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CIPP-SAW Application as an Evaluation Tool of E-Learning Effectiveness

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Abstract: The effectiveness level of e-learning implementation in the learning process at health colleges is very important for all users to know. Things that can be done to measure the level of effectiveness accurately is to carry out evaluation activities using computerized tools. One of the innovations found in this research was a computer-based evaluation application called the *CIPP-SAW* application. This application is formed by combining an educational evaluation model called *CIPP* (*Context-Input-Process-Product*) with a decision support system method called *SAW* (*Simple Additive Weighting*). Based on those situations, this research aimed to provide an overview of the user interface design and workings of the *CIPP-SAW* application used in evaluating the effectiveness of e-learning implemented in health colleges (case study in Bali province). This research was a development study using Borg & Gall's design, which focused on the preliminary field test and main product revision stages. The subjects involved in the field trial of the *CIPP-SAW* application were 64 respondents. The respondents included: two informatics experts, two educational evaluation experts, 30 students, and 30 lecturers from several health colleges in Bali province. Data collection tools in the form of questionnaires, interview guidelines, and photo documentation. The analysis technique used was descriptive quantitative which compares the effectiveness level of the *CIPP-SAW* application with the effectiveness standard which refers to a scale of five. The results showed that the effectiveness level of the *CIPP-SAW* application was 87.521%, so it was in a good category.

Index Terms: Application, *CIPP*, *SAW*, Evaluation, E-Learning.

1. Introduction

An asynchronous learning strategy is appropriate to be used as an alternative to being able to carry out the quality learning process in social distancing situation. One of the learning models that can be used in realizing asynchronous strategies is e-learning. Currently, the use of e-learning as a learning model is not only used in colleges but also the basic education level.

Even e-learning also has been used in specific universities such as colleges in the health sector. This is reinforced by the statement was expressed in 2018 by O' Doherty *et al.* [1] which stated that online learning (blended learning, virtual learning, and e-learning) in the education of health is a relatively new concept and is developing rapidly in supporting the learning process in the digital era.

The success of e-learning implementation, especially in health colleges can be seen from the level of e-learning effectiveness used in the learning process in the health sector. Several basic aspects to determine the effectiveness, including the need for e-learning to support learning in the health sector, support from the academic community, legal regulations, benefits, funds, the readiness of human resources, the readiness of supporting equipment, financial governance, quality of the learning process, and user satisfaction toward e-learning.

However, the facts that occur in the field indicate that the implementation of e-learning, especially in health colleges, cannot be said to be effective. It is caused by several aspects that determine effectiveness, such as the readiness of human resources and the readiness of supporting equipment that cannot be determined accurately. Things can be done to solve those problems found in the field is to determine an evaluation model suitable for evaluating the effectiveness of e-learning.

Several evaluation models that can be used to evaluate the effectiveness of e-learning included: *Countenance*, *Discrepancy*, *CSE-UCLA*, and *CIPP* models. However, the limitations of these models are the difficulty in determining the dominant aspects that need to be maintained and the dominant aspects that need to be improved to increase the level of e-learning effectiveness.

From the limitations of several evaluation models, innovation is presented in the form of the *CIPP-SAW* application which is used as a tool to evaluate the e-learning effectiveness, especially those used in health colleges.

This application is a web-based application that combines the *CIPP* evaluation model with the *SAW* method. The *CIPP* (*Context-Input-Process-Product*) model is an evaluation model in the education sector [2-11]. *SAW* (*Simple Additive Weighting*) is one method in the decision-making system [12-14].

Based on that innovation, the question in this research is "how does the display of user interface design and workings of *CIPP-SAW* application in evaluating the e-learning effectiveness used in health colleges (case study in Bali province)?"

The main objective of this research was to show the user interface design and workings of the *CIPP-SAW* application which is used as a tool for evaluating the effectiveness of e-learning in health colleges in Bali province.

2. Literature Review

There are several research results from the previous five years that give the reasons for the emergence of this research idea. The research was conducted in 2017 by Jampel *et al*. [15] demonstrated the use of the *SAW* method combined with the *CSE-UCLA* evaluation model to evaluate the implementation of learning programs and certification of course institutions in Bali. The similarity of Jampel *et al*.'s research with this research is the use of *SAW* in determining the dominant aspects that need to be improved in program implementation. The difference is clear from the education evaluation model used to evaluate programs. Jampel *et al*. using the *CSE-UCLA* evaluation model, while in this research using the *CIPP* model.

The research was conducted in 2018 by Ragab *et al*. [16] demonstrated the use of the *ESSAM* model to measure user satisfaction with the effectiveness of e-learning. This *ESSAM* model consists of seven evaluation components, included: society support, student, course, cost, technology, university support, and instructor. The similarity of Ragab *et al*.'s research with this research is the use of artificial intelligence methods to determine priorities and weighting of the evaluation components. The difference lies in the type of evaluation model used, where this study uses the *CIPP* model while Ragab *et al*. using the *ESSAM* model.

The research was conducted in 2020 by Barteit *et al*. [17] demonstrated the evaluation method and summary of evaluation results used as a basis for determining the effectiveness of e-learning. The similarity of Barteit *et al*.'s research with this research is in terms of research objectives, namely to determine the level of e-learning effectiveness. The difference is clear from the methods used to determine the effectiveness of e-learning. The research was conducted by Barteit *et al*. using an evaluation method consisting of the document review stages, focus groups, interviews, system log data, and questionnaires. This study used an evaluation method based on the *CIPP* model which consists of the *Context*, *Input*, *Process*, and *Product* stages.

The research was conducted in 2015 by Zhang *et al*. [18] has a similarity with this research in terms of the object of evaluation, namely the e-learning effectiveness. The difference lies in the evaluation stage is used. The research was conducted by Zhang *et al*. using evaluation stages that refer to questionnaires, online activity logs, and final exam scores. This study used an evaluation stage that refers to the *CIPP* evaluation components.

The research was conducted in 2017 by Abdillah and Kurniawan [19] showed the use of the *SAW* method to select the most suitable e-learning for an institution. The obstacle of Abdillah and Kurniawan's research is that they have not been able yet to show that the most dominant aspects of evaluation are maintained and the most dominant aspects of evaluation are corrected to determine the e-learning effectiveness.

The similarity between Abdilah and Kurniawan's research with this research is that both use the *SAW* method for the calculation process of finding the best alternative from several alternative options. The difference between Abdilah and Kurniawan's research with this research is the existence of an educational evaluation model that is used as the basis for evaluating. This study used the *CIPP* evaluation model, while Abdilah and Kurniawan's research did not use the educational evaluation model.

3. Method

A. Research Approach

This research was a development study with a development stage that refers to the *Borg* & *Gall* model design. The reason for using the *Borg* & *Gall* model in this research was to be able to achieve the main objectives of this research, especially in showing information about the user interface design and workings of the *CIPP-SAW* application. The stages in the design of the *Borg* & *Gall* model consist of 10 stages, included [20]: research and information collecting, planning, develop a preliminary form of product, preliminary field test, main product revision, main field test, operational product revision, operational field testing, final product revision, dissemination, and implementation. Especially in 2020, research focus on the preliminary field test stage and main product revision of the evaluation application that had been formed. In the *Borg* & *Gall* model, the user interface design of the *CIPP-SAW* application can be seen specifically at the development stage of the preliminary form of the product. The complete workings of the *CIPP-SAW* application can be demonstrated at the preliminary field test stage.

