IMPLEMENTING RAPID APPLICATION DEVELOPMENT (RAD) METHODOLOGY IN DEVELOPING ONLINE LABORATORY AND ROOM BOOKING SYSTEM (eLABAS)

ABSTRACT

Managing laboratories and room booking system and the evaluation of basic equipment for laboratories and room manually is a tedious task, thus a system to manage the booking and evaluation is proposed to be developed using Rapid Application Development methodology. This methodology is chosen as it allows fast implementation of the system in real development. The development had started in Mac – August 2015 and the process had been developed based on the requirement acquired. This system has been used for four semester in the department. This rapid application development is proved to be a right methodology for this project as it serves the goal of rapid implementation for a small size system with small size of users.

Keywords: online booking system, e-booking, reservation, Rapid Application Development, methodology

1.0 INTRODUCTION

Jabatan Pengajian Politeknik (JPP) have been provided Standard Operation Procedure (SOP) to meet the quality procedure requirement as well as for the guidelines and references. For Politeknik Tuanku Syed Sirajuddin (PTSS), this SOP usually referred to the quality procedure document stated in PTSS-PK-11. One of the SOP is to the evaluation of basic laboratories and rooms’ equipment at the end of each semester. Quality document number for this SOP is PP-11(7)(19-10-16). Department of Information Technology and Communication is one of the academic department that has six computer laboratories and four lecture rooms. Recognizing the importance of this evaluation process, development of a system that could handle the process is proposed. This proposed system also provide another two modules which are booking system and damage report.

The proposed system is Laboratory and Room Booking System (eLABAS); a system that was developed to provide and efficient method for booking any available computer laboratories (labs) and rooms in the department. This system consists of three major modules, but this paper is elaborated only two modules which are laboratory & room booking and evaluation of basic laboratories and rooms’ equipment. This system is available to be accessed online with single sign-on. This system will helps staffs in the department to find available labs and rooms and then book them, usually for the class replacement location. Generally, throughout the semester, all labs and rooms were fully occupied for lecture session. Therefore staffs who need to do class replacement will face difficulties to find available location. The staffs need to alert to their colleagues who are not in the office so that the staff can use the available location. By the end of the semester, all staffs need to do the evaluation
manually, the form will be distributed to all locations’ users and the form need to be given back to the location supervisor.

2.0 SYSTEM WORKFLOW

Managing laboratories and room booking system and the evaluation of basic equipment for laboratories and room manually is a tedious task. The coordinator needs to remind all the location supervisors at the end of semester to send the compilation of evaluation form. Before that, location supervisor needs to print and distribute the form to all users that used the location for whole semester. After that, the location supervisor needs to wait for the user to return the form within the time given. Sometimes, the location user will forget to return the form and the location supervisor need to re-print the form. This will lead to the time consuming. After all users return to the form to the location supervisor, the form will be returned to the coordinator for analyzed and summarization.

2.1 Booking System Workflow

Previous process of booking available location for the lecture replace was done manually. Staff need to fill in the booking form/book by first seeing the location supervisor. The problem occurred when staff needs to find the location supervisor when the location supervisor is not at his/her place and the staff do not know where the location supervisor keep the booking form/book. This will consume a lot of time to find when the location supervisor is available because the booking can be made. Another concern is about the paper usage, the booking form/book usually will be provided by making a lot of photocopies. This will lead to the paper wastage.

2.2 Evaluation of Basic Laboratories and Rooms’ Equipment

Each laboratory and room in the department is assigned to a supervisor that is responsible for every equipment available in that location. At the end of every semester, all lecturers which are staffs in the department as well, need to complete the evaluation of basic laboratories and rooms equipments’. Labs and rooms supervisor needs to find all the lecturers that used their labs and rooms throughout the semesters to fill the evaluation form. After users had finished fill in the form, they need to return form back to the location supervisor. Sometimes the form just been left on the table without location supervisor noticed, this will lead to missing form and the flow need to be started all over again. Location supervisor needs to collect all forms from the users before submit to the coordinator.
3.0 RAPID APPLICATION DEVELOPMENT METHODOLOGY

Rapid Application Development (RAD) is a concept that was born out of frustration with the waterfall software design approach which too often resulted in products that were out of date or inefficient by the time they were actually released. She also claimed the term RAD was come from James Martin in early 1990s. (M, Rouse, 2016).

Rapid Application Development (RAD) was first coined by James Martin in his book “Rapid Application Development”. In his book, Martin wrote “Rapid Application Development (RAD) is a development lifecycle designed to give much faster development and higher-quality results than those achieved with the traditional lifecycle. It is designed to take the maximum advantage of powerful development software that has evolved recently.” Martin states that there exist four fundamental aspects of fast development which are tools, methodology, people and management. (Daud, Bakar, & Rusli, 2010) RAD is a software development life cycle that permits organization to develop product faster while reducing cost and time. They also added about RAD is focuses on developing prototype model faster to get feedback from customer. (Hassan, Qamar, & Idris, 2015). Phases involved in developing mobile application using RAD such as requirement planning, user design, construction and cutover. (W. F. W. Ahmad, Muddin, & Shafie, 2014). RAD methodology is time driven rather than requirements driven. Surely requirements are what define the functionality of the software. (Dillman, 2003). Figure 1 shows the phase involved in RAD.

