small sample sizes [14]. Furthermore, PSSUQ can be used with small samples (less than 15) as its sensitivity allows it to detect specific differences or patterns consistently despite the limited number of respondents [19].

The first instrument is PSSUQ, which consists of 16 questions on a scale of 1 to 7, where 1 is “strongly agree” and 7 is “strongly disagree”. The results of processing the PSSUQ questionnaire, totaling nine usability questionnaire respondents, can be seen in Table 5. Each question is a representation of four categories consisting of overall system usefulness, information quality, and interface quality.

Based on the four categories assessed from the PSSUQ questionnaire, each has a standard value of 2.82 overall, 2.80 for system usefulness, 3.02 for information quality, and 2.49 for interface quality. Table 5 shows the average value of each PSSUQ category obtained from 9 questionnaire respondents.

Table 5. Mean Value of PSSUQ Categories from Questionnaire Respondents

Category	Mean Value	Standard Value (Sauro & Lewis, 2016)
System usefulness (1-6)	2,84	2,80
Information quality (7-12)	3,06	3,02
Interface quality (13-15)	3,18	2,49
Overall (16)	3,11	2,82

The average results in Table 5 show that four categories have an average value below the standard. The average value below the standard is an average value that is greater than the standard value because, in the PSSUQ questionnaire, the smaller the value, the better. The categories that have an average value below the standard are overall (3.11), system usability (2.84), information quality (3.06), and interface quality (3.18).

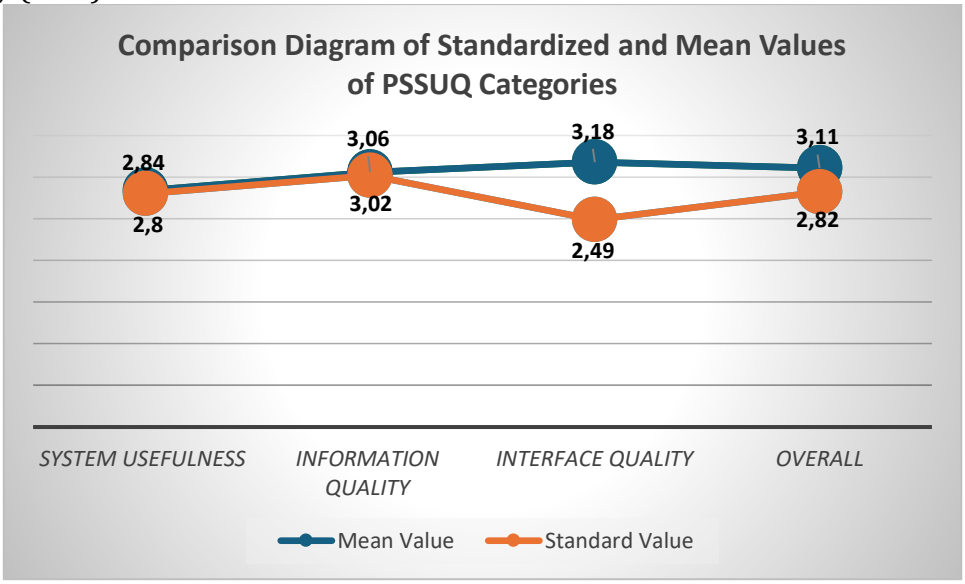

Figure 1. Comparison Diagram of Standardized and Mean Values of PSSUQ Categories

Figure 1 shows a comparison diagram of the standard and average values of each PSSUQ category for online questionnaire respondents. From the diagram, the overall aspects, system usability, information quality, and interface quality, in the assessment of user satisfaction in using SIPITTI still need improvement to be able to approach the standard value.

The second instrument used in the usability questionnaire is SUS. SUS is a questionnaire consisting of 10 questions with five answer options from 1 (strongly disagree) to 5 (strongly agree). The SUS score is obtained from the calculation of the score obtained by each usability questionnaire respondent. Details of SUS scores for nine usability questionnaire respondents can be seen in Table 6.