B. Object of Research

The object studied in 2020 focuses on the *CIPP-SAW* application. This application is used to evaluate the effectiveness of e-learning implemented at several health colleges in Bali Province.

C. Research Location

This research was conducted in several health colleges in Bali province. Some of the health colleges intended including *STIKES Bina Usada Bali* (*Badung* Regency), *STIKES Advaita Medika* (*Tabanan* Regency), *STIKES Buleleng* (*Buleleng* Regency), STIKES Wiramedika Bali, *STIKES Bali*, and *Poltekkes Denpasar* (*Denpasar* City).

D. Research Subject

This research involved several respondents to conduct field trials of the *CIPP-SAW* application. The respondents included: two education evaluation experts, two informatics experts, 30 lecturers at health colleges in Bali province, and 30 students at health colleges in Bali province.

E. Data Collection Tools

All data obtained in this research were collected using a questionnaire, interview guidelines, and photo documentation. The questionnaire was used to obtain quantitative data regarding the effectiveness level of the *CIPP-SAW* application. Interview guidelines were used to obtain qualitative data used in determining recommendations for appropriate improvements to the suggestions given by respondents in field trials. The content validity of the questionnaires and interview guidelines was carried out by testing using the Gregory validity. Photo documentation was used to obtain data related to the user interface design of the *CIPP-SAW* application.

F. Data Analysis Technique

Field trial data were analyzed using quantitative descriptive techniques by comparing the percentage level of effectiveness of the *CIPP-SAW* application with the effectiveness standard which refers to the five-scale category. The categorization consists of very good category in the percentage score range of 90% -100%, good with a percentage score range of 80% -89%, moderate with a percentage score range of 65% -79%, less with a percentage score range of 40 % -64%, and very less with a range of percentage scores of 0% -39%.

4. Results and Discussion

Some of the things shown in the results section of this study included: the user interface design of the *CIPP-SAW* application, simulations of workings of the *CIPP-SAW* application, the results of field trials, and revisions of the field trial results. The details of research results can be shown as follows.

A. The User Interface Design of CIPP-SAW Application

The user interface design of the *CIPP-SAW* application consists of several forms, included: 1) the main menu, 2) data input for evaluation aspects, 3) weight data input on the evaluation components, 4) normalization of the weight on the evaluation components, 5) assessment data from respondents to e-learning regarding each aspect of evaluation, 6) the average score of respondents' assessment of each aspect in the *CIPP* components, 7) the process of determining the normalization matrix, 8) the ranking process, 9) decisions and recommendations. The complete view of those forms can be seen in Figure 1 to 9.

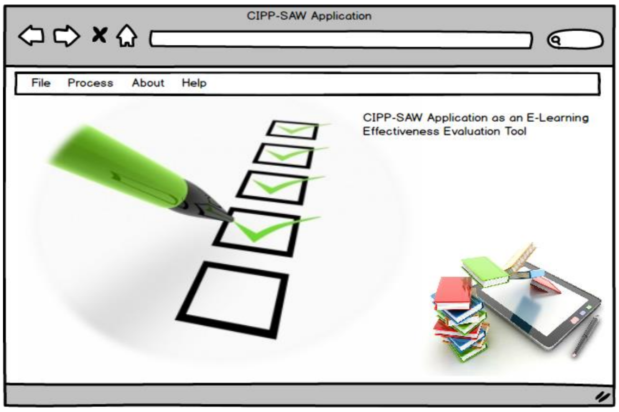

Fig. 1. Display of Main Menu Design

Figure 1 shows the appearance of the main menu form as the first web page. This first page is used as a pointer to another web page.

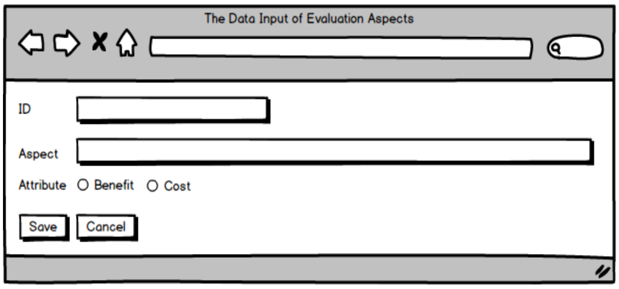

Fig. 2. Display of Data Input Design of Evaluation Aspects

Figure 2 shows the display form for inputting evaluation aspects data. In the form shown in Figure 2, it consists of several features, included: a feature to enter an ID, evaluation aspects, and attribute status (cost or benefit) from the evaluation aspects.

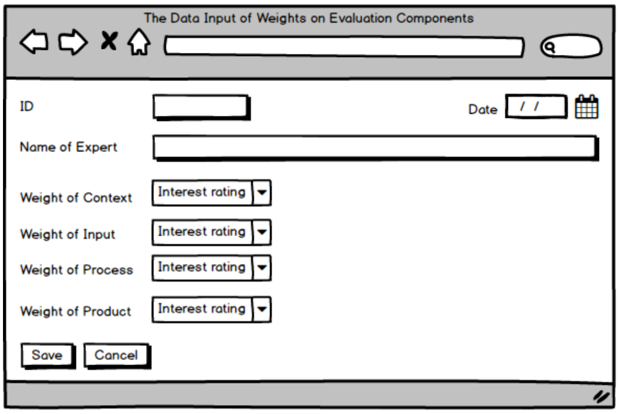

Fig. 3. Display of the Weight Data Input Design in the Evaluation Components

Figure 3 shows the display form for inputting weight data in the evaluation components. In the form shown in Figure 3, it consists of several features, including a feature for entering Expert ID, expert name, weight for context component, weight for input component, weight for process component, weight for a product component.

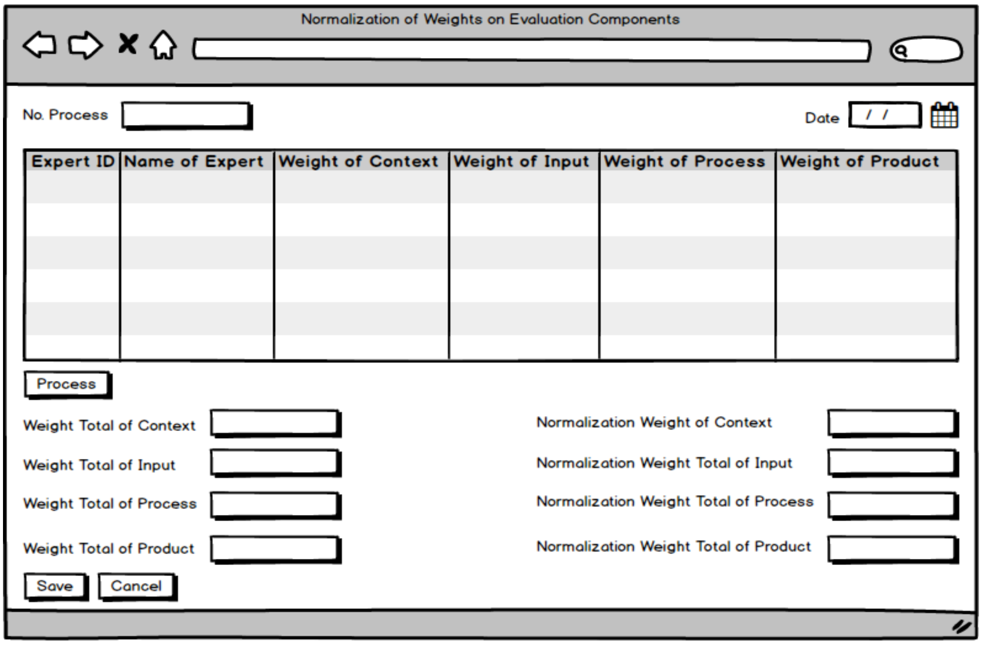

Fig. 4. Display of Weight Normalized Design in Evaluation Components

Figure 4 shows a display of form to facilitate the weight normalization calculation process for each evaluation component. In the form shown in Figure 4, it consists of several features, including a feature to list the weight of each evaluation component, the total weight of each evaluation component, and the normalized weight of each evaluation component.

