Preliminary design of CIPP-SAW evaluation model in measuring ICT-based learning effectiveness in health colleges

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Abstract. Evaluation activities are essential to be conducted to measure the effectiveness level of the ICT-based learning process in colleges, including also specifically for health colleges. Evaluation models that are often used to measure ICT-based learning effectiveness in health colleges are formative-summative models. However, reality shows that the evaluation model is not effective. The problems solving to overcome that problem is to develop a new evaluation model in the form of CIPP (Context-Input-Process-Product) model based on SAW (Simple Additive Weighting) so that it can show the assessment accuracy level to ICT-based learning quality aspects. This study purpose was to know the initial design of the CIPP model based on SAW. This research uses the Borg & Gall development method, which focuses on the model design phase. Subjects involved in designing this evaluation model were three peoples with academic classifications in the fields of information technology, educational evaluation, and health. The research results showed that there was a clear evaluation model design using CIPP evaluation components and SAW methods in conducting learning evaluation. The impact that arises from this study results is the effectiveness of the implementation of ICT-based learning was more clearly measured, while the implications of this study present an evaluation model innovation in the field of education which is the adoption of decision support system concept in facilitating the calculation of the effectiveness of each evaluation aspect starting from the highest level to lowest.

1. Introduction
The learning process that occurs in universities today has undergone a very rapid change, along with the emergence of the 4.0 industrial revolution. The learning materials and instructional media have begun to switch from hardcopy to digital format. Likewise the strategy and model in learning has changed from conventional (through face to face between students and lecturers that only occur in class) to be based in information technology through the utilization of e-learning in learning activities that can be done outside the classroom.

Even though the use of information technology has been applied in various lines in the university environment to get easier the learning process, but the level of implementation effectiveness in information technology-based learning is also not necessarily optimal. The facts in the field showed that there are still difficulties in students (especially in health colleges) in following information technology-
based learning models. That statement is reinforced from the results of a research that was conducted in 2016 by Ghasemi et al. about “e-learning in medical sciences education: a comprehensive literature review”, which states that commonly the students of health science view positively about the importance of applying technology-based learning information, but sometimes in its implementation raises the yearning of students to interact directly with lecturers in the classroom and sometimes raise the feel frustrated of students due to their boredom and inability to operate information technology [1]. The other research which strengthens the facts that occur in the field is research that was conducted in 2014 by Ikkay and Zeynep about “impacts of e-learning in nursing education: in the light of recent studies”, which states that students of nursing education tend to difficulties in following information technology-based learning due to ignorance of the ICT importance and their inability to operate it [2].

Based on those problems and facts, it is necessary to take appropriate actions to overcome them. The one step that can be used to obtain recommendations or solutions to those problems was to conduct evaluation activities using a valid model. The one of evaluation model that is often used to evaluate the learning process in health colleges is the formative-summative evaluation model. Unfortunately, that evaluation model had not been able to demonstrate the level of information technology-based learning’s effectiveness from the context dimension, input, process, until product based on the highest effectiveness score to the lowest effectiveness score for determine the priority aspects in learning and the dominant aspects that need to be maintained for maintain quality learning. Referring to those situations, it is necessary to develop a new evaluation model as an innovation in answering the weaknesses of evaluation activities that occur at health colleges. One new model that can be developed is in the form of a CIPP (Context-Input-Process-Product) model based on SAW (Simple Additive Weighting).

Based on the problems that occur related to the evaluation of the learning process at health colleges and the emergence of innovative ideas to solve these problems, then the problem statement from this research was how the initial design of the SAW-based CIPP model? From that problem statement, it can be determined the purpose of this research was to find out the design form of the SAW-based CIPP evaluation model that can be used to determine priority aspects and dominant aspects in the learning process (especially learning based on information technology) at health colleges.

This research was carried out from several research results which were conducted by other researchers, including research that was conducted in 2015 by Contreras and Hilles about “assessment in e-learning environment readiness of teaching staff, administrators, and students of faculty of nursing-Benghazi University”, showed the assessment results in the form of human resource readiness at the Faculty of Nursing-Benghazi University in implementing learning using e-learning [3]. The weakness that is still found in the research conducted by Contreras and Hilles is that it has not been explained in detail the assessment standards used to assess the readiness of human resources in the implementation of e-learning. The research that was conducted by Donkin and Askew in 2017 about “evaluation of formative (in-class) versus (e-learning) activities to benefit student learning outcomes in biomedical sciences”, showed that formative assessment has a positive role in knowing generally level of the learning process effectiveness [4]. The obstacle in Donkin and Askew’s research was had not been able to show the level of the learning process effectiveness more specifically from the highest to the lowest levels based on a review at each aspect of the assessment.

