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Information System Development Based-on ERP and RAD Methods: Application for Activities Information Broadcasting

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Abstract - **As technology develops, information systems become very important in institutions. Information systems support the delivery of information quickly and accurately. The system is a reference at the Persada Islamic Boarding School Ahmad Dahlan University to develop an information delivery system using applications integrated. Manual systems cause the information to be less relevant, requiring an integrated and comprehensive system that can effectively and efficiently deliver information to students. The application developed using Enterprise Resource Planning (ERP) and Rapid Application Development (RAD) methods. The application of these methods requires two main steps, including determining ERP and RAD for implementation. The process for obtaining an ERP method requires steps such as Material Requirement Planning, Close-Loop, and Manufacturing Resource Planning, and Enterprise Resource Planning. The RAD method requires steps such as Requirement Planning, RAD Design Workshop, and Implementation. Application testing used black-box and alpha testing. Each of these tests obtained an accuracy of 95% and 97.7%. Thus, this application can be implemented in Persada very well on mobile and desktop platforms. Besides, the app used information broadcasting to users in real-time for any information in Persada.**

Keywords: Information System; Enterprise Resource Planning (ERP); Rapid Application Development (RAD), Integrated Information Systems, Information Broadcasting

I. INTRODUCTION

Industry 4.0 is a driver of rapid technological development [1]. The technology impacts an institution in information broadcasting, such as the Persada Islamic Boarding School of Ahmad Dahlan University. Information systems in completing tasks according to their purpose. It is one of the references for broadcasting information online. This system includes users to manage and access data/information stored in the cloud server [2]. This system is an effective and efficient system that can process anywhere and anytime.

Information broadcasting in Persada is processed manually. Persada only gives information broadcasting is handled there, so students must come to find out the information themselves. The process is the basis for developing more effective and efficient information systems. The development of information systems can provide information accurately. Updated information using the real-time system gives notifications via application and e-mail. This information can be accessed anywhere and anytime.

The development of information broadcasting systems in Persada has limitations in various criteria, namely design, user accesses, purpose, and methods. The design of information systems contains information related to users and activity activities. Users can access the developed information system, such as Admin, Lecturers, and Students. Information broadcasting uses notifications via application and e-mail. The methods that were developed in the information system are ERP and RAD methods.

Information and communication technology provides an impact on information systems development [3], [4]. Several methods that can develop information systems are ERP and RAD. The ERP model has developed a cloud-based information system [5]. Research on ERP methods has governed the selection process for multicultural enterprises on organizational needs and requirements [6]. ERP model can create an integrated information system and more effective [7]. Thus, ERP

becomes a benchmark for users to know the flow of information [8].

Besides, the system development model with ERP, another method used is RAD [9]. RAD provides a process for rapid system development. RAD works efficiently in real situations and uses accurate data [10]. RAD model developed can be implemented in various platforms such as the web [11] and mobile applications [12]. Several studies related to the research that will be created and designed in this research are considered to develop information broadcasting systems. Some of these research studies include making mobile device applications used database infrastructure and web servers based-on SOA (Service Oriented Architecture) [13]. Besides, the application of SMS-based mobile technology is used to broadcast information in real-time [14]. Mobile technology has a rapid development process and a short development life cycle [15].

Website applications will be more effective and efficient if they can be accessed on various platforms such as a desktop or mobile devices [16], [17]. This system is very optimal and useful in providing information [18]. Website applications have been developed in various fields, one of which is education [19]–[21]. In the field of education, the website serves to provide updated information about academics, students, teachers, and related information [22], [23]. As with the scheduling process [24], [25], scheduling results must be announced or broadcasted to all related users.

Based on this description, this research will develop an information system for broadcasting information on activities at Persada Islamic Boarding School, Ahmad Dahlan University. System development uses a combination of ERP and RAD methods.

After this introduction section, this article will explain some parts of the development of information systems in Persada. The second section describes the materials and methods used in developing the system. The third section explains the results and discussion of system development, starting from the system's analysis and design, application of methods, system implementation, and testing. Moreover, the fourth section explains the conclusions of the research that has been done.

II. METHOD

This section will explain the data and tools used. Moreover, it will also explain the theory of information systems development concept. The system development process will explain of ERP and RAD methods. The basics of testing systems are the last section used and processed.

A. Data and tools used in the information systems development

This research uses data from the Persada Islamic Boarding School of Ahmad Dahlan University. The existing activity information system is still manual and not optimal, so developing an information system that makes it easy for students to obtain information can change. Data collection uses several methods, such as literature review, interview, and observation [26]. Tools used in the process of developing information systems are using CodeIgniter and MySQL.