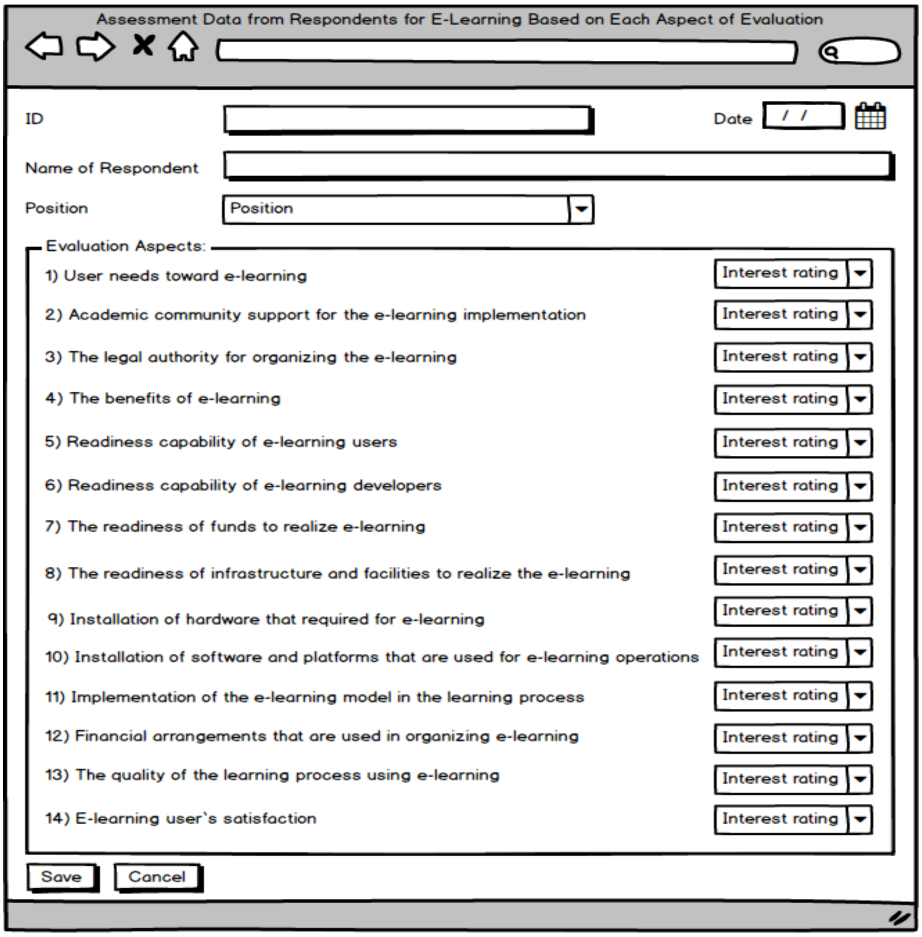

Fig. 5. The Design Display for Respondents Assessment Data to E-Learning regarding Each Evaluation Aspect

Figure 5 shows the form display for entering respondent assessment data on e-learning. In the form shown in Figure 5, it consists of several features, including a feature for entering the respondent's ID, the respondent's name, the position, and the importance rating value given by the respondent for each evaluation aspect.

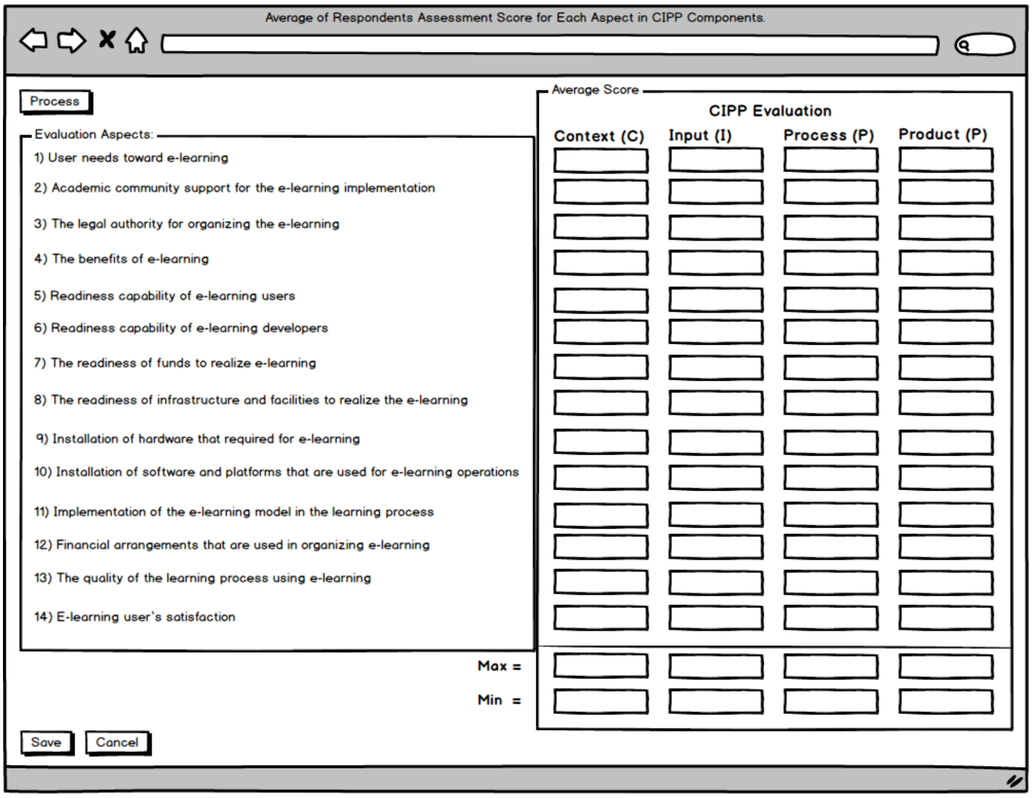

Fig. 6. The Design Display for Respondent Assessment Score Average towards Each Aspect in the *CIPP* Component

Figure 6 shows the form display for calculating the average score of the respondents' assessment of each evaluation aspect. In the form shown in Figure 6, it consists of several features, including a feature to display the average score for the evaluation aspects, the maximum and minimum score of the average score for the evaluation aspects in each evaluation component.

