

# **Web-Based Application of High School Laboratory Administration: Case Study at SMA Pasundan 8, Bandung, Indonesia**

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## **Abstract**

In this paper, we report the design of a web-based laboratory system which uses the PHP programming language, in addition to using the programming language PHP and MySQL as its database. In making this application, we customized laboratory system of SMA Pasundan 8, Bandung (Pasundan 8 High School in Bandung, Indonesia). The laboratory website uses a MySQL database for collecting user data active, borrowing and repayment of laboratory equipment. The data will be recorded based on credentials, schedule access to laboratory and information notice new tool can be found the information on the user's laboratory. The schedule of each user will be known by the users who use the lab.

## **Keywords**

laboratory applications, PHP, mysql, Yii Framework, administration

## **1. Introduction**

### **1.1 Background**

The development of technology that is increasingly advanced and increasingly sophisticated from time to time, now the development of technology can be an excellent alternative that can help an institution such as government, health, social and cultural, companies, institutions and others (Pradana & Wijaksana, 2017). We can see at this time that all systems in these institutions use technology as material to make it easier for all fields to work better with technology (Connolly & Begg, 2010).

From the explanation of the position of the laboratory and the existing problems, in the IT Project application will be built that can make a recent development of the use of technology, which will be made in the laboratory based on the website and by using the Mysql database to collect data on active users, borrowing and the return of laboratory equipment will be recorded identity, laboratory use schedule and notification of new equipment information can be known information to laboratory users and each usage schedule will be known by users who will use the laboratory. So that makes laboratory users will be more updated to know the development of laboratories in the Pasundan 8 High School, Bandung (SMA 8 Bandung).

Based on the background above, there are several problems or obstacles experienced by teachers and students in carrying out activities in the lab, including registering, borrowing equipment, returning equipment and scheduling at a laboratory that still uses the writing system on the folio book sheet. There is no guarantee of data determination

in writing in a book in the event of loss / error in writing. The absence of information from the system on new laboratory equipment to each laboratory user.

Also based on the background and problem formulation above, the objectives to be achieved are to make it easy to register, borrow equipment, return equipment and schedule in the laboratory, facilitate the storage of any data that enters an application both from laboratory users and each laboratory device. Last is to make it easy to find out the latest tools in the laboratory to laboratory users. This system is designed based on the scope, including designing a registration, borrowing, returning tools and scheduling system is stored using the Mysql database to systematically collect data to obtain information from the database. Laboratory equipment management will be managed in the Mysql database as a system that stores the incoming device data. Designing the latest laboratory equipment information using the website available at the laboratory.

## **1.2 Writing Structure**

This report as a whole consists of five chapters, in which each chapter outlines the following issues:

Chapter I. Introduction, Contains background, problem identification, objectives, scope, systematic writing. The background contains a brief review of the conditions / conditions that exist and the shortcomings of the system being observed so that the topic taken appears, identification of the problem contains various problems that have been identified and will be given a solution through the function of the system / application / tool to be made, the objective contains the objectives for what the system / application / tool was made, the scope contains project boundaries or the scope of the application to be built, and Systematics of writing explains the contents in the project report.

Chapter II. Platform Theory, containing theories about software used in making projects, including hotel theory, service, application, website, Unified Modeling Language (UML), Data Dictionary, Database, PHP, MySQL, HTML, Yii Framework, XAMPP, Sublime Text, Apache, and Testing, Research Methods, Research Journals.

Chapter III. Analysis and Design, Contains analysis and design. The analysis consists of an analysis of the system that is running, analysis of procedures / Flow Map that is running, analysis of the system to be built, analysis of application requirements and analysis of software and hardware requirements. The design using object oriented consists of use case diagrams, class diagrams, interaction diagrams, sequence diagrams, action diagrams, state chart diagrams, component diagrams, deployment diagrams, object diagrams.

Chapter IV Implementation and Testing, which discusses the implementation of an application that includes the application environment, display interface, testing, and usage instructions.

Chapter V. Conclusions and Recommendations, is the final part of the report containing conclusions and suggestions from the project that has been made so that it can be a reference in further project development.

## **2. Theoretical Ground**

### **2.1 General Theory (UX/UI Concept)**

Application programs (often only referred to as applications) are "programs created by users intended to perform a specific task". Laboratory (abbreviated as lab) is a place of scientific research, experiments, measurements or scientific training is carried out. Laboratories are usually created to allow these activities to be carried out in a controlled manner (Pradana et al., 2020). The laboratories in Pasundan 8 Bandung High School are laboratory facilities which are managed by the Ministry of National Education in Bandung City which are managed by Pasundan 8 Bandung High School as an infrastructure for the pratikum process at the school. Existing laboratories at the school consist of: Physics Laboratory, Chemistry Laboratory and Biology Laboratory which are arranged in one place by insulating the place at each practicum place (Pradana & Novitasari, 2017).