Table 6. SUS Score of Each Respondent Usability Questionnaire

Responden SUS	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Skor SUS
R1	4	2	4	1	5	1	4	2	5	2	85

R2	5	2	5	2	4	2	3	2	4	2	78
R3	2	2	4	1	4	4	4	2	4	2	68
R4	4	2	4	4	4	2	3	2	4	4	63
R5	5	5	5	5	4	4	4	4	4	4	50
R6	4	2	4	2	4	2	4	2	4	4	70
R7	4	2	3	3	4	2	2	4	2	4	50
R8	3	2	4	4	4	3	4	4	2	4	50
R9	4	2	4	2	4	2	4	2	4	5	68

The SUS score is rated on a scale of 1 to 100. The overall SUS score of the SIPITTI assessment generated from 9 usability questionnaire respondents is 64. This shows that SIPITTI has a lower value than the average SUS research value of 68. From these results, it can be concluded that there are still problems with SIPITTI usability that need improvement. The lowest value obtained from respondents is 50, and the highest value is 85. When viewed from the total SUS value of 64, the value is in the C- or Okay category. That way, overall, based on usability testing data, SIPITTI still needs to be improved. This shows that SIPITTI has room for improvement to get a better score in the above-average and good or even perfect categories.

The data processing results of the PSSUQ questionnaire and SUS questionnaire show values that can still be improved to obtain the highest score. This score will be compared with the PSSUQ and SUS scores generated from the design evaluation stage of the improvement recommendations. This aims to determine whether changes in the improvement design can affect the resulting PSSUQ and SUS scores.

Analysis of the Results of Open-ended Questions

The open-ended questions resulted in a number of reviews of user problems with SIPITTI. The problems identified from the open-ended questions filled in by nine respondents were then processed into open coding through a validation process by two raters who are experienced in UI/UX research.

The list of problems identified by nine respondents of open-ended questions contained in the questionnaire was 26 issues. The list of problems obtained was then codified and grouped to develop recommendations for improving interface design at a later stage. The problems found from this stage were then codified and grouped into usability guide categories to conduct the evaluation [20]. The codification results consist of 6 categories, namely Page layout and navigation, Graphics, Images and Multimedia, Heading, Titles and Labels, Organization of Information and Content, The Home page and Search, Accessibility, and Compatibility.

The list of problems in Figure 5.6 shows that categories related to graphics and labels are found to be the most common categories faced by users. This is related to the visual and structured way of presenting information that SIPITTI, confusing users, does not optimally convey. The list of problems identified in the open-ended questions will then be combined with the problems found in usability testing activities to serve as a guide in developing recommendations for improving SIPITTI's interface design.

Analysis of the Results of Usability Testing

From the usability testing problem matrix by users, the total problems and frequency of each scenario are generated. The frequency percentage is calculated from the total problems divided by the number of usability testing participants.

Based on Sauro and Lewis [12], the frequency of problems is divided into four category levels consisting of: level 1: ≤ 10%, level 2: 11 - 50%, level 3: 51 - 89%, and level 4: ≥ 90%. All problem frequencies from four task scenarios fall into level 2, namely task scenarios 2 (22%), 3 (22%), 4 (33%), and 5 (22%).

Table 7. Problem Matrix for Usability Testing Respondents

Respondent	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
R1					✓	
R2				✓		
R3			✓			
R4				✓		
R5		✓				
R6					✓	
R7		✓				
R8				✓		
R9			✓			
Total Problems	0	2	2	3	2	0
Frequency (%)	0%	22%	22%	33%	22%	0%

The overall problems found during usability testing conducted by 9 participants were then analyzed to find similar problems to be codified and grouped. This analysis resulted in four categories, namely Page layout and Navigation, Graphics, Images and Multimedia, Screen-based controls, and Organization of information and Content.

