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User Interface Design for Discrepancy-Simple Additive Weighting Evaluation Instrument

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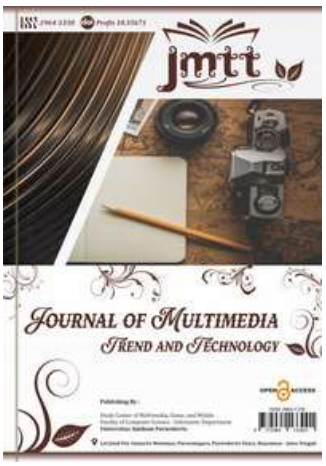

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ABSTRACT

In an effort to make it easier for users to understand how DSS-based instruments function without having to run the actual application, a user interface design is required. The purpose of this study was to show the quality of the user interface design of the Discrepancy-SAW evaluation instrument. The research approach used the R&D development model, which focuses on three stages of development. The three stages were design creation, initial design trial, and revision of the initial design trial. The subjects involved in the initial trial of the user interface design were 40 respondents. The trial tool was a questionnaire consisting of 10 questions related to the user interface design. Analysis of the trial data was carried out by comparing the percentage of user interface design quality with quality standards that refer to the eleven-scale categorization. The results of this study show the quality of the user interface design of the Discrepancy-SAW evaluation instrument in the good quality category by a quality percentage of 83.38%. The impact of the results of this study is that stakeholders in the field of education gain knowledge about the existence of the user interface design of the Discrepancy-SAW evaluation instrument. It is appropriate for use in determining the dominant factors that trigger inequality in the lecture process in the research methodology course.

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INTRODUCTION

The research methodology course is one of the important courses that determines students' success in completing their thesis optimally and on time. Therefore, this course should receive special attention from students in every study program at the higher education level [1][2]. In reality, there are still many students who are less active and not focused in following the lecture process in this course. Students often experience inequalities/ obstacles in the lecture process in research methodology courses due to their lack of understanding and indifference in paying attention to the material provided by the lecturer. This is caused by several factors, including: the lecturer's ability to explain the material is not optimal, students' basic ability to understand the material is still deficient, students' attitudes and interest in learning are low, learning resources are limited, and the learning environment is not conducive. Of the several factors that cause inequality in the learning process in this course, it is necessary to determine the dominant factor that causes inequality. Based on this reality, it is important to carry out a thorough and in-depth evaluation to find out any obstacles/inequality that occur in the learning process as well as the dominant factors that cause inequality in research methodology courses by using appropriate evaluation instruments.

One form of evaluation instrument that can be used to determine the existence of disparities that occur in the research methodology course lecture process as well as the dominant factors that cause inequalities is a discrepancy evaluation instrument based on the decision support system method (namely Simple Additive Weighting/SAW). In order to make it easier for users to understand how the SAW-based discrepancy evaluation instrument functions without needing to run the actual application, a user interface design is needed.

Referring to real problems and the ideas or solutions offered to overcome them, this research question is "What is the form of user interface design for the Discrepancy-SAW evaluation instrument to find out the dominant aspects that trigger or cause inequality in the lecture process in research methodology courses?" The aim of this research is to show the quality of the user interface design of the Discrepancy-SAW evaluation instrument.

This research was motivated by several results and limitations found in previous studies as a research roadmap. Research by Jampel et al. [3] regarding evaluation of computer learning and certification programs at course institutions in Bali. The limitation is that there is no instrument that has been shown in detail to measure the effectiveness of the computer learning and certification program. This was then continued with Pakaya and Machmud's [4] research on The Development of Geogebra-Based Mathematics Learning Media. The limitation is that it has not yet demonstrated a measuring instrument to assess the effectiveness of the mathematics learning media. Followed by research by Qadriah et al. [5] regarding evaluation of the online mathematics learning process. The limitation is that the instrument used as a measuring tool for the effectiveness of the Mathematics learning process has not yet been demonstrated. Research by Kamid et al. [6] shows an increase in students' mathematical problem solving abilities through the application of the Laps-Heuristical learning model. The limitation is that the instruments used to measure this increase have not been shown in detail. Mursidin's research [7] on discrepancy evaluation instruments to measure inequality in the responsibility character learning process. The limitation is that the dominant determining aspect that causes inequality in the responsibility character learning process has not been shown. Therefore, research will continue in 2024 specifically regarding the development of the Discrepancy-SAW model evaluation instrument to determine the dominant aspects that determine the occurrence of inequality in the lecture process for research methodology courses. The results that are expected to be realized in the research in 2024 are the design of the user interface design for the Discrepancy-SAW model evaluation instrument

METHOD

Research Approach

The approach to this research emphasizes on Development. Development for research in 2024 is focused on three stages, including: designing the instrument design, initial testing of the instrument,

and revision of the results of initial testing of the instrument. The model used in the development process is Borg and Gall [8], [9]. The three stages of development were carried out based on the research objective of realizing the quality of the user interface design for the Discrepancy-SAW evaluation instrument which can be used in determining the dominant aspects that trigger inequality in the lecture process in research methodology courses.