The World Wide Web (WWW), better known as the web, is "one of the services obtained by computer users connected to the internet". The web was originally an information space on the internet, using hypertext technology, users are led to find information by following the links provided in web documents displayed in a web browser (Whitten, 2006). Databases are logically connected data and are designed to meet the information needs of an organization. XAMPP is a popular web server bundle used for trial and error on Windows because of its easy installation. The open source program bundle includes, among others, Apache web server, PHP interpreter, and MySQL database.

User Experience (UX) is the process of designing a product through a user approach. With this approach, you can create a product that suits the needs and desires of the user. A product with a good UX design will create a pleasant experience for users when using your product. Users become easy and comfortable when using the product.

Meanwhile, this UX component includes how the features provided on the product, design structure, navigation of product use, visual design aspects, and all aspects of interaction with users. UX also covers how you define branding, content, and copywriting according to your target audience. Definition of User Interface (UI): As previously mentioned, the UI is part of the UX which is the visual appearance of a system design. This display allows users to connect and interact with a product. Apart from functioning as a connector, the UI also serves to beautify the appearance so that it can increase user satisfaction. However, it not only has to be beautiful, the UI also has to be easy to use. Some of the UI components include button components, typographic icons, themes, layouts, animations that appear on products, and other interactive visuals. All the UI components are designed with a focus on beauty and user-friendliness (Pradana et al., 2020).

## **2.2 UML**

UML which stands for Unified Modeling Language is a set of convection modeling that is used to determine or describe a software system in relation to objects. (Whitten, 2006). UML can also be interpreted as a standard graphics language used to model object-based software. UML was first developed in the mid-1990s in collaboration with James Rumbaugh, Grady Booch and Ivar Jacobson, who each developed their own notation in the early 1990s. Being a UI designer and UX designer requires skills of its own. Some of the skills needed by a UI designer are graphic design, branding design, creative thinking, and convergent thinking. These skills must be possessed by UI designers in designing product displays to make them look attractive and easy for interaction. Meanwhile, a UX designer is responsible for making product designs with a user approach to make it easy to use. Therefore, they must have the skills to do research, analytical thinking, problem solving, critical thinking, and creative thinking.

## **2.3 Steps to Use UML (Unified Modeling Language)**

The steps for using the Unified Modeling Language (UML) including the following:

First is to make a list of business processes from the highest level to define the activities and processes that might occur. Then map the use case for each business process to define precisely the functionalities that must be provided by the system, then use the use case diagram and complete it with requirements, constraints and other records. Make a deployment diagram roughly to define the physical architecture of the system. Define other non-functional, security and other requirements that must also be provided by the system.

Based on the use case diagram, start making activity diagrams. Last, define the top level objects of the package or domain and create a sequence and / or collaboration for each workflow, if a use case has the possibility of normal and error flow, make another diagram for each flow.

## **2.4 UML Scope**

In terms of specifications, the Unified Modeling Language (UML) provides models that are precise, ambiguous and complete. Specifically, the Unified Modeling Language (UML) specifies important steps in decision making analysis, design and implementation in systems that are very nuanced software (software intensive system) (Oetomo, 2002).

In this case, Unified Modeling Language (UML) is not a programming language but the models created are directly related to various programming languages, so it is possible to do mapping directly from models made with Unified Modeling Language (UML) with object-oriented programming languages, such as Java, Borland Delphi, Visual Basic, C ++, and others.

## **3. Design and Analysis**

The analysis is a study by conducting an experiment that produces conclusions from the decomposition of a complete information system into component parts (Pradana et al., 2019). The aim is to identify and evaluate all problems that arise and occur as well as the opportunities and needs that are expected so that improvements can be proposed that can build and enhance the working system of the tools to be made (Sidik & Betha, 2002).