Table 8. Comparison of Problem Categories of Open-ended Questions and Usability Testing Results

No	Kategori	Open-ended Questions	Usability Testing
1	*Page layout and navigation*	✓	✓
2	*Graphics, Images, and Multimedia*	✓	✓
3	*Heading, Titles, and Labels*	✓	
4	*Organisation of Information and Content*	✓	✓
5	*The Home page and Search*	✓	
6	*Accessibility and Compatibility*	✓	
7	*Screen-based controls*		✓

The data in Table 8 shows that there are three aspects found in the results of problem identification from open-ended questions and usability testing, namely Page layout and navigation, Graphics, Images, Multimedia, and Organization of Information and Content. The Heading, Titles, Labels, and The Home page and Search aspects were only found in the open-ended questions, while the Screen-based controls aspect was only found during usability testing. This shows that in addition to having features that are still difficult to access and some information that is difficult to understand, SIPITTI users face other problems related to screen-based control elements.

Interface Design Improvement Recommendations

The design of interface design improvement recommendations begins with analyzing the problem by mapping it to the usability heuristic principles for user interface design. Each problem statement that was successfully identified from the usability questionnaire and usability testing stages was then combined and analyzed. At this stage, a combination of similar problem statements and elimination of problem statements that are not problems related to user interface and usability are carried out. The list of problems that have been identified is then analyzed for recommendations for improving interface design in accordance with the principles of Shneiderman's Eight Golden Rules of Interface Design [11]. The recommended improvement solutions that have been compiled in Table 9 are then grouped based on the task scenarios used in usability testing. Grouping improvement solutions based on usability testing tasks can help make it easier to identify each related improvement solution in prototype design.

Table 9. List of SIPITTI Improvement Recommendations Based on Shneiderman's Eight Golden Rules of Interface Design

Function	Problem Description	Solution Description	Rules of Interface Design
Homepage	1. The registration menu should be placed in an easy-to-find location. 2. A document download feature should be added. 3. Images need to be captioned with relevant information. 4. The header needs to have informative shortcuts.	1. Placed the registration menu at the top right of the screen to make it more visible. 2. Adding a document download feature. 3. Adding relevant information to images to improve user understanding. 4. Added a shortcut menu that provides informative documents.	1. Reduce Short-Term Memory Load 2. Support Internal Locus of Control 3. Offer Informative Feedback 4. Enable Frequent Users to Use Shortcuts
Dashboard	1. Graphics should have clear and complete captions. 2. The news menu needs to be moved to make the infographic more visible.	1. Added information related to the displayed graphics. 2. Improve the position of the news menu to make the infographic more visible.	1. Offer Informative Feedback 2. Page Layout and Navigation
Infographic	1. The size of the graphic needs to be optimized to fit more data. 2. Manage space. 3. Graphics presentation needs to be improved to be more user-friendly. 4. Visualization of infographics is not clear enough	1. Increase the size of the graphic to help users access richer information. 2. Manage space by adding important information. 3. Improve the visual appearance of the graphic to increase user comfort 4. Add visual direction for scrolling to the diagram.	1. Reduce Short-Term Memory Load 2. Strive for Consistency 3. Design for Aesthetic and Minimalist Design 4. Offer informative feedback
E-monev	1. Specific information should be displayed on the menu. 2. Automatic validation needs to be implemented	1. Create a tooltip when the mouse is at a certain position before the button is pressed. 2. Make the “submit” button inactive when filling out an	1. Offer Informative Feedback 2. Prevent Errors 3. Strive for Consistency

	to ensure all data is filled in before saving. 3. Structuring and separation of functions between header, footer, and content. 4. The form structure needs to be improved, and data search filters must be added.	incomplete form to help users avoid mistakes. 3. Reorganize and provide a dividing line between header, footer, and content. 4. Added data search filters as a feature designed to speed up the information-finding process.	4. Enable frequent users to use shortcuts
Map	1. Map implementation needs improvement in function and navigation to be more optimal. 2. A map system needs to be developed with additional features.	1. Made map navigation better by including information pop-up feedback. 2. Displaying a map legend to help users understand the information displayed.	1. Offer Informative Feedback 2. Reduce Short-Term Memory Load
Others	1. Special buttons for technical guidelines need to be added.	1. Added a technical guide link for users	2. Support internal locus of control