Subject, Object, and Research Location

Several subjects were involved in the initial testing phase of the user interface design for the Discrepancy-SAW evaluation instrument, including informatics experts, educational evaluation experts, and several methodology lecturers in Bali. The number of experts in the field of informatics education is two experts, the number of educational evaluation experts is two experts, and 40 students at state universities in Bali (especially North Bali) are taking research methodology courses. The object of this research is the user interface of the Discrepancy-SAW evaluation instrument. The research location was carried out at state universities in Bali (especially North Bali).

Data Collection Instruments

The data collection tool used in this research was a questionnaire. All questions used in the questionnaire are related to the user interface design of the Discrepancy-SAW evaluation instrument as a measuring tool in determining the dominant aspects that trigger inequality in the lecture process in research methodology courses. The number of questions in the questionnaire is 12 items.

Data Analysis Techniques

The technique used in conducting data analysis on the results of initial trials on the user interface design of the Discrepancy-SAW evaluation instrument is descriptive quantitative. This technique is carried out by interpreting the quality percentage of the user interface design trial results of the Discrepancy-SAW evaluation instrument into quality categorizations that refer to user interface design quality standards. User interface design quality standards are determined according to the five scale reference. The formula used to calculate the percentage level of quality of the Discrepancy-SAW evaluation instrument can be seen in equation (1) [10], [11], while the user interface design quality standards which refer to the five scale can be seen in Table 1 [12], [13].

$$P = (f/N) \times 100\% \quad (1)$$

Notes:
P= Percentage of quality
f = Total acquisition value
N = maximum total value

Table 1. Quality Standards of instrumen evaluasi Discrepancy-SAW Referring to Five Scale Category

Percentage of Quality	Quality Category	Recommendations
90-100 %	Excellence	No Revision Required
80-89 %	Good	No Revision Required
65-79 %	Moderate	Revision
55-64 %	Less	Revision
0-54 %	Poor	Revision

RESULT

Referring to the three stages of development focused on this research, several research results have been obtained. Some of the results in question include: results at the user interface design stage, results at the initial user interface design trial stage, and results at the user interface design initial trial revision stage. The data obtained as a result of this research can be shown as follows.

Design Development

At this design development stage, a user interface design for the Discrepancy-SAW evaluation instrument was obtained. This design was created using the Balsamiq Mockups application. The form of user interface design in question can be seen in Table 2.

Table 2. Sample result for respondent

Student-22	4	5	5	5	4	5	4	4	5	4	4	5	2	2	58	82.86
Student-23	4	5	5	4	4	4	4	5	5	5	4	5	3	3	60	85.71
Student-24	5	4	4	4	4	5	4	4	5	4	4	4	2	2	55	78.57
Student-25	5	4	5	4	5	5	5	4	5	4	5	4	3	3	61	87.14
Student-26	4	5	4	4	5	5	4	4	4	5	5	4	3	3	59	84.29
Student-27	4	5	4	5	4	4	5	4	5	4	4	5	2	2	57	81.43
Student-28	5	4	4	5	4	5	5	4	5	5	4	5	3	2	60	85.71
Student-29	4	5	4	4	5	4	4	5	5	4	4	4	2	3	57	81.43
Student-30	4	4	5	4	5	4	4	4	4	4	5	4	2	2	55	78.57
Student-31	4	5	4	5	4	4	4	5	4	5	5	5	2	3	59	84.29
Student-32	5	5	5	4	5	4	5	4	4	5	5	4	3	3	61	87.14
Student-33	5	5	4	4	4	5	5	4	5	4	4	5	3	2	59	84.29
Student-34	4	5	4	4	5	4	4	4	5	4	5	5	3	2	58	82.86
Student-35	4	4	5	5	5	5	5	4	4	5	4	4	2	3	59	84.29
Student-36	4	5	4	5	5	4	4	5	4	5	4	5	3	2	59	84.29
Student-37	5	5	5	4	5	4	5	4	5	4	4	5	2	3	60	85.71
Student-38	5	5	4	4	4	5	5	5	4	5	4	5	2	3	60	85.71
Student-39	4	5	4	5	4	5	5	4	4	4	5	5	3	2	59	84.29
Student-40	4	4	4	4	4	5	5	4	4	5	4	4	2	2	55	78.57
														Average		**83.38**

There were several suggestions given by respondents when conducting initial trials on the user interface design of the Discrepancy-SAW evaluation instrument. These suggestions were used as a basis for making improvements to the user interface design of the Discrepancy-SAW evaluation instrument. Some of the suggestions in question can be seen in full in Table III.