B. Information system development concept

The system is an interaction between the components in it to carry out activities with specific objectives. The system has the methods, procedures, and techniques used to solve the problem. Thus, the system is a series of inputs, processes, and outputs to achieve system goals.

The information system is a system with the development that takes into account the needs of its users. Thus, this system has different aims to adjust the needs of its users. Information systems become very important to simplify and speed up information generated for users. It has become a staple in the development of information systems.

The concept of information system development has four main stages: investigation, analysis, design, and implementation [27], [28]. The development process is adjusted to the needs of an organization/agency. In this study, the development of information systems proceeded to these four steps. The system development uses ERP and RAD methods that adjust the needs in Persada. These methods are implemented in website applications and be accessed via desktop and mobile apps. This website application makes it easy to broadcast information. This application is accessed anywhere and anytime, so it is more effective and efficient. Information that is broadcast is in the form of new/update notification and information. Apart from access to the application, users will receive notification e-mails from that information.

C. ERD and RAD Methods

In this research, combining ERP and RAD methods is in the development of information systems. Both of these methods are used in making a website using steps like in Fig. 1.
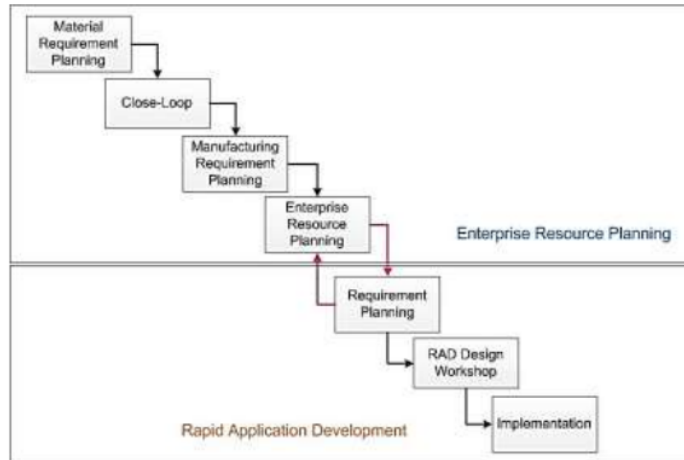
Fig. 1 The process flow of ERP and RAD methods is in the development of information systems.

Based on Fig. 1, the stages of the process are divided into two parts, namely ERP and RAD. ERP has four steps: Material Requirement Planning (MRP), MRP Close-Loop, and Manufacturing Resource Planning (MRP II). Meanwhile, RAD has three stages, namely Requirement Planning, RAD Design Workshop, and Implementation.

The basis of ERP is to unite all departments and functions of an enterprise into an integrated computer system. This system can accommodate all the specific needs of other different departments. The initial concept of ERP comes from material requirements planning, which all needs are planned carefully and become a reference for the development of the system. In the MRP close-lop stage, this stage will provide a series of functions and tools in solving priority problems following system development planning. The development of this method, the event will involve manufacturing planning in the analysis of planning, design, and simulation based on the planned needs. Furthermore, the development will include the stage of enterprise resource planning. This stage will expand the business processes of the integrated system as a whole. At this stage, the development will be carried out with the RAD method.

RAD is a software development model that emphasizes short life development cycles. This RAD model that is often used is the Waterfall method. The development of RAD with the waterfall method with the initial step is requirements planning. This stage will identify the purpose of the application and the information requirements imposed on the system's use. This stage aims to solve the problems of a company.

The next stage of RAD is the RAD design workshop. This stage aims to design and improve business processes by describing workshops. Analysis and design programs can work by building and showing a visual representation of an application system's design and work patterns. Based on the workshop's design, the user will respond to the existing prototype and analyze improvements to the current design modules. It can lead to the development of the system to the level of acceleration.

The final step of RAD is implementing the prototype in a real environment. Developers and users will conduct in-depth analysis during workshops and adjust the design of business and non-technical aspects of an organization/agency. After this process is completed and approved, it will be developed, tested, and implemented in the organization/agency.

D. Systems Testing

System testing is the final process of making the whole system. These steps are carried out after going through the system design and implementation process. System testing uses two methods, namely black box testing and alpha testing.

The black box test is a system test by observing the performance of the application/system that has been made. Testing is done by inputting data and looking at the output produced, whether it is following the expected and the absence of errors (errors) in the process so that it can be adjusted between the input given with the output results obtained.

