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**i-JaMCSIIX** Exploring ideas **2021**  
International Jasin Multimedia & Computer Science Invention and Innovation Exhibition



# **International Jasin Multimedia & Computer Science Invention and Innovation Exhibition (i-JaMCSIIX 2021)**

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## Web-Based Science Lab Inventory System for Faculty of Pharmacy in UiTM Bertam

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**Abstract**—Inventory is the most important part of a business. Inventory can be either raw materials, in-process goods or finished product depends on the business. Business inventory is always in large numbers therefore to manage and keep track of every inventory; a systematic system is needed to avoid from any shortage or surplus problems. However not only business, but university laboratory also such as Faculty of Pharmacy in UiTM Bertam owns an inventory that keeps all apparatus and chemical substances to be used by students for experiments. However, the process of keeping inventory is still being managed manually. The staff in charge, assistant science officer add and update the inventory manually. This can lead to problems like data inaccuracy when adding and updating list of inventories. Moreover, to use the inventory, lab assistant needs to fill in form and submit it to assistant science officer, which takes long time for lab assistant to wait for approval. There is also problem where there is no notification to notify assistant science officer about expired and low quantity inventory. With these problems, objectives are made that is to gather and analyze requirements from stakeholder to design and develop Science Lab Inventory System for Faculty of Pharmacy in UiTM Bertam. The system was developed based on the waterfall model that only involved three phases: requirement gathering and analysis, design, and implementation. Each phase has their activities and deliverables done to accomplish the objectives. Interview are conducted with the stakeholder to identify the problems, to collect requirements, and documented in Software Requirements Specification (SRS). Diagrams are constructed and documented in Software Design Document (SDD). As a result, a web-based system named Science Lab Inventory System for Faculty of Pharmacy in UiTM Bertam is developed by using SRS and SDD documents as reference throughout developing this project.

**Keywords**—*Information Technology, web-based, inventory.*

### I. INTRODUCTION

Inventory is raw materials, work-in-process goods and fully finished products that are considered as a part of business' assets that are ready or will be ready to be sold (Ziukov, 2015). Hence, instead of inventory that only focuses on business, inventory of Science Laboratory in university is also crucial to ensure that every record of laboratory equipment such as apparatus and hazardous items as chemical substances are kept. Presently, many universities still depend on manual system when it comes to management of laboratory. On that account, it is vital for a university laboratory's inventory to have a systematic way to keep record and track of every equipment in the laboratory and to lessen the gap with today's technologies. A good system can not only help increase university laboratory management level, but it can also boost the efficiency of experimental teaching and research (Liu et al., 2012). Therefore, a good system of inventory is the root of everything because by having a consistently good system, the management of laboratory will be operating smoothly and can avoid any problem. Moreover, even if there are any problems, it will be easier to track and solve it.

Nonetheless, Faculty of Pharmacy in UiTM Bertam is still keeping record of its science lab inventory manually. It is definitely tiring and somehow contribute to problems occurred. Total of 162 chemical substances and 121 apparatus are being stored in Faculty of Pharmacy's inventory that located at seven labs in two building (Building 4 and Building 5). First, six labs that located at level 1 in Building 5: namely Lab Sciences (05A01 038/0), Anatomy Lab (05A01 039/0), Microbiology 1 Lab (05A01 005/0), Microbiology 2 Lab (05A01 006/0), Solid Dosage Form 1 (05A01 017/0), and Liquid Dosage Form Lab (05A01 015/0). There is also one store (05A01 003/0) that is also at level 1 in Building 5 that is specifically used to store apparatus Then, one lab located at level 1 in Building 4; Pharmaceutical Chemistry Lab (04A01 018/0). Chemical substances are being stored in different laboratory in any of the seven labs according to the where it is assigned to be located at.