Table 3. Suggestions from Respondents given in the Initial Trial

No	Respondent	Suggestions
1	Expert-1	Show clearly the features to indicate user access rights settings.
2	Expert-4	Show clearly the features to show historical data from the calculation results of the SAW method in determining the dominant factors that cause inequality.
3	Student-12	Add facilities for setting user access rights.
4	Student-24	Add facility to view history of recapitulation of SAW method calculation results over a certain period.
5	Student-30	Show facilities for setting user access rights.
6	Student-40	Show features to manage user access rights, so that the instrument is safe and not used by irresponsible parties.

Revision Stage of Initial Trial Results

Based on the respondents' suggestions shown in Table 3, it is necessary to revise the user interface design of the Discrepancy-SAW evaluation instrument. Revisions were carried out by the research team. The results of the revised user interface design for the Discrepancy-SAW evaluation instrument can be seen in Figure 1 (a) and (b).

(a) (b)

Figure 1. Design User Interface for Discrepancy-SAW Evaluation Instrument

DISCUSSION

Based on the quality percentage shown in Table II, it appears that the quality of the Design User Interface for Discrepancy-SAW Evaluation Instrument is classified as good. This is in accordance with the quality percentage of 83.38% which is included in the good category if compared with the quality percentage of 80-89% in Table I. There were 12 questions used in the initial trial of the Design User Interface for Discrepancy-SAW Evaluation Instrument. Point 1 is a statement about the general appearance of the user interface design of the Discrepancy-SAW evaluation instrument. The second point is the clarity of the defining components contained in the discrepancy evaluation model used in the user interface design of the Discrepancy-SAW evaluation instrument.

The third point is the clarity of the installation components contained in the discrepancy evaluation model used in the user interface design of the Discrepancy-SAW evaluation instrument. The fourth point is the clarity of the process components contained in the discrepancy evaluation model used in the user interface design of the Discrepancy-SAW evaluation instrument. The fifth point is the clarity of the product components contained in the discrepancy evaluation model used in the user interface design of the Discrepancy-SAW evaluation instrument. The sixth point is the suitability of the defining components used as a basis for determining the dominant factors that trigger or cause obstacles in the lecture process in research methodology courses in terms of the context domain. The seventh point is the suitability of the installation components which are used as a basis for determining the dominant factors that trigger or cause obstacles in the lecture process in research methodology courses in terms of the input domain.

The eighth point is the suitability of the process components which are used as a basis for determining the dominant factors that trigger or cause obstacles in the lecture process in research methodology courses in terms of the process domain. The ninth point is the suitability of product components which is used as a basis for determining the dominant factors that trigger or cause obstacles in the lecture process in research methodology courses in terms of the product domain and inequality domain. The tenth point is the readiness of the feature to display the results of the SAW method calculations used in determining the dominant factors that cause inequality in research methodology courses. The eleventh point is the readiness of expert weighting for each discrepancy evaluation component. The twelvth point is the readiness of the feature to display decisions and recommendations. The thirteenth is the readiness of the feature to show user access rights settings. The fourteenth point is the readiness of the feature to show historical data from the SAW method calculation results in determining the dominant factors that cause inequality.

Figure 1 shows the appearance of the Design User Interface for Discrepancy-SAW Evaluation Instrument. In this design there is an 'ID' textbox and a 'name' textbox to input the identity of the instrument user. There are 4 components of the discrepancy model evaluation, including: definition, installation, process, and product. Each evaluation component has several instrument

items. Each item is given an assessment score referring to The Likert Scale, which consists of 5 importance ratings (poor, Less, moderate, good, and excellence). There is a weighting score given by experts for each component of the discrepancy model evaluation. The weighting score also refers to The Likert Scale. There is a 'process' button to show the results of the SAW method calculations in determining the dominant factors that cause inequality. Apart from displaying the SAW method calculation results, the process button also displays decision results and recommendations. The save button functions to save data on all business processes in the Discrepancy-SAW Evaluation Instrument.