Alpha Test is testing the program by inviting several users to run the program or distributing questionnaires to the respondents and asked to try the system directly. Users come from the Santri Persada group, first being given information about how to use the program,

including responses regarding the level of program friendliness (user-friendly), interface format, and broadcast applications via e-mail.

III. RESULTS AND DISCUSSION

In the results and discussion, the section discusses the initial analysis for making applications, ranging from analysis and system design, implementation, testing. System analysis and use case diagram design will illustrate how the application can be run. Implementation is a general application description of all forms that can function following the use case that has been made. Application testing uses the black box and alpha methods to recommend whether the application is feasible or not feasible to be implemented.

A. System Analysis and Design

The developed system is analyzed in the input, process, and output sections. In the input section, the analysis process determines everything inputted in the system, such as the key of a course/activity. The process section provides an analysis process for everything processed from the system, such as schedule changes and other information related to the system. The output section provides outputs in the form of updated information to the students.

Analysis of needs in the application of information systems for student's activities is the user logins, data input, activities, and system testing. User login shows access rights of users who input username and password to access the application. The data input process for student's activities is studies, service, and training material. The testing process is done by accessing data from one of the student's databases on the main form with already connected tables.

Based on the ERP and RAD process flow Fig. 1, system design, in general, can be implemented as in Fig. 2. Fig. 2.(a) shows the use-case analysis. At use case, it shows the users and activities of users. Users in this application are grouped into three users, namely admin, lecturer, and student.

User grouping will affect the activities carried out by the user. Activities and data that can be processed by users on the system are related to several fields, namely schedules, courses, students, and lecturers. The user as admin manages all activities and data available so that all control rights are on the admin. Besides the admin, some students and lecturers have limited access. Access users as students only get information about the schedule, selection of courses, and updating personal data on student data. Lecturers can access data schedules and self-update data on lecturers' data.

Based on this system (shown in Fig. 2.(a)), the system is designed based on the client-server. The system is embedded in applications stored in a database on the cloud server, as shown in Fig. 2.(b). All of the data can be accessed wherever and whenever by the user following their access rights. The developed application is obtained from a desktop PC or an Android-based Mobile App.
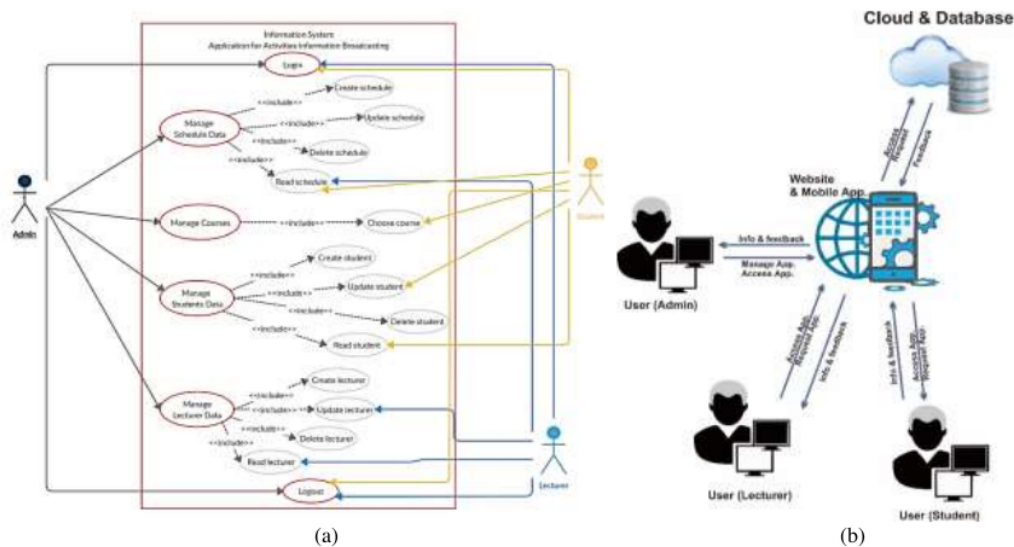

(a)   (b)

Fig. 2 (a) Use case system in general and (b) application connectivity with related users

Implementing the system follows the standard of making the system with the incorporation of ERP and RAD methods (according to Fig. 1). The details of the steps applied are shown in Fig. 3.

The system development process begins based on the constraints and data from Persada, which is obtained based on the process of analysis, observation, and user interviews. The analysis process refers to a review of the previous material, which is then used for the development of information systems. Besides, observations and interviews are intense and directly related to the system currently working at Persada. The results obtained will be reviewed and used as a reference for developing systems more effective and efficient.

