Physical design development for evaluate digital library application based on modified *CSE-UCLA* with *weighted product*

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Abstract. Digital library as one of the supporting services of information technology-based learning process has been found in many universities, but in the implementation, there are still many obstacles. Therefore, it is necessary to evaluate using appropriate tools to obtain accurate results. Based on that, the primary purpose of this paper is to explain the physical design of applications that apply the modified *CSE-UCLA* model with *weighted product* method, so it can be used to evaluate the digital library. Subjects involved in conducting trials on this application for digital library evaluation are four peoples consisting of two educational experts and two informatics experts. The location of the experiment was done in one of the computer universities in Bali Province. The tool used to collect data of trial result is in the form of questionnaires. The analysis technique used is descriptive quantitative concerning the quality percentage of each trial aspects. The results obtained from this study were average percentage of evaluation application quality of 92.00% belonging to the excellent category, so it can be concluded in general that applications were ready for use to evaluate the quality of digital library services.

1 Introduction

There are various information technology-based services used in helping the learning process in universities, including blended learning, e-learning, digital library, e-module, and others. The emergence of various information technology-based services in universities occurred due to rapid advances in the field of information and communication technology. The advancement of information and communication technology has a tremendous influence in various fields, including in the field of education which enables the learning process to be well facilitated through the help of information technology, especially computer [1]. One of the most important services of various information technology-based services those were utilized in the field of education and become a requirement of a universities accreditation, so the existence of digital library needs to be optimized. Besides, the digital library as one of the important services, because it becomes information technology-based services that must be available in universities to facilitate academic community in searching the source/teaching materials supporting the courses learned and other digital collections to support the learning process.

But the reality that occurred in the field, not all universities can organize digital libraries optimally. There is even a college in the field of computer, which provides digital library services only as a formality for completeness of accreditation without running the process business of digital libraries well. Based on the

problem of evaluation activities is certainly needed in obtaining a recommendation improvement of digital library services to be more optimal. The meaning of the actual evaluation activity to obtain results that can later be used as a recommendation in taking a decision. The meaning is essentially the same as the research studies on the evaluation that has been done previously by Divayana [2-6], Suandi, Putrayasa and Divayana [7], Arnyana, *et al.* [8], Jampel, *et al.* [9], Divayana, Ardana, and Ariawan [10], Divayana and Sanjaya [11], Divayana, *et al.* [12-15], Divayana, Adiarta and Abadi [16-19], Divayana and Sugiharni [20], Ariawan, Sanjaya and Divayana [21], Wahanani, Suartana, and Hasyim [22], Lee, *et al.* [23], Xuesheng and Liyingi [24], Li, *et al.* [25], Suhaimi, *et al.* [26], Fatahillah, *et al.* [27], Burhani, Zukhruf and Frazila [28], Calmanoa, *et al.* [29], and Xu, *et al.* [30].

In order to obtain an evaluation result that can show a good quality average value in terms of components that can indicate the initial state of the system, the components can indicate an alternative choice to meet the needs of the program, a component that is able to introduce information about the program, components that are able to show information about the function/performance of the program, and the capable components that show information about the benefits of the program. Besides, the evaluation results are also able to show the percentage of quality ranging from the smallest percentage to the highest in each evaluation component. Given the need for such evaluation results, it is necessary to develop appropriate evaluation

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applications as their solutions. The evaluation application that can be developed in the form of evaluation application based on the modification of education evaluation model that is *CSE-UCLA* by using decision support system method that is a *weighted product*. Based on the existing problems and general idea for problems solving, then the problems formulation in this paper are: 1) how is the physical design of application for digital library evaluation based on modified of *CSE-UCLA* evaluation model by using *weighted product* method?, 2) how is the result of user response to the physical design of the application?

This research arises because based on the obstacles found in research that has been done before in 2016 by Divayana [31] that the evaluation of expert digital library based on the expert system in one of the universities in Bali province still not able to show the evaluation result from the lowest value until the highest of each component of the evaluation, so it has not yet been found with certainty that the priority aspects must be improved on each component of the evaluation.

2 Method

This study is a development research, using 10 stages of Borg and Gall development model [32], which consists of 1) research and information collecting, 2) planning, 3) develop preliminary form of product, 4) preliminary field test, 5) main product revision, 6) main field test, 7) operational product revision, 8) operational field testing, 9) final product revision, and 10) dissemination and implementation. In particular, the study of this paper only discusses the stages of developing preliminary form of product and preliminary field test, because it refers to the formulation of predetermined problems related to the physical design of the application and the user's response to the physical design. To find out the results of the user's response to the physical design, then conducted a trial involving four users, they are two informatics experts and two education evaluator. The location of this trial was in one of the computer universities in Bali Province. The tool used to collect the results of user responses in the form of questionnaires. The analysis technique used in this study was quantitative descriptive. The physical design of an application for digital library evaluation based on modified *CSE-UCLA* with the *weighted product* can be shown in Figure 1 to 3.

The formula used in the normalization process is the vector-S formula in the *weighted product* method, which is shown as follows [33-35].

$$S_i = \prod_{j=1}^n x_{ij}^{w_j} \quad (1)$$

With $i=1,2,\dots,m$, and $\sum w_j$ must be worth $= 1$

where:

S : alternative preference values of normalization result

x : criteria value

w : criteria weight

n : number of criteria

w_j is a rank that is either positive or negative. The positive value for profit attribute, and the negative value for cost attribute.