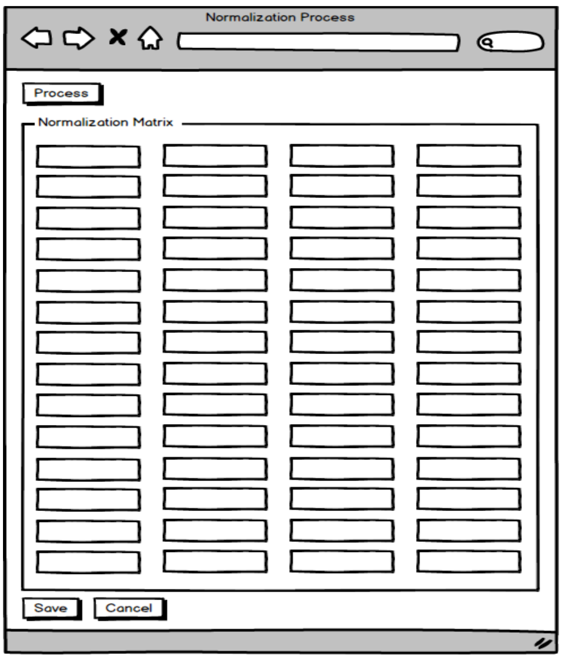

Fig. 7. The Display Design of Process for Normalization Matrix Determination

Figure 7 shows a form display to facilitate the normalization matrix calculation process. The form shown in Figure 7 contains text box features that display the normalized score matrix.

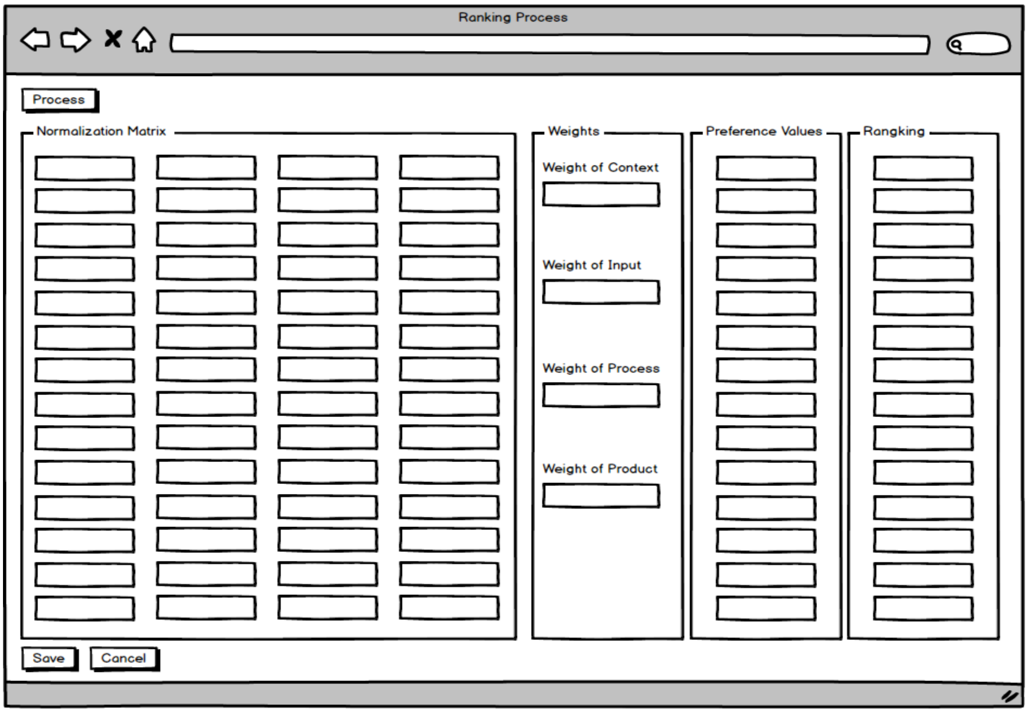

Fig. 8. The Design Display for Ranking Process

Figure 8 shows a form display to facilitate the ranking process. In the form shown in Figure 8, it consists of several features, including a feature to display the normalized weight of each evaluation component, preference value, and ranking.

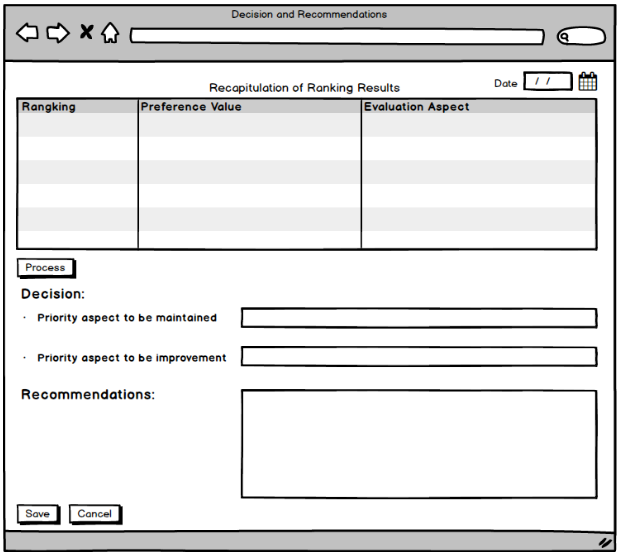

Fig. 9. The Design Display of Decisions and Recommendations

Figure 9 shows a form display for processing decisions and input recommendations. The form shown in Figure 9 consists of several features, including a feature to display a summary of ranking results, a decision feature, and a recommendations feature. There are two features of decisions in form 9, including a feature to determine priority aspects that need to be maintained and a feature to determine priority aspects that need to be improved. Priority aspects that need to be maintained are obtained based on the maximum value of the preference value. Priority aspects that need to be improved are obtained based on the minimum value of the preference value.

B. *Workings Simulation of the CIPP-SAW application*

Some of the data needed to simulate of workings the *CIPP-SAW* application to get priority aspects that are maintained and improved, included: weighting data for the *CIPP* evaluation components from experts and simulation data. The simulation data can be shown in Table 1, the weight for each component of *CIPP* evaluation given by several experts can be shown in Table 2, and the attribute classification of each evaluation aspect is shown in Table 3.

Table 1. Simulation Data

Evaluation Aspects		**Evaluation Components**			
		Context	***Input***	***Process***	***Product***
A1	User needs toward e-learning	4.45	1.00	1.00	1.00
A2	Academic community support for the e-learning implementation	4.47	1.00	1.00	1.00
A3	The legal authority for organizing the e-learning	4.56	1.00	1.00	1.00
A4	The benefits of e-learning	4.66	1.00	1.00	1.00
A5	The readiness of e-learning users capability	1.00	3.58	1.00	1.00
A6	The readiness of e-learning developers capability	1.00	4.33	1.00	1.00
A7	The readiness of funds to realize e-learning	1.00	3.33	1.00	1.00
A8	The readiness of infrastructure and facilities to realize the e-learning	1.00	3.34	1.00	1.00
A9	Installation of hardware that required for e-learning	1.00	1.00	4.42	1.00
A10	Installation of software and platforms that are used for e-learning operations	1.00	1.00	4.25	1.00
A11	Implementation of the e-learning model in the learning process	1.00	1.00	4.13	1.00
A12	Financial arrangements that are used in organizing e-learning	1.00	1.00	3.08	1.00
A13	The quality of the learning process using e-learning	1.00	1.00	1.00	3.25
A14	E-learning user's satisfaction	1.00	1.00	1.00	3.86

Table 2. Weights of Each *CIPP* Evaluation Component

Expert	**Evaluation Weight**			
	Context	***Input***	***Process***	***Product***
Education Expert-1	4	5	4	4
Education Expert-2	5	5	4	5
Informatics Expert-1	4	4	5	5
Informatics Expert-2	4	5	4	4
Total	**17**	**19**	**17**	**18**

From the data in table 2, it can be determined the normalized weight of each evaluation component. The normalized weight calculation can be explained as follows.