As for Laboratory and Room Booking System, the development process literally followed as shown in Figure 1. All phases involved in developing eLABAS are similar to the method by Dillman. All this can be discuss here.

3.1 Scope

There will be two scopes which are scope of user and scope of system. For user scope, there are three roles has been defined. Administrator who can control the whole system. The privilege given to the coordinator. Second role is staff with location supervisor privilege and the last one is staff who is not location supervisor.

For system scope is the ability of the system to provide service to the users.
3.2 Requirement Analysis

In this crucial phase, problems were identified and came out with solutions. Basically there are two preliminary studies that have been done in this analysis phase. Firstly in preliminary study, problems regarding manual rooms booking and basic equipments’ evaluation were identified in literature review and surveyed to list down all the choices of solutions for the problems.

In the second preliminary study, in order to determine the problems occurred in the first preliminary study, a survey was conducted on thirty staffs of the Department of Information Technology and Communication (ITC) PTSS. The result of the survey proved that they were facing problem while choosing room and laboratory for class replacement and loss basic equipments’ evaluation form that has been distributed by the location supervisor.

Rather than using preliminary studies for analysis, exploratory study also can be done to cater the requirement for the intended user. (R. Ahmad, Chyi, Sarlan, & Kasbon, 2015).

3.3 Design

There were two activities that involved in this phase. The activities were database design and user interface design. For database design, all staffs will be added as the users and supervisor will be added as role too. So, there will be a normal staff with supervisor role and without supervisor role. All locations will be matched with its supervisor. Several table will be added to the database. Overall design for user database design as shown in Figure 2.

![Figure 2: User Database Design](image)

For user interface design can be referred to part 5 in this paper. All interfaces design have been discussed with the coordinator which is Penyelaras Makmal dan Bilik Kuliah (PBMB).

3.4 Development

Develop process is the first step in prototype cycles. All the design interfaces were translated into programming code. Referring to (R. Ahmad et al., 2015), they have system architecture of developed tools. The computer must be install with the software that required by the system architecture.
For eLABAS to be developed, several software have been used. eLABAS is developed using Hypertext Markup Language (HTML), Cascading Style Sheets (CSS), and Hypertext Preprocessor (PHP) language. HTML language is used to develop the appearance of the website, both front office and back office. CSS language is used to organize the style of the front office appearance. PHP language is used to create and control the functions of every subsystem. In the back office, Ajax technique is used to enable data exchanging asynchronously between browser and server to avoid full page reloads. The programming tools used is Eclipse PHP Development Tool (PDT) and Adobe Dreamweaver Creative Suite (CS) 4. The tools used to create the multimedia are Adobe Photoshop CS4 and Adobe Flash CS

3.5 Test
In this phase, prototype of the system will be demonstrate to the users to get their feedback. For usability testing, a summative usability testing plan has been used. Summative usability testing is the summative evaluation of the prototype with representative users and tasks design to measure the system usability and performance in order to identify how effective and user friendly the system are. (Ebitisam K. Elberkawi; Naser F. M. El-firjani; Abdelsalam M. Maatuk; Shadi A. Aljawarneh, 2016)
The test was conducted in a computer laboratory involved with ten users as the representative. They were given username and password to login to the system. Before that, demonstration of system usage has been delivered. After testing has been completed, the users need to answer several feedback of the system. As the results, all ten users are satisfied with the system and only two users commented about the user interface design.

3.6 Implementation
The system prototype will be amended upon users request to fulfill their needs and requirement. The develop system should be friendly to user. These three processes; develop, demonstrate and refine will be continuously change and cycled until the completed system has been developed. If the objectives have been met, the next phase will be continued.

3.7 Operation and Maintenance
Once the testing phase completed, system will be uploaded into server. Training will be conducted to each level of user to demonstrate the functionalities of each available module.

4.0 ADVANTAGES OF RAD
Advantages gained from using RAD are as described in Table 1. By using RAD it is easier to implement as the development focuses on each requirement development at a time. User involvement while developing product helps in improving user satisfaction as more communication occurs while developing products and user can see the product progress. Another advantage is that it takes shorter time to be implemented in working environment. (Daud et al., 2010)
Advantages of using RAD as follows: (Hassan et al., 2015)

- Cost Effective
- Time Effective
- Fast Software Development Life Cycle
- Life cycle consumes 60 to 90 days
- Achieves High Customer’s Satisfaction
- Good Risk Management
- Reduce Developer’s Effort

Based on review from previous development for TimeSheet Application using Web Services as Plug In (Alwi, 2005), RAD is the easiest way to develop system and it can save cost and time.