Currently the addition of tools and laboratories still uses manual methods, in this case it is still necessary to record new laboratory tools and materials using folio books for laboratory tools and materials when entering the Pasundan 8 Bandung high school laboratory, so that the arrival of goods is very time consuming. the current system

consists of five procedures, namely the registration of students / teachers in the laboratory, scheduling, lending of tools and materials, returning tools and materials, and stock of laboratory equipment and materials

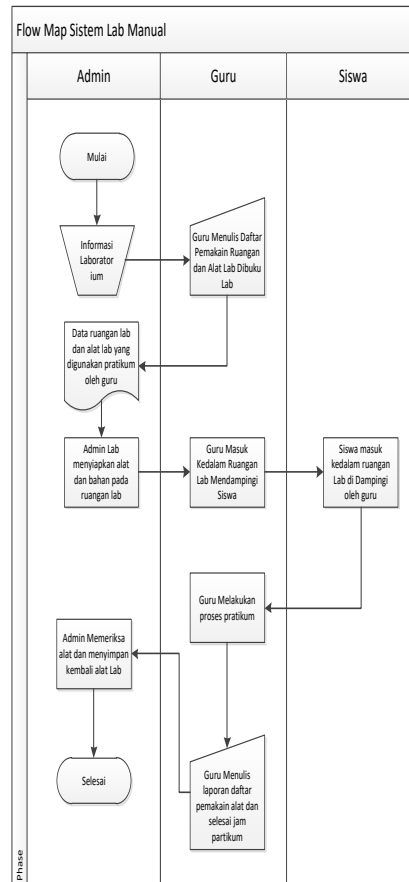


Figure 1 Flow Map of laboratory system that is running

In the procedure of student or teacher registration will enter on the main page then the registration option then students and teachers enter data manually in the folio book, if the data is approved by the person in charge of the laboratory, the student and teacher will be registered later and after registered the laboratory responsible person enters the student register data mentioned in the laboratory use folio book.

### 3.1 Analysis of the Built System

Analysis of the requirements referred to here in the form of a flow map analysis of the system to be built includes login procedures, registration procedures, borrowing, repayment, scheduling and adding stock of tools and materials in the laboratory and reporting procedures.

The flow map that will be built is as follows:

Analysis of the system that will be built on the login procedure

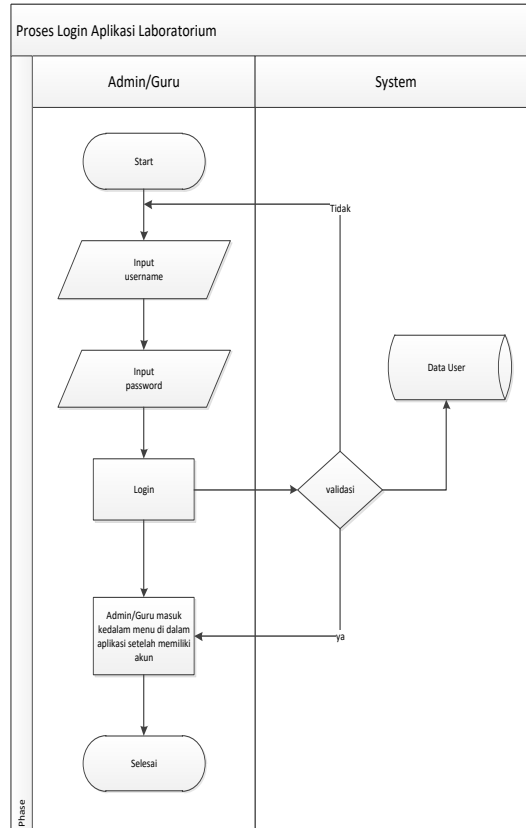


Figure 2 Flow Map of Login Analysis

The login procedure involves 2 actors including the admin (in charge of the laboratory) user. Where each of these actors have different access rights to the system and laboratory applications created (Gilang et al., 2019). Design is a depiction, planning, and sketching or arrangement of several separate elements into a unified whole. This stage includes configuring the software and hardware components of a system.

### 3.2 Use Case Diagrams

Use Case diagram is a construction to describe the relationships that occur between actors with activities contained in the system. The purpose of modeling use cases is to define the functional and operational needs of the system by defining usage scenarios agreed between the user and the developer. From the analysis of existing application users, the use case diagram for laboratory applications can be seen in Figure 3

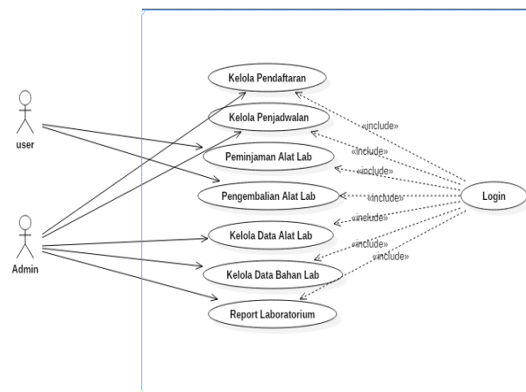


Figure 3: Use Case Diagram Laboratorium SMA Pasundan 8

### 3.3 Class Diagram

Class Diagram illustrates the structure and relationships between objects in the system. The structure includes the attributes and methods that exist in each class. The relationship of each class is illustrated by using inheritance and generalization as shown in Figure 4.