The results of the improvement prototype design were compiled in the form of clickable prototypes developed using Figma tools. It should be noted that there are limitations in the number of SIPITTI users, where currently, the number of registered reporter accounts is 38, representing various agencies or institutions. Furthermore, the prototype was tested again by nine usability testing respondents. Evaluation of the prototype was carried out by conducting contextual interviews to assess users' understanding and opinions of the prototype using the task scenarios that had been prepared. After the contextual interview, respondents filled out an online questionnaire consisting of PSSUQ and SUS.

Table 10. Comparison of Mean Value of PSSUQ

Category	Mean Value As-is	Mean Value To-be	Standard Value (Sauro & Lewis, 2016)
System usefulness (1-6)	2,84	2,13	2,80
Information quality (7-12)	3,06	2,31	3,02
Interface quality (13-15)	3,18	2,11	2,49
Overall (16)	3,11	2,22	2,82

The results of PSSUQ data processing from the evaluation of the improved prototype can be seen in Table 10. The to-be average value column shows the PSSUQ score calculated from the improvement prototype evaluation data. Meanwhile, the SIPITTI score before adopting the improvement can be seen in the as-is mean value column in Table 10. The resulting score improvement after adopting the prototype improvement solution is seen in all PSSUQ assessment categories. Based on data from 9 usability testing respondents, the highest score was generated in interface quality with a score of 2.11. The score with the highest increase is generated in the interface quality category, with an increase in score up to 1.07.

The average PSSUQ value obtained from the evaluation results of the prototype improvement is then compared with the PSSUQ standard value. The average results in Table 10 show that four categories have an average value above

the standard. The average value above the standard is the average value that is smaller than the standard value because, in the PSSUQ questionnaire, the smaller the value, the better it means. The categories that have an average value above the standard are overall (2.22), system usefulness (2.13), information quality (2.31), and interface quality (2.11). Overall, these results show that none of the PSSUQ scales are classified as substandard.

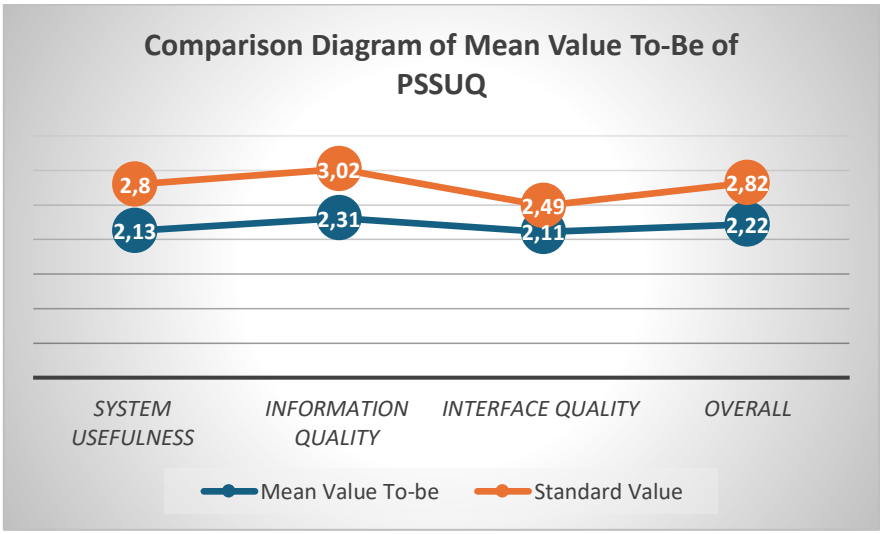

Figure 2. Comparison Diagram of Standardized and Mean PSSUQ Category Values for Questionnaire Respondents of the Improvement Prototype

In addition to the PSSUQ assessment, nine usability testing respondents also evaluated the improvement prototype with SUS. Details of SUS scores from each respondent for the SIPITTI improvement prototype can be seen in Table 11. The median score of all SUS scores from 9 respondents was 74.