Table 2 below shows the comparison and its criteria derived by (Hanafiah, 2007) from Dillman research in (Dillman, 2003)

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Budget</th>
<th>Time</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waterfall</td>
<td>High</td>
<td>Long term</td>
<td>Static</td>
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<tr>
<td>Incremental</td>
<td>High</td>
<td>Short term</td>
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<td></td>
<td>Low</td>
<td>Long term</td>
<td>Static</td>
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<td>Evolutionary</td>
<td>Low</td>
<td>Long term</td>
<td>Dynamic</td>
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<td>Spiral</td>
<td>High</td>
<td>Long term</td>
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<tr>
<td>RAD</td>
<td>High</td>
<td>Short term</td>
<td>Dynamic</td>
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<tr>
<td>Extreme / Agile Development</td>
<td>Low</td>
<td>Short term</td>
<td>Dynamic / Static</td>
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As the conclusion, the reason for eLABAS was developed using RAD because of time constraint. The system need to be done by the end of the semester so that the evaluation process of basic laboratories and rooms equipment can be done through online system. Meanwhile, the first module which is laboratories and room booking system can be used throughout the running semester just after the module completely developed. Another reason for RAD to be choose in the development process because of the ease of implementation. Developer first design the database and system workflow to meet the easiness of usage.

5.0 DEVELOPMENT OF ONLINE LABORATORY AND ROOM BOOKING SYSTEM (eLABAS)

Online Laboratory and Room Booking System (eLABAS) is developed based on requirement in development process user shown in Table 2. This system consists of two main user; PBMB (administrator) and staff. PBMB. This system was development in the duration of less than six months (March 2015- August 2015). That
was the reason for using this methodology and development Gantt chart shown in Figure 3.

| Table 2: User requirement table |
|-----------------------------|----------------|
| **User**                   | **Requirements**   |
| PBMB (Administrator)        | i. Maintain system |
|                             | ii. Display report |
| Staff                      | i. Booking room / lab |
|                            | ii. Display booking information |
|                            | iii. Manage personal booking |

<table>
<thead>
<tr>
<th>Activity</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
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<tr>
<td>Analysis &amp; Quick Design</td>
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<td>Develop</td>
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<td>Demonstrate</td>
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<td>Refine</td>
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<td>Testing</td>
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<td>Deployment</td>
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Figure 3: Gantt chart

Figure 4 shows the login interface of the eLABAS. Registered user must login before can view the available menu.
Figure 5: Interface of Available Modules

Figure 5 shows the available menu after user logged into the eLABAS. Actually there are three menu available for the user. This paper is focused on the “SISTEM TEMPHAHAN MAKMAL / BILIK KULIAH”.

Figure 6: Interface of Menu in “Sistem Tempahan Makmal”

Figure 6 shows existing reservation that has been made by all users together with previous reservation. By viewing this menu, user will no reserve any location that has been reserved.
Figure 7 shows the menu to select the location for the reservation. After select the location user must key in the date and time for the reservation. User must click “SIMPAN” to complete the reservation process.

Figure 8 shows location supervisor adding the users that used the respective computer laboratory for basic laboratories and rooms equipment evaluation menu.
Figure 9: List of Location that used by the user

Figure 9 shows a list of location that has been used by the users throughout the whole semester based on the time table. The user needs to evaluate all the equipment available in those locations.

Figure 10: Basic Laboratories and Rooms Equipment's Evaluation Form

Figure 10 shows the form for the evaluation process that needs to be fill by the location users.

6.0 CONCLUSION AND DISCUSSION

Development of eLABAS had been done to ease the process of booking the available laboratory and room and also in to simplify the process of evaluation basic equipments’ for laboratories and rooms. For the evaluation system, it still follow the standard of procedure (SOP) that required by the Polytechnic. Rapid Application Development (RAD) had been chosen due to it fast implementation. As this system is a small size system, RAD is expected to the most appropriate method for the development process. The used of this methodology allowed users to be part of the system development whereas users can give comment by the time it is implemented. It can be concluded that using RAD for a small size system and fast implementation of the system is appropriate as users can see the product in a very short time and developer can still control the activities in development process.
For evaluation of basic equipment for laboratories and rooms module, we believed that it will make user feels easier to complete rather than supervisor needs to print and distribute the evaluation from. By using eLABAS, location user will print the form and give to location supervisor. eLABAS will make coordinator (PBMB) easier to do the equipment analysis before submit the report to the Head of Department (HOD).

For location booking system, user not need to find location supervisor to book the place by write the name and time for booking. User just login to the eLABAS and select location together with time and date.

As a conclusion, the implementation of eLABAS is hope to provide a lot of benefits to the user in the department especially. Generally, it is really hope that other organization could takes some benefits from this eLABAS development. This system as well can helps a lot of users in order to find available location for any needed requirements and for the evaluation of basic laboratories and rooms equipments. For future enhancement, we hope that user or administrator can release the location to free if they are not using the location and the time and date will be disable for the location that has been booked by another users.
REFERENCES


