

Evaluation of e-learning application systems performance based on the users perceptions

(Case study at Bina Nusantara University)

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Abstract— The use of IT applications in teaching and learning had changed the way students learn using e-learning which was more modern, effective and efficient. This paper will explain the result for e-learning system performance evaluation based on faculties and students perspective using the Web-Based Evaluation model of E-Learning system. Number of samples used in this study were 348 students and 270 lecturers who use e-learning system namely Binusmaya. Results obtained from this study were the characteristics and problems of e-learning systems that were complained by users as well as an alternative solution to solve these problems and suggest some recommendations.

Keywords—e-learning; performance; evaluation; users perception

I. INTRODUCTION

The application of information and communication technologies in many areas such as education and training are now offering a new paradigm for education and training at the university and the topic of electronic learning systems (e-learning systems) have received much attention by researchers. Now, the application of information and communication technology (ICT) in education makes it possible to provide education that can transcend the boundaries of space, time and political boundaries [1]. E-learning refers to the use of electronic devices for the process of learning and teaching, including content delivery using electronic devices such as Internet / Intranet / extranet, audio or video tape, satellite broadcast, interactive TV, or CD-ROM [2].

Application of IT in teaching and learning was created to change the way students learn by using a more modern, effective, and efficient way. The alternative is to use e-learning. E-learning is often equated with web-based learning (WBL), internet-based training (IBT), an advanced distributed learning (ADL), web-based instruction (WBI), online learning (OL) and open / flexible learning (OFL) [3]. E-learning is a teaching method using electronic media and multimedia elements such as information technology to deliver the materials. The rapid development of information, communication and a necessity of efficient and effective of learning process encourage the development of e-learning systems [4]. E-learning can provide several benefits in the teaching and learning process as follows: cost effectiveness, timely content, and access flexibility [5]; [6]. Higher education institutions and universities around the world have been

increase the need of using online learning in order to realize the benefits of different education such as: facilitating the exchange of information and collaborative learning, improve the quality of teaching and learning, increasing the possibility of access to education and training, to realize the flexibility of time and place, respond to labor market conditions and its own technological innovation, preparation for lifetime learning and independent learning so that at the same time can reduce costs and improve the overall cost-effectiveness of education services [7]; [8]; [9].

The rapid expansion of the Internet as a delivery platform combined with the tendency of the material to the education has motivated universities to invest their resources to develop online programs. However, an increase in the development of e-learning and to be able to perform continuous management of e-learning system is a pretty good challenge for educational industry. Hence the need for feedback from the users of online learning such as: faculty and students, to be able to develop this system as well [10]. Several factors led to the failure of the system online learning are: (1) too ambitious using cost and time available. (2) information technology developed by not using adequate learning design consideration (3) start developing software without adequate planning immediately, (4) do not anticipate changes to the system according to changes in the system of learning assessment, (5) failure to prepare students actively in the learning process such as group work [11]. The purpose of this research is to evaluate e-learning system based on perceptions of faculty and students to be able to develop a system of effective e-learning according to their criteria.

II. RELATED WORKS

E-learning is an important trend in the application of information and communication technology to facilitate student learning, especially in college where the program and the curriculum must evolve to meet the changing needs of a competitive global economy [12]. Because of the increasing development of Internet, the concept of e-learning is completed and generally refers to the process of learning is done through the internet for online courses offered [13]. E-learning refers to the use of computer network technology, especially through the Internet, to provide information and guidance to individuals. Due to the flexibility access and just-in-time delivery, e-learning is emerging as a popular approach for learning in

organizations and universities [6]. Learning Management System (LMS) or a Virtual Learning Environment (VLE) is widely used as a means of online learning has become a common part of the toolkit in the learning process [14].

The use of web technology has changed the way business is conducted, including in the field of education. In the last decade, the development of e-learning system has to be essential to meet student demand. The main point is the attitude of students towards IT. If they feel comfortable with the LMS, their learning performance will be higher. Multimedia has been included in the LMS in recent years, which could provide extra motivation for students [15]. Student perspective is important, because many higher education institutions seek to attract and retain students and to adopt e-learning program [16]. Academic acceptance has long been recognized by some practitioners of education as one of success factors to the success of e-learning. In the e-learning system, not only the students, but also all stakeholders is important to the success of e-learning. In the internet era, institutions of higher education are increasingly inclined to use e-learning. Benigno and Trentin identify a framework for evaluating e-learning with a focus on two aspects: the first is to evaluate the learning, and the second is to evaluate the student's performance. They use factors such as student characteristics, student interaction, learning materials, learning environment, effective support, and information technology. [17]

The research that was conducted by Farahat illustrates the importance of social factors related to the students' adoption of online learning. Therefore, deploying the culture of online learning among students community, assessing and developing students' readability to online learning, establishing computer labs equipped with sufficient facilities and making them available for all students of the university, supplying students' houses with free internet through the server of DBMU, planning and conducting events to deploy culture of online learning among students and their families can facilitate familiarity with online learning and encourage adoption of online learning. Furthermore, organizing training courses to promote students' perception of ease and usefulness of online learning could also enhance their positive attitudes and consequently their behavioral intention to practice online learning. [18]