The research on “summative assessment in a doctor of pharmacy program: a critical insight” which was carried out in 2015 by Wilbur showed the results that summative assessment was not suitable to be used as a tool to conduct an assessment of the implementation of learning in a doctoral program of pharmacy [5]. The obstacle that is still found in Wilbur’s research is that no assessment model has been found that is appropriately used to assess more authentically the implementation of learning in a doctoral program of pharmacy. The research on “evaluation of the use of e-learning in undergraduate radiology education: a review” which was conducted in 2014 by Zafar et al. showed that Kirkpatrick’s evaluation model could be used to evaluate the characteristics of information technology-based learning (especially e-learning) [6]. The obstacle which was found in the research that was conducted by Zafar et al. is the evaluation component that used is still focused on outcomes so that other evaluation components such as context, input, process, and product have not been revealed in depth [6].
Wing et al. in a research that was conducted in 2014 on “formative assessment in health care education”, explained that through a formative assessment model it can improve and inspire students to learn independently because there is no pressure in learning as the result of a fear at summative assessment that seems to be a threat [7]. The obstacle that is still found in Wing et al research is that it has not been able to show in detail what aspects of learning can cause the students excited for learning and what aspects that cause the students unexcited for learning, so that it will make it easier to give the follow-up of improvement/refinement to the learning process. The research in 2017 that was conducted by Mugimu and Mugisha about “assessment of learning in health sciences education: MLT case study”, stated that authentic assessment activities are needed to properly assess health sciences education to improve the quality of students in learning [8]. The obstacle in the research that was conducted by Mugimu and Mugisha is that there is no detailed explanation about the authentic assessment components which is needed starting from input, process, and product in learning on the health sciences education.

A research that was conducted in 2018 by Stenberg et al. about “formative peer assessment in healthcare education programmes: protocol for a scoping review” showed that there are peer evaluations that use a formative assessment model to assess health service education programs [9]. The obstacle which was found in Stenberg et al. research is that it has not shown the existence of a clear mapping related to aspects that become the standard of assessment. The research that was conducted in 2017 by Lisnawita et al. about “developing decision support system: assessing the lecturers’ performance with additive weighting method”, showed the process of calculating simple additive weighting methods that can be used in decisions making to determine the good or bad of lecturer’s performance in carrying out the three main obligations (tri dharma) in higher education [10]. The obstacle which was found in the research that was conducted by Lisnawita et al. is that the aspects on decision making in each component of tri dharma have not been explained in detail as a reference for determining the lecturer performances effectiveness.

The research that was conducted by Divayana and Sanjaya about “mobile phone-based CIPP evaluation model in evaluating the use of blended learning at school in Bali”, showed the use of CIPP model to evaluate the blended learning implementation at vocational high schools in Bali [11]. The obstacle that is still found in the Divayana and Sanjaya research is that it has not been able to show the aspects that be the priority of evaluation. Based on the problem statement, objectives, and several studies behind this research, so that it is necessary to conduct research on the initial design of the CIPP evaluation model that is combined with the SAW method to obtain an overview about the correct evaluation stages in conducting evaluations towards ICT-based learning in health colleges (especially those in the Province of Bali).

2. Method
The study method that was used in this study was the Borg and Gall method which consists of 10 stages [12], which currently focuses on the preliminary form of product stage which resulted in the initial design of the SAW-based CIPP evaluation model. The numbers of persons that were involved in making the initial design of this model were three peoples, which consisting of one person of academically qualified in the field of informatics engineering, one person in the field of educational evaluation, and one person in the health field. The application that was used to design the initial design of this model was the yEd Graph Editor. The time that was needed to make the design was for a week.