Figure 2 shows the appearance of the Design User Interface for setting user access rights. This design is an answer to the suggestions given by expert-1, Student-12, Student-30, and Student-40 during the initial trial. This design makes it easier for admins to set user access rights to obtain the right to operate the Discrepancy-SAW Evaluation Instrument according to their needs.

Figure 3 is a display of the Design User Interface of features which function to show historical data from the SAW method calculation results. This design is an answer to the suggestions given by expert-4 and Student-24 during the initial trial. This design consists of 2 comboboxes, including one "user" combobox and one "action" combobox.

The "user" combobox functions to select the user who is conducting the search. The "action" combobox functions to select actions that can be carried out by the user when searching the history of the SAW method calculation results. There are two date time pickers that are used to check the time period (start date to end date) from the history of the SAW method calculation process that has been carried out. There is a table that stores recapitulation data of the SAW method calculation results over a certain period. There is one "save" button to save data and one "print" button to print historical data from the SAW method calculation results.

This research has succeeded in answering the limitations of Jampel et al.'s research. [3], research by Pakaya and Machmud [4], research by Qadriah et al. [5], research by Kamid et al. [6], Mursidin's research [7] shows the existence of a digital format evaluation instrument user interface design that can be used to determine the dominant aspects/factors that cause inequality in the learning process. The novelty of this research is the design of a digital format evaluation instrument user interface that combines the Discrepancy evaluation model with a decision support system method (namely SAW). The limitation of this research is that it has not shown the physical form of the Discrepancy-SAW evaluation instrument which is ready for use in the field, because the results of this research are only limited to developing the user interface design.

Principally, this research has the same characteristics and objectives as several other studies. Research that was conducted by Suratno and Shafira[14], research by Zhou et al. [15], research by Dwivedi et al. [16], research by Anastacia et al. [17], and research by Dewiyanti et al. [18] also has similarities with this research regarding the use of user interface design as a visual element that is useful for connecting users with technological systems, even though the technological system is not yet fully completed physically

4.1. First, the advantages of Game-Based Learning Media.

Games are considered to increase Student Motivation and Engagement. Games are designed to attract attention and keep players engaged. Elements such as challenges, rewards, and competitions can increase students' intrinsic motivation to learn. They may be more enthusiastic and proactive in the learning process. Games are also considered to support Active and Interactive learning. Unlike passive learning methods, games require active participation from students. They must make decisions, solve problems, and react to situations in the game, which can deepen understanding and retention of information [18][19][20].

Through learning and play this can provide Contextual Learning Experiences. Games can simulate real-world situations or create interesting contexts for the subject matter. This helps students see the relevance of the material and how the concepts can be applied in practice. Through learning and play this can encourage Iterative Learning and Experimentation. Games often allow players to try again after failure without severe punishment. This creates a safe environment to

experiment, make mistakes, and learn from them. Students may feel more comfortable taking risks and exploring different approaches [21][22][23].

4.2. Second, the shortcomings of game-based learning media.

Games can be a potential distraction and loss of Focus. If not designed well, the entertainment elements in the game can be a distraction and divert students' attention from the actual learning objectives. Game media also has accessibility and Digital divide issues. Not all students have the same access to hardware (computers, tablets, smartphones) and stable internet connections to play digital learning games. Through games, it can also be difficult to measure learning outcomes. Evaluating the impact of learning games on student learning outcomes can be more complex than traditional methods. There needs to be a proper metric to measure the understanding and skills gained through playing [24][5][25].

Overall, game-based learning media has great potential to improve the quality and attractiveness of learning. However, it is important to consider its advantages and disadvantages carefully and to design and implement it wisely so that learning objectives can be achieved effectively.

CONCLUTIONS

In general, the user interface design of the Discrepancy-SAW evaluation instrument is included in the good category. This can be seen from the quality percentage results of 83.38% which is classified as good when viewed from the user interface design quality standards with a reference scale of five. The novelty of this research is the emergence of a digital format evaluation instrument user interface design that integrates educational evaluation models (namely Discrepancy) with decision support system methods (namely SAW). Based on this integration, it will be easier to determine the dominant aspects or factors that determine the occurrence of inequality in the lecture process for research methodology courses. Future work that can be done to overcome this research obstacle is to create a physical form of the Discrepancy-SAW evaluation instrument that is ready for use in the field. The impact of the results of this research for stakeholders in the education sector is to gain new knowledge about the existence of appropriate user interface design for the Discrepancy-SAW evaluation instrument. Apart from that, the Discrepancy-SAW evaluation instrument can also be used by educational evaluators to determine the dominant factors that trigger inequality in the lecture process in research methodology courses.

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