The determination of evaluation result based on the ranking process using the vector-V formula in *weighted product* method, which is shown as follows [33-35].

$$V_i = \frac{\prod_{j=1}^n x_{ij}^{w_j}}{\prod_{j=1}^n (X_j)^{w_j}} \quad (2)$$

where:

V : The relative preference value of each alternative for ranking

X : Criteria value

w : Criteria weight

The alternative chosen is the alternative that has the highest preference value.

The average category of trial results of the application for digital library evaluation follow the converting of quality percentage to scale 5 [36], showing the details as follows: 1) excellent category with 90-100% percentage range, the good category with 80-89% percentage range, enough category with 65-79% percentage range, less category with 55-64% percentage range, and poor category with 0-54% percentage range.

3 Results and discussion

The main menu of an application for digital library evaluation based on modified *CSE-UCLA* with the *weighted product* is shown in the following figure 1.

Fig. 1. Display of Main Menu.

The normalization form of an application for digital library evaluation based on modified *CSE-UCLA* with the *weighted product* is shown in the following figure 2.

The screenshot displays the 'NORMALIZATION PROCESS' form. It includes a menu bar with options: File, Edit, Process, Profile, Result, Help. Below the menu is a tabbed interface with 'Welcome Page' and 'Normalization Process X'. The main content area is titled 'NORMALIZATION PROCESS' and contains two tables. The left table lists various assessment criteria (Weight, Aspect ID, System Assessment, Program Planning, Program Implementati..., Program Improvem..., Program Certification) with numerical values. The right table shows a list of identifiers. Below the tables, there are input fields for 'Vektor V' and 'System Assessment'.

Fig. 2. Display of normalization form.

The evaluation result form of an application for digital library evaluation based on modified *CSE-UCLA*

with the *weighted product* is shown in the following figure 3.

The screenshot displays the 'RESULT OF EVALUATION' form. It includes a menu bar with options: File, Edit, Process, Profile, Result, Help. Below the menu is a tabbed interface with 'Welcome Page', 'Normalization Process', and 'View Result'. The main content area is titled 'RESULT OF EVALUATION' and contains a table with columns: Position, Date, Components, Constraints, and Recommendations. The table lists five evaluation items with their respective weights and constraints.

Fig. 3. Display of evaluation result form.

Figure 1 shows display of the main menu that serves as the main gateway in connecting to other forms. Figure 2 shows the display of normalization form used to perform the multiplication of attribute ratings after first

being powered by the attribute weights. Figure 3 shows the display of evaluation result form. The trial results of an application for digital library evaluation by four respondents involved can be seen in following Table 1.

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Table 1. Trial results of application for digital library evaluation by respondents.

No.	Trial Aspect	Respondents				Σ	Percentage of Quality
		R1	R2	R3	R4		
1.	Conformity and accuracy of login design	5	4	4	4	17	85.00
2.	Conformity and accuracy of main menu design	4	4	5	5	18	90.00
3.	Conformity and accuracy of user data input form	4	5	4	5	18	90.00
4.	Conformity and accuracy of the form design of interest rating score input by admin	5	5	4	5	19	95.00
5.	Conformity and accuracy of the form design of decision-making preference weights	5	5	5	4	19	95.00
6.	Conformity and accuracy of the form design of interest rating score input on each evaluation aspect by user	4	5	5	4	18	90.00
7.	Conformity and accuracy of the form design of calculation average value of each aspect	5	4	4	5	18	90.00
8.	Conformity and accuracy of the form design of normalization process	5	5	4	5	19	95.00
9.	Conformity and accuracy of the form design of ranking process	5	5	5	4	19	95.00
10.	Conformity and accuracy of the form design of evaluation result	5	5	4	5	19	95.00
Average							92.00

Referring to the conversion, and based on the data shown in Table 1 above, so trial results average of application for digital library evaluation included in the excellent category, so in general the application is ready for use and no need for improvement anymore.

The results of this study represent the answer to the obstacles found in previous studies by Divayana [31] related to limitations regarding evaluation results calculation showing the lowest value up to the highest of each evaluation component. Besides having advantages as a solution to the previous research constraints, but specifically in this study also found obstacles. The obstacles found in this study is the unavailability print out facility of the evaluation report, and backup data facility so that there is no print archive or digital archive if suddenly the application breaks.

Future works that can be done to overcome these obstacles is in the development form of evaluation application of digital library services equipped with backup data and print facility of the evaluation report.

4 Conclusions

The application for digital library evaluation is already good and ready to be implemented in universities. This application has been able to provide accurate calculation results using *weighted product* method, especially in showing the lowest value up to the highest of each evaluation component of *CSE-UCLA* model. Solutions that can be done to overcome obstacles in this study is to prepare the reports print facility and backup data facility.

The authors would like thanks to Director General of Higher Education on the Indonesia Republic, who provided funding in this study. The authors also would like thanks to the Rector of Universitas Pendidikan Ganesha, which provides opportunities in conducting this study and all parties who provided to support and assistance in completing this study.

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