3. Results and discussion
This research resulted in the initial design of the evaluation model that combines two models, namely CIPP and SAW. CIPP is one of the educational evaluation models, while SAW is one method of decision support systems in the computer field. The initial design of the model can be seen in figure 1.
Figure 1 describes the initial design form of the SAW-based CIPP evaluation model that was used to measure the effectiveness of the ICT-based learning implementation at health colleges. The design of the evaluation model has four evaluation components, namely Context, Input, Process, and Product. At the context component consists of four aspects, including user needs, support from college academic society, legality, and usefulness. The input component consists of four aspects, including the readiness of user capabilities, the readiness of developer capabilities, funding readiness, and the readiness of facilities and infrastructure. At the process component consists of four aspects, including the installation of hardware, installation of software, implementation of ICT-based learning, and financial management. The product component consists of two aspects, including the learning process quality and user satisfaction. All aspects of evaluation that was used to measure the effectiveness of the ICT-based learning implementation at health colleges were quantified in the form of scores that were obtained through questionnaires. The results of collecting scores for each aspect using the questionnaire were then given a weighting decision and continued with the process of calculating effectiveness using the SAW method. The results of the calculation of the SAW method resulted in the effectiveness level of ICT-based learning processes from the highest to the lowest levels. Referring to the results of the effectiveness level, then next was able to be determined the most dominant aspects and the aspects that be a priority. The decisions about the dominant and priority aspects were used as a basis of making...
recommendations for improvements to aspects that are still a priority and maintaining the effectiveness of the dominant aspects that determine the success of ICT-based learning processes at health colleges.

This research succeeded in becoming a solution to the obstacles found in several previous researches including: 1) the constraints of the research that was conducted by Contreras and Hilles were successfully answered by showing the existence of features in the design that present aspects of human resource readiness in the input component, namely the readiness of user capabilities and the readiness of developer capabilities; 2) the constraints of the research that was conducted by Donkin and Askew had been answered with the existence of features in the design that present the determination of the level effectiveness in learning process from the highest to the lowest scores; 3) the constraints of the research that was conducted by Wilbur and also the research that was conducted by Mugimu and Mugisha had been answered by presenting features in design that was the form of aspects in each evaluation component starting from the context component, input, process, and product that showed authentic assessment which can carried out on ICT-based learning processes at health colleges; 4) Zafar et al. research constraints, was able to be answered through the features in design that showed all evaluation components, including context, input, process, and product so that evaluation did not only refer to outcomes; 5) the constraints of Wing et al. research and also the research that was carried out by Divayana and Sanjaya were answered with the availability of features in the design that were able to show the dominant aspect and priority aspect to find out aspects that must be maintained and aspects that must be improved so as to facilitate the give of what follow-up recommendations must be done to improve the learning spirit of students; 6) the constraints of the research that was conducted by Stenberg et al and also the research that was conducted by Lisnawita et al, had been answered by the presence of features in the design that were able to show aspects that become the assessment standard and at the same time also become the reference categorization of effectiveness level starting from the context component, input, process, and product, so it was clearly measurable the success of the learning process that occurs between students and lecturers. Even though this research had been able to be a solution to the weaknesses that were found in other researches, this research also still has limitations because it has not specifically raised the aspects which were used to measure the efforts to socialize the existence of ICT-based learning programs at health universities.

The results of this research successfully demonstrated the initial design of the educational evaluation model which is an innovation that combines the educational evaluation model (called CIPP) with decision support methods (called SAW) so that the ICT-based learning evaluation process can produce appropriate recommendations following accurate calculations. This statement was reinforced from the research results in 2011 by Kabassi, Alepis, and Virvou [13], which stated that the fuzzy decision-making method is one of the decision support methods that can be used to evaluate e-learning. Other research that strengthens this research results is the research conducted by Piasecki, Roszkowska, and Lyczkowska-Han’kowiak stating that each criterion used to making decisions in an evaluation can refer to the SAW method [14].

4. Conclusions
The initial design of the SAW-based CIPP evaluation model had been able to be realized well, and subsequently it had been used as a basis for developing evaluation applications in measuring the effectiveness of ICT-based learning processes at health colleges (especially in Bali Province). The solution that can be done to solve the obstacles found in this research is to insert one of the evaluation components of the CSE-UCLA model, namely the implementation program component so that it can be used accurately in measuring the effectiveness of socialization efforts the existence program.

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