Evaluation of e-learning application systems has been conducted by many researchers. For improving the quality of e-learning software from both qualitative and quantitative analyses has been done by Syamsuddin [19] using ISO 9126 software quality metrics as the basis of evaluation framework. Evaluation of e-learning system based on student perception [7]. Performance evaluation of e-learning system using E-Traceability System [20], this research proposed a tool for observing users' learning activities in real-time by monitoring the major possible number of behavioral aspects and personal traits.

III. METHODOLOGY

This case study was based on the migration of old Binusmaya into new Binusmaya. Because of this migration, there were several issues that arise such as problems in the user interface of the new Binusmaya, the access speed, as well as problems in the student empowerment which students and

lecturers assume new version of Binusmaya can be used for assisting their learning process. Based on these problems a case study was done by collecting data, the data was collected in several ways such as library, questionnaire, interviews, and survey. The data was obtained through various sources, the students and lecturers also IT directorate at Binus University. The data such as how to access into new Binusmaya, the user interface of the new Binusmaya, data about e-learning and e-learning evaluation of Binusmaya, as well as the architecture of Binusmaya itself. These data were used to analyze using qualitative data analysis and triangulation methods.

The Evaluation of Binusmaya is conducted using the criteria's of the evaluation of Web-based E-Learning System [21]. The detail of these criteria's can be seen at Fig. 1.

Fig. 1. The Evaluation structure of WELS (Web-based E-Learning System) [21]

Dimension	Criteria
Learner Interface	Ease of Use
	User Friendliness
	Easy of Understanding
	Operation Stability
Learning Community	Easy of discuss with other learners
	Easy of discuss with teachers
	Easy of accessing shared data
	Easy of exchanging learning with the others
System Content	Up to date content
	Sufficient content
	Useful content
personalization	Capability of controlling learning progress and learning
	Capability of recording performance

The Questionnaire data was obtained from Binusmaya users such as lecturers and students. The number of samples used in this study was about 348 students and 270 lecturers.

IV. RESULT AND DISCUSSION

A. Binusmaya : e-learning Application System

E-learning methods are used by Binus University known as MCL (Multi Channel Learning). The systems used a web application called Binusmaya. Binusmaya was made around 2004. Binusmaya used as a means of online learning of the students so that students and faculty can make the process of learning and teaching without the need for face to face in the classroom and students are also not tied to a particular time and place as binusmaya can be accessed anytime and anywhere by using the Internet connection. In 2010, Binusmaya system changed to a newer version.

Binusmaya, as e-learning applications can be accessed by the website at the address: <http://binusmaya.binus.ac.id>. On this page, the user can log in by entering username in the text field of student id and password.

Binusmaya database is stored in a database server that has a capacity of 32 763 MB. Server database that is used not only contains a database for binusmaya applications, but accessed by various divisions in Binus. Existing database on the server include database for admission (marketing), Binus International, Data Accreditation, Binus School, BDPD (English training given to employees), CMS, Binus S3, QMC (Quality Management Center), SAC (Student Advisory Center), SALCC (language laboratory at Binus), and WITEL

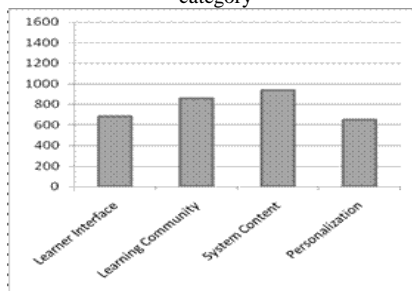
(Widia Center of Excellence for Teaching and Learning). Another database server used is a forum server that has a capacity of 2047 MB. This server is used only to store the forum data. Software that is used as the database server is SQL Server 2005. With so many applications that access the database server, then this causes the weight of work that must be borne by the database server that can cause slow access to the database

The solution, to help improving the performance of applications binusmaya caused by a large load to the database server, is to use a system called Memcached. Memcached is a widely used technology for large sites such as Live Journal, Wikipedia, You tube, Twitter and Facebook [22]. Memcached is a fairly new technology that aims to reduce the database load by adding a cache object to the application layer.

B. Binusmaya evaluation based on user perception

The results of evaluation to Binusmaya e-learning system conducted by questionnaires and interviews, it can be seen that some of the aspects that were considered less by students were ease of use, user friendliness, easy of understanding, operation stability, easy of accessing the data shared, up to date content, capability of controlling learning progress, learning capability of recording performance. While aspects assessed less by lecturers were ease of use, operation stability, easy of discuss with other teachers, up to date content, and capability of controlling learners progress. The detail of the evaluation result of the faculty and students perception of Binusmaya can be seen at Fig. 2.