Table 11. SUS Score of Prototype

Responden SUS	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Skor SUS
R1	4	3	4	4	4	2	4	2	2	4	58
R2	5	4	4	2	5	2	5	2	4	2	78
R3	5	2	4	1	5	2	4	2	5	3	83
R4	5	2	4	2	4	2	4	2	4	5	70
R5	4	2	4	2	4	2	4	2	4	3	73
R6	5	2	4	2	4	2	4	2	4	3	75
R7	4	2	4	2	4	2	4	2	4	3	73
R8	5	2	4	1	5	3	4	2	5	4	78
R9	5	1	4	1	4	2	5	2	4	2	85

The SUS data processing results are based on Table 11; the SUS score generated from the data of 9 respondents is 74. This score has increased significantly from the score of 64. This shows that SIPITTI has a higher value than the average SUS research value of 68. When viewed from the total SUS score of 74, the value is in the B- or Good category. Although the SUS score can still be improved towards the highest SUS score of 100, the significant increase in SUS score after adopting the improvement solution shows that the design of SIPITTI is increasingly

in accordance with user needs. After the implementation of SIPITTI in accordance with the recommended prototype design, it is necessary to evaluate and explore user needs in order to achieve a higher SUS score. Usability testing conducted shows an increase in the usability of SIPITTI.

D. Conclusion and Future Work

This research was conducted through ten stages, namely: problem identification, literature review, determination of research instruments, evaluation of as-is information systems, usability testing, and open-ended questions, identification of user needs, design of improvement designs, prototype development, evaluation of improvement prototypes, and preparation of conclusions and recommendations.

Usability evaluation using the PSSUQ and SUS online questionnaires involving nine respondents. The mean score results in Table 5 show that four categories have an average value below the standard. The categories that have a mean score below the standard are overall (3.11), system usefulness (2.84), information quality (3.06), and interface quality (3.18). In addition, the quantitative analysis of SUS resulted in a score of 64. This score needs to be increased to achieve a higher score towards a score of 100. This shows that SIPITTI still needs improvement to achieve a score in the good category and a better SUS score.

Qualitative analysis was conducted to support the results of quantitative analysis by conducting usability testing involving nine respondents. The results of usability testing show that the frequency level of problems faced by respondents when running task scenarios is as many as 4 task scenarios, which are classified as level 2, and the frequency of problems is 11-50%.

Evaluation of prototype improvements was carried out on nine respondents by conducting usability testing and using an online questionnaire consisting of PSSUQ and SUS. The results of PSSUQ, according to the average results in Table10, show that four categories have an average value above the standard. The categories that have an average value above the standard are overall (2.22), system usefulness (2.13), information quality (2.31), and interface quality (2.11). Overall, these results show that there is no PSSUQ scale that is classified as below standard. SUS data processing results can be seen in Table 11. The SUS score generated from the data of 9 respondents is 74. This score has increased significantly from the score of 64. This shows that SIPITTI has a higher score than the average SUS research value of 68. When viewed from the total SUS score of 74, the value is in the B- or Good category. The significant increase in SUS score after adopting the improvement solution shows that the design of SIPITTI is more in line with user needs.

Research related to usability evaluation of geospatial information systems has a vast opportunity to be developed from various sides. Future researchers can use other usability evaluation methods to find the quality of geospatial information systems that can still be improved. In addition, research on functional evaluation and customer satisfaction analysis of geospatial information systems can be carried out further so that input from the user side is more comprehensive.

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