Normalized weights on context components
= 17/(17+19+17+18) = 17/71 = 0.239
Normalized weights on the input components
= 19/(17+19+17+18) = 19/71 = 0.268
Normalized weights on process components
= 17/(17+19+17+18) = 17/71 = 0.239
Normalized weights on product components
= 18/(17+19+17+18) = 18/71 = 0.254

Table 3. Attribute Classification

Evaluation Aspects	Attribute
User needs toward e-learning	Benefit
Academic community support for the e-learning implementation	Benefit
The legal authority for organizing the e-learning	Benefit
The benefits of e-learning	Benefit
The readiness of e-learning users capability	Benefit
The readiness of e-learning developers capability	Benefit
The readiness of funds to realize e-learning	Cost
The readiness of infrastructure and facilities to realize the e-learning	Benefit
Installation of hardware that required for e-learning	Benefit
Installation of software and platforms that are used for e-learning operations	Benefit
Implementation of the e-learning model in the learning process	Benefit
Financial arrangements that are used in organizing e-learning	Cost
The quality of the learning process using e-learning	Benefit
E-learning user's satisfaction	Benefit

Before performing the normalization calculation process to obtain a normalization matrix, it is necessary to know the *SAW* formula used. The formula intended can be seen in equation (1) below [21].

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{\underset{i}{Max}\ x_{ij}} & if\ j\ is\ benefit\ attribute \\ \dfrac{\underset{i}{Min}\ x_{ij}}{x_{ij}} & if\ j\ is\ cost\ attribut \end{cases} \quad (1)$$

Where:
r_{ij} is the normalized performance rating of the alternatives $A_i$on attributeC_j; i=1,2,...,m and j=1,2,...,n [21].
Based on the data in Table 1, equation (1), and Table 3, the normalization calculation process can be carried out to obtain a normalization matrix. The normalization calculation process can be explained as follows.

$$r_{1-1} = \frac{4.45}{\max\{4.45; 4.47; 4.56; 4.66; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{4.45}{4.66} = 0.956$$

$$r_{2-1} = \frac{4.47}{\max\{4.45; 4.47; 4.56; 4.66; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{4.47}{4.66} = 0.960$$

$$r_{3-1} = \frac{4.56}{\max\{4.45; 4.47; 4.56; 4.66; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{4.56}{4.66} = 0.980$$

$$r_{4-1} = \frac{4.66}{\max\{4.45; 4.47; 4.56; 4.66; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{4.66}{4.66} = 1.000$$

$$r_{5-1} = \frac{1.00}{\max\{4.45; 4.47; 4.56; 4.66; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.66} = 0.215$$

$$r_{6\text{-}1} = \frac{1.00}{\max\{4.45; 4.47; 4.56; 4.66; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.66} = 0.215$$

$$r_{7\text{-}1} = \frac{\min\{4.45; 4.47; 4.56; 4.66; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}}{1.00} = \frac{1.00}{1.00} = 1.000$$

$$r_{8\text{-}1} = \frac{1.00}{\max\{4.45; 4.47; 4.56; 4.66; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.66} = 0.215$$

$$r_{9\text{-}1} = \frac{1.00}{\max\{4.45; 4.47; 4.56; 4.66; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.66} = 0.215$$

$$r_{10\text{-}1} = \frac{1.00}{\max\{4.45; 4.47; 4.56; 4.66; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.66} = 0.215$$

$$r_{11\text{-}1} = \frac{1.00}{\max\{4.45; 4.47; 4.56; 4.66; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.66} = 0.215$$

$$r_{12\text{-}1} = \frac{\min\{4.45; 4.47; 4.56; 4.66; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}}{1.00} = \frac{1.00}{1.00} = 1.000$$

$$r_{13\text{-}1} = \frac{1.00}{\max\{4.45; 4.47; 4.56; 4.66; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.66} = 0.215$$

$$r_{14\text{-}1} = \frac{1.00}{\max\{4.45; 4.47; 4.56; 4.66; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.66} = 0.215$$

$$r_{1\text{-}2} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 3.58; 4.33; 3.33; 3.34; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.33} = 0.231$$

$$r_{2\text{-}2} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 3.58; 4.33; 3.33; 3.34; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.33} = 0.231$$

$$r_{3\text{-}2} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 3.58; 4.33; 3.33; 3.34; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.33} = 0.231$$

$$r_{4\text{-}2} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 3.58; 4.33; 3.33; 3.34; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.33} = 0.231$$

$$r_{5\text{-}2} = \frac{3.58}{\max\{1.00; 1.00; 1.00; 1.00; 3.58; 4.33; 3.33; 3.34; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{3.58}{4.33} = 0.827$$

$$r_{6\text{-}2} = \frac{4.33}{\max\{1.00; 1.00; 1.00; 1.00; 3.58; 4.33; 3.33; 3.34; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{4.33}{4.33} = 1.000$$

$$r_{7\text{-}2} = \frac{\min\{1.00; 1.00; 1.00; 1.00; 3.58; 4.33; 3.33; 3.34; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}}{3.33} = \frac{1.00}{3.33} = 0.302$$

$$r_{8\text{-}2} = \frac{3.34}{\max\{1.00; 1.00; 1.00; 1.00; 3.58; 4.33; 3.33; 3.34; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{3.34}{4.33} = 0.773$$

$$r_{9\text{-}2} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 3.58; 4.33; 3.33; 3.34; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.33} = 0.231$$

$$r_{10\text{-}2} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 3.58; 4.33; 3.33; 3.34; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.33} = 0.231$$

$$r_{11\text{-}2} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 3.58; 4.33; 3.33; 3.34; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.33} = 0.231$$

$$r_{12\text{-}2} = \frac{\min\{1.00; 1.00; 1.00; 1.00; 3.58; 4.33; 3.33; 3.34; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}}{1.00} = \frac{1.00}{1.00} = 1.000$$

$$r_{13\text{-}2} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 3.58; 4.33; 3.33; 3.34; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.33} = 0.231$$

$$r_{14\text{-}2} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 3.58; 4.33; 3.33; 3.34; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00\}} = \frac{1.00}{4.33} = 0.231$$

$$r_{1\text{-}3} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 4.42; 4.25; 4.13; 3.08; 1.00; 1.00\}} = \frac{1.00}{4.42} = 0.226$$

$$r_{2-3} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 4.42; 4.25; 4.13; 3.08; 1.00; 1.00\}} = \frac{1.00}{4.42} = 0.226$$

$$r_{3-3} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 4.42; 4.25; 4.13; 3.08; 1.00; 1.00\}} = \frac{1.00}{4.42} = 0.226$$

$$r_{4-3} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 4.42; 4.25; 4.13; 3.08; 1.00; 1.00\}} = \frac{1.00}{4.42} = 0.226$$

$$r_{5-3} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 4.42; 4.25; 4.13; 3.08; 1.00; 1.00\}} = \frac{1.00}{4.42} = 0.226$$

$$r_{6-3} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 4.42; 4.25; 4.13; 3.08; 1.00; 1.00\}} = \frac{1.00}{4.42} = 0.226$$

$$r_{7-3} = \frac{\min\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 4.42; 4.25; 4.13; 3.08; 1.00; 1.00\}}{1.00} = \frac{1.00}{1.00} = 1.000$$