Fig. 2. The evaluation results of faculty and student perceptions by category



In the category of Learner Interface, the problem that appeared is the ease of use factor, user friendliness, easy of understanding, and the operation stability, this means that the user find difficulty in using Binusmaya and frequent problems such as errors and slow access. The problems that often occur in Binusmaya application were: (1) The display was messed up because i-frame in Binusmaya application only could display partly and some image failed to display due to the slow of internet access. (2) Some menus can't be accessed using certain browsers application. (3) Some errors occur because of server requests time out caused by too many users were accessing the server concurrently.

Queries is used to access data from the database is done by checking the token. Token is like an id that every user had when they logged in to the binusmaya. Token design originally created for this application is expected to be an application with a single login allows the user to access to a variety of other applications in BINUS with one login. With this token,

the data will take longer because every time you open a menu in binusmaya, the application will check whether the token of the user id is still active or not in the database. More users are logging on to the database, make the searching process of token will be longer and user need more time to access menu in binusmaya.

The analysis also showed that some store procedure used to access data on binusmaya has some errors that caused some error in the application. In the category of Learning community, the problem is the easy of accessing shared data factor on the students and easy of discuss with other lecturers.

In the category of System Content, the problem was a factor of up to date content that felt by lecturers and students. The cause of this problem was due to the materials used for learning was very rarely updated so that the material was always used every year besides sometimes new technologies that should be included in the material to add knowledge of students and lecturers.

In the category of Personalization, the problem is the capability of controlling learning progress factor, capability of recording learning performance. This means that students and lecturers feel they were not given the facilities to support student learning and control facilities that allow students to view the history of their learning performance well where for it must be done customization according to their needs.

For the Learning Community, System content, and Personalization dimension, the solution can be given is to add features that provide assistance to students and faculty that help their learning. For example, by giving the media for the teachers can have discussions with each other, to add feature that students can share their to help in sharing information and knowledge. Features for content system used to maintain the quality of e-learning content in order to help the learning process. An example is to check the content that is used to keep up to date and meet the learning needs of students, as well as by adding additional material in the form of an attractive media such as video, animation or games in order to increase students' interest in learning. Personalization features to be used so that the user can control the settings of teaching and learning. An example is to add facilities that students can make arrangements of the given tasks by using a scheduler or notes to remind students if no assignment or exam, a feature that gives a warning to students when there is a decline in their achievement with a GPA meter or the like. Features are also provided so that teachers can conduct a more detailed assessment arrangement to facilitate their assessment.

C. Recommendations of e-learning development

Based on the results of the analysis has been done on the application of binusmaya, some recommendations that can be used for application development of binusmaya are as follows:

- One reason for the poor performance of binusmaya is due to insufficient server capacity. The solution is using memcached to reduce the workload.
- Another cause of the problem is in terms of design binusmaya database is still not optimal. Recommendations to overcome this are to design a foreign key to optimize performance and maintain data integrity, removal of token checking function that can slow down the query. design index to accelerate query binusmaya, checks and change

stored procedures that have a query error as well as inefficient use of tables, trigger design that can be used to maintain the integrity of the data due to the lack of foreign key design.

- One of the problems experienced by users is binusmaya display issue which is considered fewer users friendly. Therefore, the recommendations can be given is to pay attention user friendly display criteria in designing the user interface so that users feel comfortable using binusmaya.
- From the analysis of benchmarking similar e-learning applications, it can be seen there are some features of e-learning should be held on an application e-learning but not owned by Binusmaya e-learning applications such as: a forum for discussion and sharing of material to fellow students and lecturer, Calendar, diaries, and Timetables, self-test and quiz, Whiteboard software, chat, tracking student activity that can be seen in e-learning applications.

V. CONCLUSION

Implementation of e-learning at the University of Binus still had shortcomings on several factors based on evaluation using a web based e-learning system (WELS). Based on students' perceptions of the factors, which were still considered less were ease of use, user friendliness, easy of understanding, operation stability, easy of accessing shared data, the up to date content, capability of controlling learning progress, learning capability of recording performance. While based on the perceptions of teachers, the factors that were lacking were the ease of use, operation stability, easy of discuss with other teachers, up to date content, and capability of controlling learners progress. Therefore, faculty and students as users still assume that binusmaya as e-learning system used in Binus University was less helpful in their learning process.

Based on an evaluation of the system, causes of slow access (operation stability factor) of binusmaya was database design, server capacity and the lack of effective query. Then the cause of an error that was often encountered by users while using binusmaya (operation stability factor) was a database design and query errors that are used to access the data.

Causes other than operation stability factor were due to the lack of existing facilities to support teaching and learning activities of users (faculty and students) at Binus University

Several aspects need to be improved on binusmaya e-learning system is the capacity of the database server, database and query design, user interface design, as well as additional features of the application of e-learning system that can meet all the requirements

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