Based on the process that has been passed, the system will be developed using ERP and RAD methods. Both of these methods are as a basis for creating designs and making applications. In addition to using the use case in Fig. 1 as a reference for design development, the system is made based on the relationship between entities that occur in the design application. This design will be illustrated with an entity-relationship diagram (ERD), as shown in Fig. 4.

After making the application is complete, general application testing is done using the black box and alpha testing methods. After successfully testing and preparing to launch, the application will be tried directly. Trial applications are used to determine the success of the system. It is made and used for the maintenance and development of the system.

In the ERD design shown in Fig. 4, seven entities are represented by rectangles. These entities are lecturers, students, schedules, courses, classes, rooms, and grades. Each object has an interrelated relationship which is connected by a rhombus symbol. For example, the entity lecturer deals with students with a "teach" relationship, and schedules have several related entities such as courses, classes, and rooms.

B. System Creation and Implementation

Creating User grouping will affect the activities carried out by the user. Actions and data that can be processed by users on the system are related to several fields, namely schedules, courses, students, and lecturers. The user as admin manages all activities and data available so that all control rights are on the admin. Besides the admin, some students and lecturers have limited access. Access users as students only get information about the schedule, selection of courses, and updating personal data on student data. Lecturers can access data schedules and self-update data on lecturers' data.

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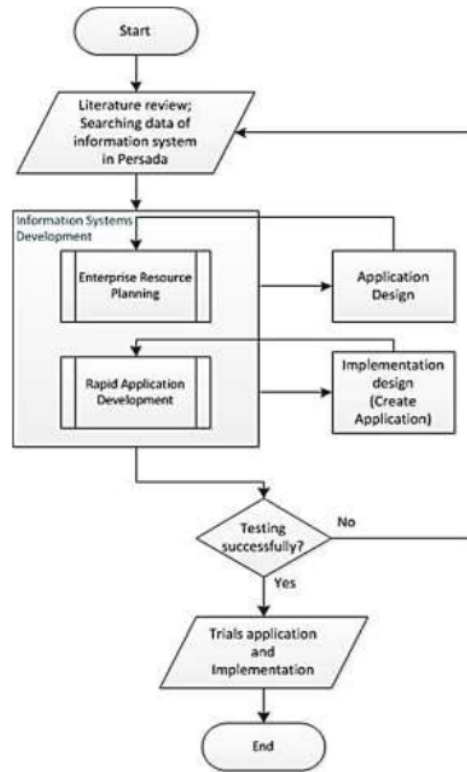

Fig. 3 Flowchart of the process of making and implementing a personal information system
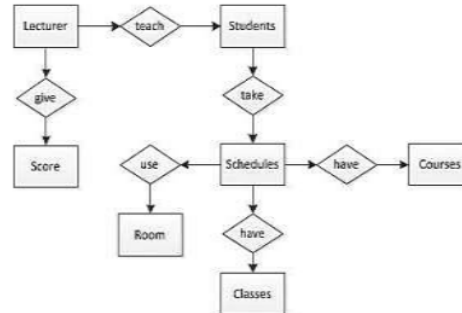

Fig. 4 ERD design based on existing business processes in Persada

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Creating applications uses web services with the ERP method. The application is made in the form of a website portal. It can be accessed on a desktop or mobile app. This portal is tailored to the business processes of Persada so that it will contain all information relating to existing activities in Persada. The implementation, development, and maintenance are always done so that the system can be sustainable and updated following technological developments and processes in Persada.

The system's initial process is preceded by logging in according to the use case design so that the application is created using the login form like Fig. 6. The user will enter a username and password to enter the system. Users will be registered directly by the admin when the registration starts. This form is coded using PHP code as in the following code (Fig. 5):

```php
<?php
defined('BASEPATH') OR exit('No direct script access allowed');
class Login extends CI_Controller {
 public function index()
 {
     $this->load->view('admin/v_login');
 }
}
```

Fig. 5 Code

Fig. 6 Display the system login for the user

After the user has successfully logged in, the user will enter the system with the main menu display shown in Fig. 7. This menu displays welcome to the dashboard page of the Information System of Kyai H. Ahmad Dahlan Islamic Boarding School Yogyakarta. Fig. 7 is a dashboard used by the admin to manage all activities and data. The management process that can be carried out, as shown in Fig. 6 is managing users, lectures, students, courses, rooms, classes, scores, and schedules.

In addition to the management process, the admin can also inform activities using the broadcast menu (Fig. 8). The broadcast menu on this system is used to send information about lectures/activities and changes in Persada.