$$r_{8-3} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 4.42; 4.25; 4.13; 3.08; 1.00; 1.00\}} = \frac{1.00}{4.42} = 0.226$$

$$r_{9-3} = \frac{4.22}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 4.42; 4.25; 4.13; 3.08; 1.00; 1.00\}} = \frac{4.42}{4.42} = 1.000$$

$$r_{10-3} = \frac{4.25}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 4.42; 4.25; 4.13; 3.08; 1.00; 1.00\}} = \frac{4.25}{4.42} = 0.961$$

$$r_{11-3} = \frac{4.13}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 4.42; 4.25; 4.13; 3.08; 1.00; 1.00\}} = \frac{4.13}{4.42} = 0.933$$

$$r_{12-3} = \frac{\min\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 4.42; 4.25; 4.13; 3.08; 1.00; 1.00\}}{3.08} = \frac{1.00}{3.08} = 0.327$$

$$r_{13-3} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 4.42; 4.25; 4.13; 3.08; 1.00; 1.00\}} = \frac{1.00}{4.42} = 0.226$$

$$r_{14-3} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 4.42; 4.25; 4.13; 3.08; 1.00; 1.00\}} = \frac{1.00}{4.42} = 0.226$$

$$r_{1-4} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 3.25; 3.86\}} = \frac{1.00}{3.86} = 0.259$$

$$r_{2-4} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 3.25; 3.86\}} = \frac{1.00}{3.86} = 0.259$$

$$r_{3-4} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 3.25; 3.86\}} = \frac{1.00}{3.86} = 0.259$$

$$r_{4-4} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 3.25; 3.86\}} = \frac{1.00}{3.86} = 0.259$$

$$r_{5-4} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 3.25; 3.86\}} = \frac{1.00}{3.86} = 0.259$$

$$r_{6-4} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 3.25; 3.86\}} = \frac{1.00}{3.86} = 0.259$$

$$r_{7-4} = \frac{\min\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 3.25; 3.86\}}{1.00} = \frac{1.00}{1.00} = 1.000$$

$$r_{8-4} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 3.25; 3.86\}} = \frac{1.00}{3.86} = 0.259$$

$$r_{9-4} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 3.25; 3.86\}} = \frac{1.00}{3.86} = 0.259$$

$$r_{10-4} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 3.25; 3.86\}} = \frac{1.00}{3.86} = 0.259$$

$$r_{11-4} = \frac{1.00}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 3.25; 3.86\}} = \frac{1.00}{3.86} = 0.259$$

$$r_{12\text{-}4} = \frac{\min\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 3.25; 3.86\}}{1.00} = \frac{1.00}{1.00} = 1.000$$

$$r_{13\text{-}4} = \frac{3.25}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 3.25; 3.86\}} = \frac{3.25}{3.86} = 0.842$$

$$r_{14\text{-}4} = \frac{3.86}{\max\{1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 1.00; 3.25; 3.86\}} = \frac{3.86}{3.86} = 1.000$$

Based on the results of normalization calculations, then it can be converted into a normalization matrix. The normalization matrix intended can be seen in Figure 10.

$$R = \begin{bmatrix} 0.956 & 0.231 & 0.226 & 0.259 \\ 0.960 & 0.231 & 0.226 & 0.259 \\ 0.980 & 0.231 & 0.226 & 0.259 \\ 1.000 & 0.231 & 0.226 & 0.259 \\ 0.215 & 0.827 & 0.226 & 0.259 \\ 0.215 & 1.000 & 0.226 & 0.259 \\ 1.000 & 0.302 & 1.000 & 1.000 \\ 0.215 & 0.773 & 0.226 & 0.259 \\ 0.215 & 0.231 & 1.000 & 0.259 \\ 0.215 & 0.231 & 0.961 & 0.259 \\ 0.215 & 0.231 & 0.933 & 0.259 \\ 1.000 & 1.000 & 0.327 & 1.000 \\ 0.215 & 0.231 & 0.226 & 0.842 \\ 0.215 & 0.231 & 0.226 & 1.000 \end{bmatrix}$$

Fig. 10. The Display of Normalized Matrix

From the normalization matrix, then further ranking calculation can be performed using normalized weight data from each evaluation component and the formula shown in equation (2). Equation (2) can be explained as follows [22-24].

$$V_i = \sum_{j=1}^{n} W_j \, r_{ij} \tag{2}$$

Where:
w_j = weighted value of each criteria
r_{ij} = score of normalized performance rating
V_i = rank for each alternative

Based on the normalized matrix data, equation (2), and normalized weights that have been obtained previously in Table 2, the calculating process of ranking can be explained as follows.

V_1 = (0.239)(0.956) + (0.268)(0.231) + (0.239)(0.226) + (0.254)(0.259) = 0.4104
V_2 = (0.239)(0.960) + (0.268)(0.231) + (0.239)(0.226) + (0.254)(0.259) = 0.4112
V_3 = (0.239)(0.980) + (0.268)(0.231) + (0.239)(0.226) + (0.254)(0.259) = 0.4160
V_4 = (0.239)(1.000) + (0.268)(0.231) + (0.239)(0.226) + (0.254)(0.259) = 0.4208
V_5 = (0.239)(0.215) + (0.268)(0.827) + (0.239)(0.226) + (0.254)(0.259) = 0.3928
V_6 = (0.239)(0.215) + (0.268)(1.000) + (0.239)(0.226) + (0.254)(0.259) = 0.4392
V_7 = (0.239)(1.000) + (0.268)(0.302) + (0.239)(1.000) + (0.254)(1.000) = 0.8129
V_8 = (0.239)(0.215) + (0.268)(0.773) + (0.239)(0.226) + (0.254)(0.259) = 0,3782
V_9 = (0.239)(0.215) + (0.268)(0.231) + (0.239)(1.000) + (0.254)(0.259) = 0.4181
V_{10} = (0.239)(0.215) + (0.268)(0.231) + (0.239)(0.961) + (0.254)(0.259) = 0.4088
V_{11} = (0.239)(0.215) + (0.268)(0.231) + (0.239)(0.933) + (0.254)(0.259) = 0.4020
V_{12} = (0.239)(1.000) + (0.268)(1.000) + (0.239)(0.327) + (0.254)(1.000) = 0.8392
V_{13} = (0.239)(0.215) + (0.268)(0.231) + (0.239)(0.226) + (0.254)(0.842) = 0.3812
V_{14} = (0.239)(0.215) + (0.268)(0.231) + (0.239)(0.226) + (0.254)(1.000) = 0.4213

From the results of these calculations, a ranking recapitulation can be made for each evaluation aspect. Complete recapitulation can be seen in Table 4.

Table 4. Ranking Recapitulation of Each Evaluation Aspect

Ranking	Evaluation Aspect Code	Preference Value
1	A12	0.8392
2	A7	0.8129
3	A6	0.4392
4	A14	0.4213
5	A4	0.4208
6	A9	0.4181
7	A3	0.4160
8	A2	0.4112
9	A1	0.4104
10	A10	0.4088
11	A11	0.4020
12	A5	0.3928
13	A13	0.3812
14	A8	0.3782

Based on Table 4, so the priority aspect that needs to be maintained is A12 (financial arrangements that are used in organizing e-learning) because its preference value has the highest score. The priority aspect that needs to be improved is A8 (the readiness of infrastructure and facilities to realize the e-learning) because its preference value has the lowest score.

C. Field Trial Results

64 respondents conducted a field trial of the *CIPP-SAW* application. The field trial results can be seen as complete in Table 5.

