Chapter

SMARTLAB: APPLICATION DESIGN FOR SUPPORTING STUDENTS' COLLABORATIVE WORK IN LABORATORY

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ABSTRACT

For information systems students, practice in conducting experiments works to create software applications in laboratories, rarely done alone by themselves. Collaboration between students are needed to make innovation of software based on knowledge sharing with other students. The purpose of this research is to design application SmartLab - information system applications that can be used to develop students for doing experiments in the laboratory. With this application, managing the laboratory intelligently is expected to be able to support knowledge sharing community. Through collaborative learning from students who will conduct experiments with students which already done that kind of experiments then sharing knowledge can occur to achieve the results that have good quality. By observing the competencies and the needs of students in the laboratory, SmartLab application has been designed. This paper describes process of design and development techniques of SmartLab application which can be a model of collaborative learning as basic component of Laboratory work in Department of Information Systems Universitas Pembangunan Jaya, Tangerang Selatan, Indonesia.

Keywords: Application software, intelligently laboratory, knowledge sharing, collaborative study

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INTRODUCTION

The use of information systems applications in this time already has influenced people's lifestyles in various daily activities, especially in urban communities. Even though there are already have a lot of applications and that can be used without cost, in many cases it hasn't answered the needs of a person or organization. The need to get applications that have different functions from those currently available, will become part of the job of work for those who have expertise in the field of Information Systems.

Department of Information Systems (SIF) Universitas Pembangunan Jaya (UPJ) organizes education to produce graduates who have competency attitudes, knowledge and skills in the field of Information Systems. One of the special skills achieved is being able to analyze and develop information systems applications by doing software engineering, as written in the curriculum book of UPJ about the achivement of SIF (UPJ, 2016, 167 - 69). In engineering learning, aspects of skills are achieved by practicing in the laboratory. Learning theory and practice, is important to be able to master the knowledge and skill of Information Systems. Activity study for theory or doing practice does not make that activity can dominates each other. These activities are carried out alternately in stages in accordance with learning material, complementing and reviewing each other. For Information Technology, practices concerning people and process which are required to bridge the gap of knowing and doing, such barrier of the knowledge application (Haamann and Basten, 2019, 707).

Currently, the use of laboratories by SIF students mostly only conducted the experiments that comes from the lecturers assignments. Students need to conduct further experiments in finding solutions to new problems that develop in the real word. There is successful experience in participating competitions that are attended by senior students and alumni, as their result of laboratory that ranging from preliminary experiments to being a product while in the laboratory. Their experience can be a reference for junior students. However, the documentation for the experiment was not well managed, so it was difficult to be used as a reference material by junior students.

The laboratory is needed to be a place for innovation with a variety of new concepts in work activities. Important insights and strategies for innovation will emerge in the laboratory as a result of collaboration between various levels of students. The challenge is how to find forms and methods that are effective at the organizational and network level. The laboratory work is not only repeated same experiments that already done before, but continue to explore other possibility.

From the background above, the problem of this research can be concluded

1. The laboratory is not yet a place for students to innovate, there are many repetition activities from existing ones.

2. Collaboration between students has not been well managed so that it can achieve a form of knowledge sharing that has an easy structure to do.

3. How to design laboratory systems that are able to facilitate ongoing experiments so that the results are more optimal than before.

From these problems, the purpose of this study is to build a SmartLab application with specific objectives:

1. Able to do documentation on the course of an experiment starting from the beginning to get ideas, make concepts, analyze needs, use-cases, computer programs to the occurrence of software application products.

2. Able to make a map the needs of students who are looking for solutions by giving references to students who have a track record of having conducted experiments on similar problems.

3. Able to provide information on the results of experiments that have the possibility to be continued at a more complex level.

The urgency of this research is as follows:

1. Require digital documentation of experimentation that becomes a reference for students.

2. The importance of collaborating between students in knowledge sharing.

3. Realizing an information system application prototype for intelligent laboratory management that can be adapted to various fields of science.

This research refers to previous research on three main subjects, namely the role of laboratories for learning, cooperative learning models in collaborative activities and the development of smart technology.

Laboratory

The concept of learning methods in laboratories that are used in SmartLab refers to the results of studies on the Change Laboratory (CL) method and the Laboratory Based Education (LBE) learning model.

The CL laboratory helps find new challenges through a shared process of inquiry, learning and change. In analyzing the cause of the problem, it will be oriented to systems that implement new forms of resolution. The CL method not only results in thinking solutions or changing practices, but also builds collaboration and motivation based on new understanding of activities and new perspectives for future progress. New concepts are made for ongoing, shared learning, new forms of activity and expansion of expertise beyond previous limits (Virkkunen and Denise, 2013, 1-3).

LBE learning system is a learning model that someone can practice cognitive, affective and psychomotor abilities by using laboratory facilities. The LBE learning

system integrates education, research and community service processes in the laboratory. Laboratory management with the LBE learning model becomes more complicated, however, through the system approach of the process, the management of this laboratory is simplified and fulfilled systematically without leaving general management functions used in the laboratory (Kautsar et al., 2019, 630).

Cooperative Learning

Cooperative learning is carried out by learning and working together by collaborating in groups in achieving learning goals with heterogeneous group structures. Insights into implementing cooperative learning have been reviewed in research that examines the benefits of cooperative learning to improve skills. At the level of tertiary education in tertiary institutions, which explores student involvement in cooperative learning from the perspective of expanding their learning programs rather than using modules that are used according to the literature. Student experience increases cumulatively which impacts on abilities that can be seen at the end of the learning program. The cooperative learning has also been studied to improve student cognitive learning outcomes. At the end of learning in the experimental class (using the cooperative learning method) and the control class (not using the cooperative learning method) showed a significant difference from the cognitive learning outcomes of students (Raviv et al, 2019).