The responsibility in managing the inventory is held by one person that is assistant science officer. The process starts with assistant science officer needs to enter data about the apparatus or chemical substances at Microsoft Excel. Data that are needed are inventory name, inventory received date, expiration date, size of the inventory, location of where the inventory is assigned, location code of where the inventory is assigned, balance of the inventory and chemical hazardous. All the data mentioned, need to be enter manually. Thus, if there are any changes, or any update need to be done, it needs to be done manually. There are seven lab assistants in total and to use any inventory for students' lab experiments preparation, they need to request by filling in form manually and send it to assistant science officer. For the request to be approved, it might take two or three days or can even be a week depends on the amount of application received. Approximately, in a week the amount of application sent is five.

The application is viewed based on the date it is being sent. It is a first come first serve based of approval. Amount of every chemical substances and apparatus to be taken out has no limit and duration but it can only be requested in accordance with its necessity (Ropishah, personal communication, 1 March 2020). Once the application has been approved, assistant science officer also needs to update the balance of the item at Microsoft Excel manually. Lab assistant also needs to write in a book prepared as a record when they have used the equipment. The book is used as a 'backup' if assistant science officer happened to make a mistake in updating the inventory manually. If the requested equipment(s) are not available, assistant science officer still need to approve but it might take time because they need to wait for new stock to arrive. Otherwise, if any equipment(s) need to be used at certain time but it is out of stock and cannot be received in that particular time, lab assistant will need to consult with the lecturer in charge to see if they can use other equipment(s) as substitute.

## II. RELATED WORK

This section will explain about current system that exist and is relevant with the project.

### A. LabWare

Since its introduction to the market, LabWare LIMS (Laboratory Information Management System) has been the most technologically advanced Laboratory Information Management System in the industry and it continues to hold the position until today. Figure 1 shows the homepage of LabWare website.



Fig. 1. LabWare homepage

(Source: <https://www.labware.com/en/p/About-Us>, 2020)

LabWare is very famous with its success in comprised of LIMS (Laboratory Information Management System) and ELN (Electronic Laboratory Notebook) functioning as an integrated single solution. LabWare provides complete sample login functionality, provide many difference manual sample login and file import schemes as well as powerful schedulers that will produce the samples to be collected or processed in the laboratory. Also, LabWare's Inventory Manager provides the features for monitoring item quantity, location, expiry date and vendor details. Moreover, LabWare provides laboratory stakeholders with many LIMS and ELN reporting options.

### B. The DocLogix Laboratory Management

DocLogix Laboratory Management solution is recommended for small to midsized laboratories. It helps handle the laboratory inventory better, optimize the productivity of sample analysis, test processing and reduce the time devoted to reporting. All laboratory staffs and management can use this solution. Figure 2 shows the homepage of DocLogix.

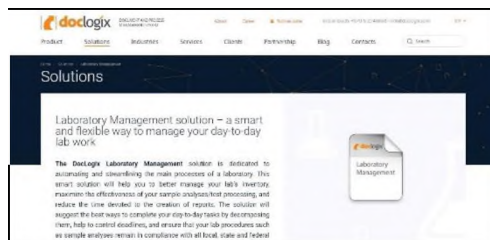


Fig. 2. The DoxLogix homepage

(Source: <https://www.doclogix.com/solutions/laboratory-management/>, 2020)

Some of the system features are decomposition of lab task and streamlining of processes, monitor inventory locations and quantities, plan the preventive maintenance of lab equipment, create usage reports and delivers out-of-stock notifications.

### III. METHODS

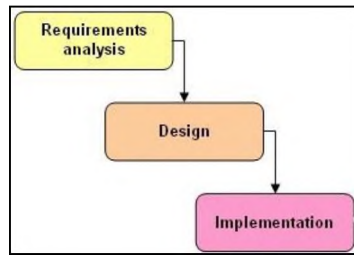


Fig. 3. Waterfall methodology

This model contains five major phases that start with requirement gathering and analysis, design, implementation, testing and maintenance phase. However, for this project only three phases will be implemented that is requirement gathering and analysis, design, and implementation phase.

### IV. FINDINGS

The tools that are used to develop the system are Eclipse JEE, Oracle SQL Developer as database to store and manage data. Programming language used is Java and Tomcat 9.0 is being used as server to run the localhost.