Table 5. The Field Trial Results of the *CIPP-SAW* Application

No	Respondents	Items-															$\sum$	Percentage of Effectiveness (%)
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
1	Expert-1	4	5	4	5	4	5	5	4	4	5	4	5	4	4	5	67	89.333
2	Expert-2	5	4	4	4	5	4	4	5	4	4	5	4	5	4	4	65	86.667
3	Expert-3	4	5	4	4	4	5	4	4	4	5	5	4	5	5	4	66	88.000
4	Expert-4	4	4	4	5	4	4	4	4	4	4	4	4	4	4	4	61	81.333
5	Lecturer-1	5	4	5	5	5	5	5	4	5	5	5	5	5	5	5	73	97.333
6	Lecturer-2	4	4	4	5	5	4	4	5	5	4	4	5	5	4	4	66	88.000
7	Lecturer-3	5	4	4	4	4	5	4	4	4	5	4	4	4	5	4	64	85.333
8	Lecturer-4	4	4	4	5	4	4	4	4	4	4	4	4	4	4	4	61	81.333
9	Lecturer-5	4	5	4	4	4	5	4	4	4	5	4	4	4	5	4	64	85.333
10	Lecturer-6	5	5	4	5	5	4	4	4	5	4	4	5	5	4	4	67	89.333
11	Lecturer-7	4	4	4	4	4	5	4	4	4	5	4	4	4	5	4	63	84.000
12	Lecturer-8	5	5	4	4	5	4	4	5	5	4	4	5	5	4	4	67	89.333
13	Lecturer-9	5	4	5	4	4	5	4	4	4	5	4	4	4	5	4	65	86.667
14	Lecturer-10	4	4	5	4	4	5	5	5	5	4	4	4	4	4	4	65	86.667
15	Lecturer-11	5	4	5	4	4	4	4	4	4	4	5	5	5	5	5	67	89.333
16	Lecturer-12	5	4	4	5	4	4	4	5	4	4	5	4	5	4	4	65	86.667
17	Lecturer-13	4	5	4	4	5	5	5	4	4	4	4	5	4	5	4	66	88.000
18	Lecturer-14	4	5	5	5	5	4	4	5	4	4	4	4	4	4	4	65	86.667
19	Lecturer-15	4	4	4	4	4	5	4	4	5	4	4	5	4	5	4	64	85.333
20	Lecturer-16	5	5	5	5	4	4	4	4	5	4	5	4	5	4	4	67	89.333
21	Lecturer-17	4	5	4	4	4	5	4	4	5	4	4	5	4	5	4	65	86.667
22	Lecturer-18	4	4	5	4	5	4	4	4	4	5	5	4	5	4	4	65	86.667
23	Lecturer-19	5	4	4	4	4	5	4	5	4	4	4	5	4	5	4	65	86.667
24	Lecturer-20	5	4	5	4	5	4	4	5	5	4	4	4	4	4	4	65	86.667
25	Lecturer-21	4	5	4	4	4	5	4	4	4	5	5	4	5	5	4	66	88.000
26	Lecturer-22	4	4	5	4	4	4	4	4	5	5	4	5	5	4	5	66	88.000
27	Lecturer-23	5	5	4	4	4	5	4	4	4	4	5	5	4	5	5	67	89.333
28	Lecturer-24	4	4	5	4	5	4	4	4	4	4	4	4	4	4	4	62	82.667
29	Lecturer-25	5	5	4	5	4	5	4	5	4	4	5	4	4	5	4	67	89.333
30	Lecturer-26	4	4	5	4	5	4	4	5	4	5	4	4	5	4	4	65	86.667
31	Lecturer-27	5	5	4	5	4	5	4	5	4	4	5	5	4	5	5	69	92.000
32	Lecturer-28	5	4	5	4	4	4	4	4	5	5	4	4	5	4	4	65	86.667
33	Lecturer-29	4	5	4	5	5	5	5	4	4	4	5	5	4	5	5	69	92.000
34	Lecturer-30	4	5	5	4	5	4	4	5	5	4	4	4	4	4	4	65	86.667

35	Student-1	4	4	4	5	4	5	4	4	4	5	4	5	5	4	5	66	88.000
36	Student-2	5	5	5	4	4	4	4	5	4	4	4	4	4	4	4	64	85.333
37	Student-3	4	4	4	4	4	5	4	5	4	5	5	4	4	4	5	65	86.667
38	Student-4	5	4	4	4	5	4	4	4	4	4	5	5	5	4	4	65	86.667
39	Student-5	4	4	5	4	4	5	4	5	4	4	4	4	4	4	4	63	84.000
40	Student-6	5	4	4	5	5	4	4	4	5	4	5	5	5	5	4	68	90.667
41	Student-7	4	4	4	5	4	5	4	4	5	4	5	4	4	4	4	64	85.333
42	Student-8	4	5	5	5	4	4	5	4	5	4	4	5	4	4	5	67	89.333
43	Student-9	5	4	5	4	4	5	4	4	4	5	4	4	4	4	4	64	85.333
44	Student-10	4	5	5	5	5	5	4	5	4	4	4	5	4	4	4	67	89.333
45	Student-11	4	4	4	4	4	4	4	4	5	5	5	4	4	5	4	64	85.333
46	Student-12	5	4	5	5	5	5	4	4	4	4	4	5	4	5	4	67	89.333
47	Student-13	4	4	4	4	5	4	5	4	5	5	5	4	4	5	4	66	88.000
48	Student-14	4	4	5	5	4	4	5	4	5	5	4	5	4	4	4	66	88.000
49	Student-15	5	5	5	4	5	4	5	4	5	4	4	4	4	4	4	66	88.000
50	Student-16	5	5	4	5	5	4	4	5	4	4	5	5	4	5	4	68	90.667
51	Student-17	4	5	5	5	4	5	4	4	4	5	5	4	5	4	5	68	90.667
52	Student-18	4	4	4	4	4	5	5	5	5	5	4	5	5	5	4	68	90.667
53	Student-19	4	5	4	4	4	4	4	4	4	4	4	4	4	4	5	62	82.667
54	Student-20	5	4	4	4	4	5	5	4	4	4	4	5	4	5	5	66	88.000
55	Student-21	4	5	5	5	4	5	4	4	4	4	5	4	4	4	4	65	86.667
56	Student-22	5	5	4	4	5	5	4	5	4	5	4	5	5	5	5	70	93.333
57	Student-23	4	5	5	5	4	4	4	4	4	4	5	4	4	4	4	64	85.333
58	Student-24	4	4	4	4	5	5	4	4	4	4	4	5	5	5	5	66	88.000
59	Student-25	4	5	5	5	5	4	5	5	5	5	4	4	4	4	4	68	90.667
60	Student-26	4	5	4	4	4	4	5	5	4	4	5	4	5	4	4	65	86.667
61	Student-27	5	5	4	5	5	4	5	4	5	4	4	4	4	4	4	66	88.000
62	Student-28	4	5	4	4	5	4	4	4	4	4	4	4	4	5	4	63	84.000
63	Student-29	5	4	5	5	4	5	4	4	5	4	5	4	5	4	4	67	89.333
64	Student-30	4	5	4	4	4	5	5	5	4	4	4	4	4	4	4	64	85.333
																	Average	**87.521**

The field trial results in Table 5 above showed an average percentage of effectiveness was 87.521%. If viewed from the effectiveness standard which refers to the five-scale category, then the effectiveness of the *CIPP-SAW* application is classified as good.