Smart Technology

For information systems innovation research today leads to three keywords Network, Smart and Open according to the results of a study discussed at the conference chapter for the Association of Information Systems in Italy in 2016. It has been published in the book *Network, Smart and Open, Three Keywords for Information Systems*. Smart technology is not only associated with the use of digital equipment in carrying out activities, but also can provide flexibility at work. In the context of the development of Information Communication Technology (ICT), to produce new applications is not just to imitate old applications that already exist. New ways of thinking with a new perspective on the entire technological environment are needed to influence the way work life is interrelated in society (Lamboglia, 2018, 1-10).

From the study of theory and related research above, it becomes the basis for SmartLab's research proposal: the design of applications for the knowledge sharing community. The SmartLab application is designed on the basis of a learning model that is reviewed and links to the latest trends in the development of Information Systems

# METHODS

Software Life Cycle

This research method begins with direct observation on the activities of students in the laboratory in conducting experiments to make information systems applications. From the observations found repeated difficulties and errors, lack of depth of material to solve current problems and lack of innovation from the experimental activities. From the observations made a questionnaire and conducted interviews in order to answer the problems experienced by students when conducting experiments in the laboratory. The results of quantitative and qualitative data collection through questionnaires and interviews obtained input from students on the problems experienced in the laboratory. From the student's data and input using the system design method, system analysis and initial design are carried out to create the SmartLab application.

The stages of this research method of making and developing SmartLab applications are passed through the sequence of the Software Life Cycle, namely:

1. Planning,
2. Analysis
3. Design
4. Program Writing
5. Testing
6. Maintenance

The stages that have been implemented are: Planning, Analysis and Design. From direct observations and obtaining student responses through questionnaires, interviews and discussions, a needs analysis is conducted so that from this stage the initial design of the SmartLab application can be made..

RESULT AND DISCUSSION
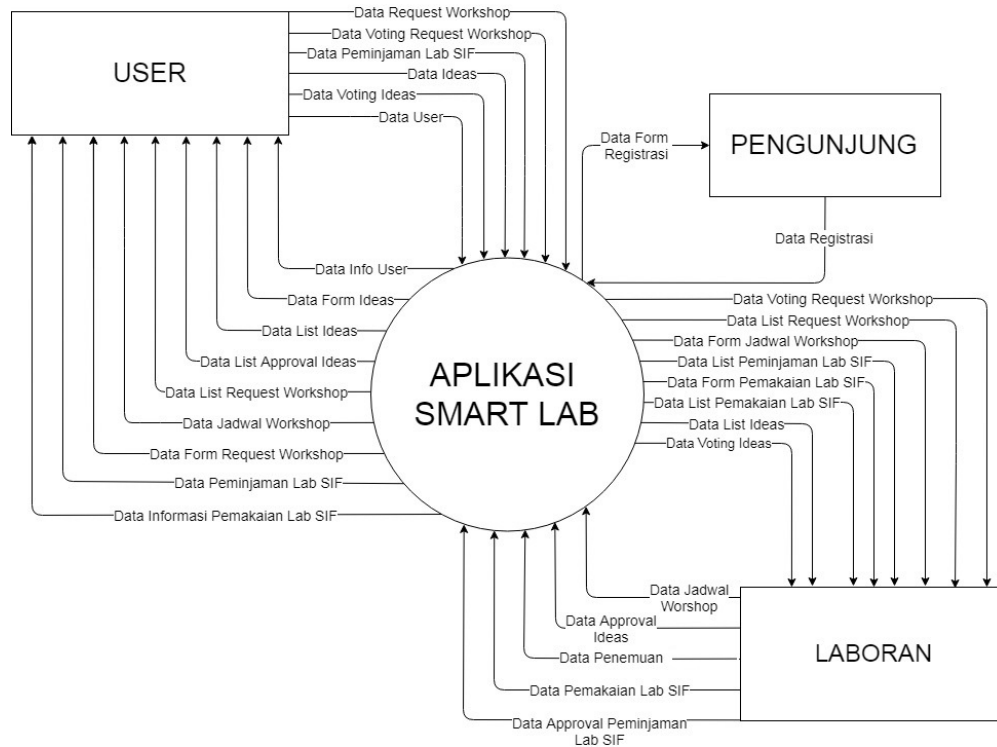
Figure 1. Proposed Desgin of SmartLab

Explanation of the above design which has been made in the initial stages as follows:

1. Actors in the system consist of visitors, users and laboratory assistants

2. Visitors can only see the results of experiments and existing works.

3. Visitors who will participate can register as users

4. Users can submit workshops, which are requests for training in the laboratory to get the technical skills needed in their experiments.

5. The report will arrange the workshop implementation data with Lab usage time.

6. In addition to managing workshops, the laboratory also manages new ideas that arise from students to be responded by other students, so collaboration between students is carried out to innovate.

From this design stage, a discussion group group will first be held with lecturers and students to complete the stages to be carried out as follows:

1. Writing programs based on a mutually agreed design
2. Testing programs from various platforms
3. Maintenance of programs from possible errors or errors

The next stage of development will be carried out by observing the input available during the application is used. Responses from experts and students who use this application will enrich the function of this application later.

CONCLUSION

In this paper, SmartLab application is proposed, based on the results of research and design that has been done, it can be concluded that recording the documentation for the experiment can be managed and possible to use as a reference for other work by further students. From the documentation of experimental work may avoid repetition work then cretivism of student can be explore. Collaboration between students able to managed. From student activity record, junior student can communicate direct to talk with the senior expert. SmartLab functions able to facilitate ongoing experiments so that the results are more optimal than before.

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