Push notifications can provide broadcasts to discover that there are changes or info via the personal e-mail of each student. The aim is to make it easier for students to receive up-to-date lectures/latest activities. Display broadcast after successfully sending notifications. In Fig. 8, after the admin successfully sends a notification to Persada students, a notification will appear in the system. With the announcement, the system successfully shares information. The results or output of the broadcast sent via an e-mail shown in Fig. 9.

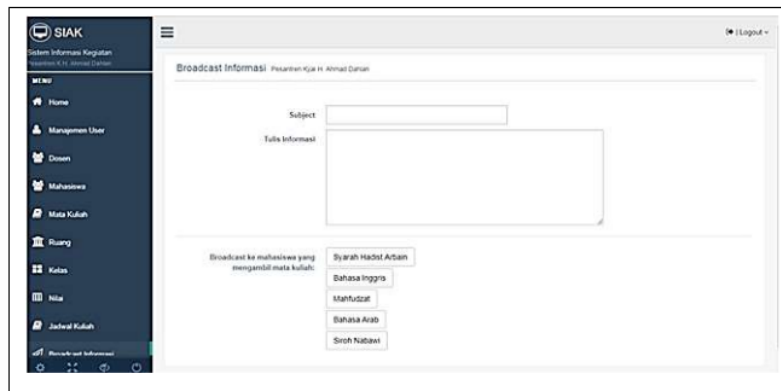**Fig. 7 Display of dashboard home admin menu that can manage the system**

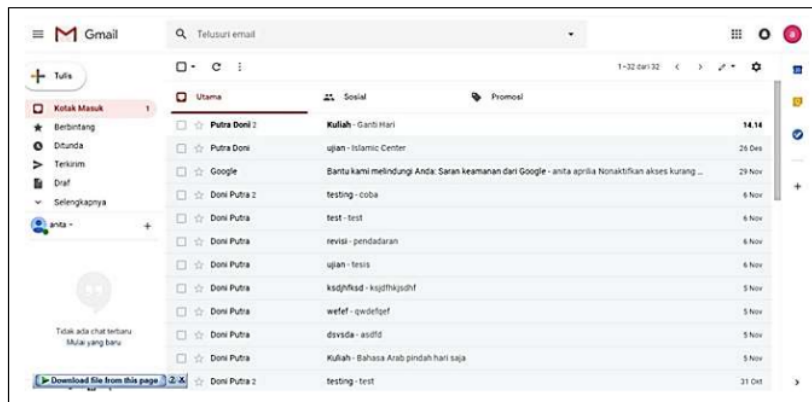**Fig. 8 The push notification / Broadcast menu display**

Fig. 9 Push notification/broadcast results

C. System Testing

System testing was used using two methods, namely black box testing and alpha testing. Black box testing is performed by checking all the forms that have been made following their functions. The black box process is done by checking all the menus in the Persada system until the process of broadcasting information to all users. The checking process shows that 95% of the system can run following existing business processes, and 5% is still considered inappropriate and is even being improved.

The alpha testing process is done by inviting several users to test the application. Each user is given a list of questions to provide an opinion about the program to be run. This test has ten questions with alternative answers: strongly agree, agree, less disagree, and disagree.

Alpha testing uses the following questions:
1. Is the application running well?
2. Is the app easy to use?
3. Does the app look attractive?

4. Is the system process flow easy to understand?
5. Is the data input process easy to run?
6. Can the admin change the entire contents of each menu?
7. Can the lecturer enter grades and see the schedule?
8. Are Students able to see the schedule and grades
9. Does the system include the needs in Persada?
10. Is the broadcast process via e-mail going well?

Based on the Alpha Test by 35 respondents, the respondents consisted of all students. The percentage of the assessment was obtained as follows:

Strongly Agree	= (166/350) x 100%	= 47.4%
Agree	= (176/350) x 100%	= 50.3%
Less Agree	= (8/350) x 100%	= 2.3%
Disagree	= (0/350) x 100%	= 0%

From the results of these calculations, it can be concluded that the program is categorized as easy to use and runs well. The broadcast process is successful and

feasible to be implemented with the percentage of strongly agreeing and agreeing to reach 97.7%.

IV. CONCLUSION

The results of the research show that the application for delivering information in Persada works very well. Application development using ERP and RAD methods results in an integrated and implementable system. This system is capable of running on various platforms, including mobile and desktop applications. This application conveys information activities in real-time on all events carried out in Persada, both regularly and self-taught, scheduled, or when changes occur. Tests of the app are using two methods. These methods are black-box testing and alpha testing. The black box testing gives 95% accuracy, while the alpha testing gives 97.7% accuracy.

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