Apart from quantitative data, there are also some qualitative data obtained in field trials. The qualitative data was obtained based on several suggestions given by respondents in field trial activities. The complete suggestions can be seen in Table 6.

Table 6. Respondents Suggestions on Field Trial

Respondents	**Suggestions**
Lecturer-4	Please prepare different access rights between admin and user
Lecturer-20	Please make a form of decision and recommendation report
Lecturer-28	Add a login form that is specifically given to admins to manage all the features available in the application
Student-8	Add the form of decision and recommendation report
Student-17	Add a login form for admin access rights
Student-30	Add different login forms for access rights between admin and user

D. Results of the Revised Field Trial

Based on the respondents' suggestions that had been shown previously in Table 6, several revisions were made to the *CIPP-SAW* application user interface design. The revision made was to add a login form to facilitate access rights for users and admin toward the features available in the *CIPP-SAW* application. In addition to adding a login form, this revision stage also added the form of a decision and recommendation report. The login form display can be seen in Figure 10, while the display of decision and recommendation report can be seen in Figure 11.

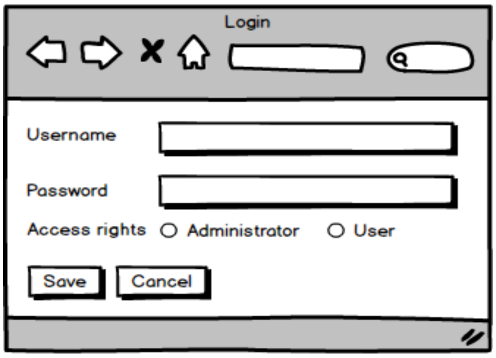

Fig. 10. The Display of Login Form

Figure 10 shows the display of the login form to facilitate the administrator and user to enter into forms that correspond to the respective access rights. This login form consists of textboxes used as a facility to enter a username and password, radio buttons are used to select only one choice of access rights.

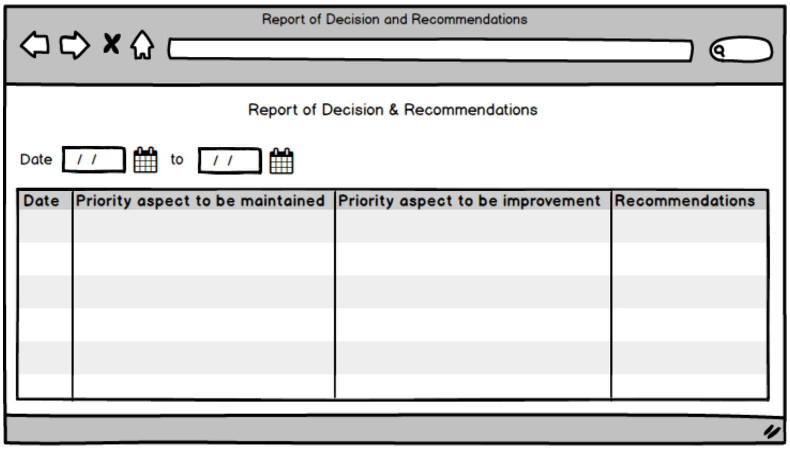

Fig. 11. The Display of Decision and Recommendation Report

Figure 11 shows the form display of the decision and recommendation report. This form makes it easy for users to view the report of decision and recommendation based on a period that can be determined according to the input of the start date and end date.

In general, this research results have succeeded in answering the questions and objectives of this research. The display of the *CIPP-SAW* application can be seen from the application user interface design in Figure 1 to Figure 11. The workings of the *CIPP-SAW* application also can be seen from the simulation of application calculations that combine the *CIPP* model with the *SAW* method.

The simulation data in Table 1 had been obtained from the data that were inputted through the features shown in Figure 6. In Figure 6, the calculation process can be conducted to get the average score of respondents' assessment on each aspect that refers to the *CIPP* components. The weight data in Table 2 had been obtained from the data that were inputted through the features shown in Figure 3. In Figure 3, the input process of weight data can be conducted by experts toward each of the *CIPP* evaluation components.

The weight normalization calculation can be done using the features shown in Figure 4. Figure 4 provides an easy facility to perform the weight normalization calculation process for each aspect of the *CIPP* evaluations. The calculation is done by dividing the total of an evaluation aspect by the total of all evaluation aspects.

The classification determining process of cost and benefit attributes can be done from the beginning by using the features shown in Figure 2. In Figure 2, a radio button is provided to select one of the attributes, either cost or benefit.

The normalization calculation process to obtain a normalized matrix can be done using the features shown in Figure 7. In Figure 7, the "*process*" button and several textboxes are displayed which make it easy to carry out the normalized matrix calculation process.

The results of the ranking recapitulation shown in Table 4 were obtained from the ranking calculation process using the features shown in Figure 8. In Figure 8, the preference value is shown which is used as the basis for ranking.

The process of determining decisions and providing recommendations is carried out through the features shown in Figure 9. Figure 9 shows the priority aspects that are maintained and improved. Optimal recommendations are made for aspects that are priority improvements.

If this study is compared with the research of Ali *et al*. [25] which measures the effectiveness of the e-learning implementation in a university, so the results of this study are similar to the research of Ali *et al*. which shows the measuring results of the e-learning effectiveness are classified as good.

When compared again with the research results was conducted by Hadullo *et al*. [26], the effectiveness percentage of the *CIPP-SAW* evaluation application was 87.521% which was as good as the evaluation tool used in the research of Hadullo *et al*. It's just that the research of Hadullo *et al*. did not show specifically the effectiveness percentage level of evaluation tool, as in this research which showed the effectiveness percentage of the e-learning evaluation tool.

Based on the quantitative results shown in Table 5, in general, there was no need for a major revision of the evaluation application. However, if it was viewed from some of the suggestions that had been given by respondents in Table 6, so it was indeed necessary and appropriate to add features to enhance the functionality of the *CIPP-SAW* application in the shape of the login form and the report form of decision and recommendations.

This research has succeeded in being an answer to the constraints of Misut and Pribilova's research [27] which only shows the results of measuring e-learning in the context domain. This research provides a solution to solve the constraints of Misut and Pribilova's research by applying the *CIPP* evaluation model to the evaluation application so that it can be used to measure the e-learning effectiveness in the domain of contexts, input, process, and product. In addition, this study is also able to show accurate calculation results based on decision support system methods (one of which is simple additive weighting) to determine priority aspect that is maintained and priority aspect that must be improved in e-learning implementation. This is confirmed by the results of research by Naveed *et al*. [28] which also shows the use of decision support system methods in evaluating the implementation of e-learning.

Even though it has been able to be a solution to other studies, this research also has an obstacle. The obstacle in this study has not shown yet the evaluation component that is used to evaluate in-depth. It is about the socialization stages of the e-learning existence for the academic community.

5. Conclusions

Generally, the display of the *CIPP-SAW* application is categorized as good and its workings are also good, accurate, and effective to use to evaluate the e-learning implementation in health colleges in Bali Province. The results of this research have a high contribution to the progress of the educational evaluation field. This evaluation tool presents an innovation that combines the educational evaluation model with one of the decision support systems methods in the computer field so that the evaluation results become more accurate. Future work that can be done to overcome this research constraint is to use the components of the *CSE-UCLA* model in evaluating the implementation of e-learning.

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