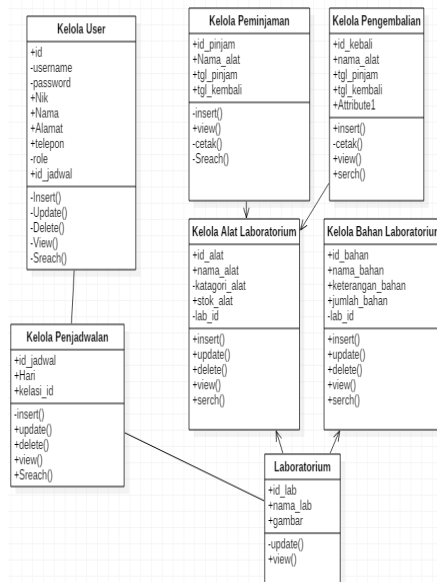


Figure 4: Class Diagram SMA Pasundan 8

## 4. Testing and Implementation

The implementation step is the most important thing that must be implemented in order to get the most out of the software built (Nugroho, 2004). Implementation of this software is applied as an application that can be accessed by the laboratory admin itself. Based on the system design compiled, the framework used is the Yii2 Framework and MySQL. On MySQL, database creation facilities are available optimally making it easier to arrange files from the table. The application implementation environment uses supporting software and hardware (Pradana et al., 2019). Therefore, the design of this system can be used properly. The software used is minimum, which includes the environment:

The software requirements used in this system include: Operating system in terms of Windows 10, Database MySQL, Programming PHP and Framework Yii2. The hardware requirements used in this system include: Processor (Intel Celeron), Memory (4 GB) and hardis 500GB HDD.

#### 4.1 Main Menu Page

This page is a page to enter the laboratory menu, stock of tools and materials, lab transactions, reports, singups and logouts. For Data Laboratory Info has a dropdown in which there are Lab Data, Tools, Schedule and Class Materials. For Info on Stock of Equipment and Material Stock has a dropdown in which there is a Stock of Equipment Stock and Material Stock. For Data Transaction Info Lab has a dropdown in which there are Data Alast Student Loans, Teacher Equipment Loans, Student Equipment Returns and Teacher Equipment Returns. For the Data Report, there are data Print Student Loan Equipment and Print Loan Tool Teacher who made the Report. For Singup Data there is a User registration process.

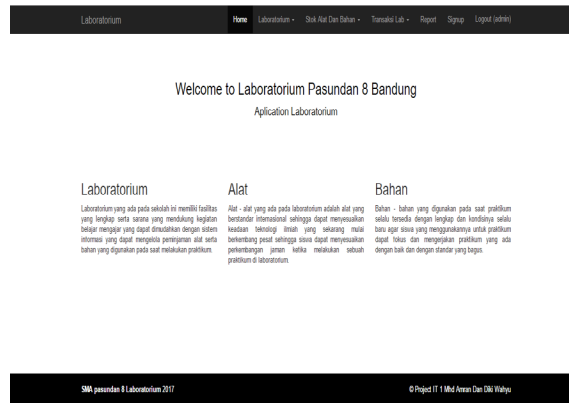


Figure 6: Main Menu Page

#### 4.2 Satisfactory Questionnaire Result of the Laboratory’s Web Users

To review the laboratory users regarding menu, stock of tools and materials, lab transactions, reports, singups and logouts, we conducted a satisfaction questionnaire as seen below.

Table 1: Laboratory Users Questionnaire

No	Questions	Answers		Target Achieved %
		Agree	Disagree	
1	The menu is easy to use.	90 %	10%	100%
2	The flowchart is complete.	100	0%	100%
3	The relationship between menus are discoverable	50%	50%	100%
4	I will recommend booking the lab facilities via web.	75%	25%	100%

### 5 Conclusion

After analyzing, designing and implementing service applications in the laboratory, it can be concluded that the application built has been able to answer the problems discussed in the previous chapters, and has succeeded in achieving its objectives, namely, easing laboratory procedures in carrying out every practicum in the laboratory.

Suggestions to be conveyed to further develop this Application System are as follows. In the future, it is expected that this application can be developed further with other different programming bases, such as adding a

broader report system, a fine system and an absent list for each practicum carried out. Making this application is expected to be a means for laboratory users in knowing the development of the laboratory.

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## **Biographies**

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**M. Amran Hakim Siregar and Roni Habibi** are graduates from Politeknik Pos, Bandung, Indonesia.

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