#### A. Manage inventory

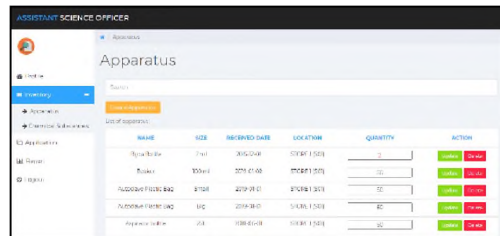


Fig. 4. View inventory interface

Based on Figure 4 above, it shows the page for inventory menu that consist of two submenus that is apparatus and chemical substances. The inventories that are stored in science lab of Faculty Pharmacy consist of only apparatus and chemical substances. Therefore, by dividing it into submenu makes it easier for lab assistant and assistant science officer to view. In this page, assistant science officer can also search inventory by typing inventory name at the search bar. To add new inventory, assistant science officer can click on create new apparatus or create new chemical substance button. While to update or delete, they can click the respective buttons at the table in action column. For inventory that has expired and low in quantity, the inventory expired date and quantity will be red in colour.

#### B. Manage application

Figure 5 given below display the page for manage application. In this page, assistant science officer can view the information of the application sent by lab assistant. Then, assistant science officer can either approve or reject the application. If assistant science officer chooses to reject, reason for reject must be inserted. Once the application has been managed, email notification will be sent to lab assistant. The contain of the email is only the date of the application submitted, the date to use the inventory, the reason of the application and reason of reject if the application is rejected. Other details can be viewed in the system. If the application is approved email notification as seen in figure 6 below will be sent to lab assistant while if the application is rejected, email notification as seen in figure 7 will be sent to lab assistant. Also, if the inventory that has been approved is low in quantity, email notification will be sent to assistant science officer as shown in figure 8 below.

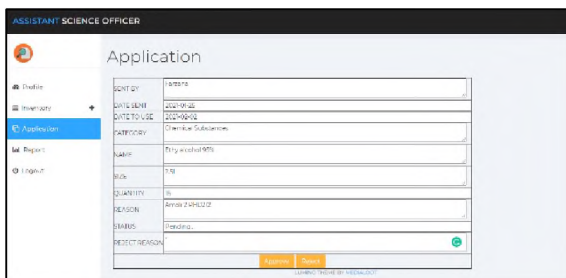


Fig. 5. Manage application interface



Fig. 6. Email notification for approved application to lab assistant



Fig. 7. Email notification for rejected application to lab assistant

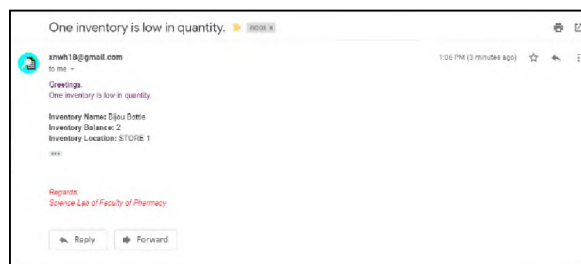


Fig. 8. Email notification if inventory is low in quantity to assistant science officer

### C. Notify expired inventory



Fig. 9. Email notification if inventory is expired to assistant science officer

For expired inventory email notification, after successfully login the system will automatically detect if there is any expired inventory on that day and assistant science officer will receive an email notification as shown in figure 9 above.

## V. CONCLUSIONS

This project is developed based on three problems: data inaccuracy when adding and updating list of inventories, takes longer time for lab assistant to wait for approval and no alert or notification to notify assistant science officer on expired and low quantity inventory. With all these three problems statement, three objectives are made to solve the problems based on the analysis made on the requirements stated by stakeholder. Each objective has their own activities and deliverables. With the accomplishment of all the activities, three of the objectives are achieved. This system will help assistant science officer to monitor and check the stock of the inventory and this system will send notification to notify if there is any expired and low quantity inventory, ease assistant science officer to approve applications sent by lab assistant thus quantity of inventory is deducted automatically once the application has been approved. Moreover, make it easier for lab assistants to view availability of chemical substances and apparatus and submit application based on the availability and receive approved or rejected email notification about the application status once it has been approved. Furthermore, takes lesser time for assistant science officer to generate report.

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