

The Implementation of Rapid Application Development Method in Designing E-Learning based on Learning Management System Moodle at Universitas Islam Riau, Indonesia

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Abstract: This study presents to develop E-learning system using Learning Management System Moodle by applying Rapid Application Development method. E-Learning is helpful for interaction, learning, and communication between lecturers and students in Universities. Students can easily learn about their courses by using this system. For years, Administration Office of Information and Technology has developed a system about administration such as the staff attendance, costs, and other systems. Therefore, at Universitas Islam Riau, E-Learning manages all activities in learning processes such as assignment, syllabus and all materials about courses. The purpose of this research was to enable lecturers and students access all teaching materials at one place for 24 hours a day and 7 days a week to make it efficient in learning process.

1 INTRODUCTION

As the technology and science increase, especially in the field of information technology which presents tremendous impacts in the world of education today, not only in formal education, but also in informal and non-formal education, people can enjoy the facilities of information technology from simple to modern ones. The technology of computer and internet, both software and hardware, provides many offers and choices for education to support students' learning process. The advantages offered lie not only in the factor of speed to obtain information, but also the multimedia facilities that can make learning more interesting through interactive visuals, such as a research conducted by (Abdellatif et al., 2011) who built e-learning web-based multimedia platforms.

E-Learning is essentially learning, or learning through the use of computer or internet technology. Education must direct students to live in new situations that arise in themselves and their environment. With such conditions, the students need the ability to learn how to learn. This capacity can be achieved with four pillars of education which are described as the

basic of education. 4 pillars of education (UNESCO) refer to learning to know, learning to do, learning to be, learning to live together. By considering the four pillars of education, students can develop the competencies that are beneficial for life in the future. Those competencies include religious, economic, social, self-development competencies (Delors, 2013).

The format of education that might be available is E-Learning, which means learning through the use of computer technology and internet, distance learning, in which teachers and students are not in one place at the same time and do not physically and directly meet in person (Abdellatif et al., 2011). E-Learning is a learning approach through a computer connected to the Internet, in which participants try to get learning materials that comply with their individual needs, and an Internet application that can connect the educators and students in online learning spaces. E-Learning aims to overcome the limitations between lecturers and students, especially in space and time (Wan and Niu, 2018).

Currently, E-Learning has been widely accepted by the world community, as it is evidenced by the widespread implementation of e-Learning in educa-

tional institutions such as schools, (Hubalovsky et al., 2019), training institutes, universities and industries (Cisco Systems, IBM, HP, Oracle, and others) (Cidral et al., 2018). E-Learning is a type of learning system allowing the provision of teaching materials to students by using the Internet, Intranet or other computer network media and mobile devices (m-learning) (Amasha and AbdElrazek, 2016). E-Learning offers a new hope as an alternative solution for most of the problems in education in Indonesia. Its functions can be tailored to the needs, both as a complementary (supplementary) or substitute for classroom learning activities as long as it is used.

Producing interesting and attractive e-learning requires three conditions that must be fulfilled in designing e-learning, namely simple, personal, and fast. A simple system will make it easier for students to use existing technology and menus. The introduction of e-learning system will be reduced by the ease of the panel provided, so that the students' learning time can be efficient for the learning process, not for learning to use e-learning system. Personal requirements mean that the teacher can interact well as if he communicates with students in front of the class. With a more personal approach and interaction, the teacher can observe the students' learning progress and the teacher can help the students with all their problems. As a result, students feel at home for a long time in front of the computer screen. Furthermore, this service is supported by speed, rapid response to complaints and the needs of other students. Thus, learning can be done as quickly as possible by the instructor or manager.

Moodle is a name for an application program that can transform a learning media into a web form. This application allows students to enter the "digital classrooms" to access learning materials. By using Moodle, we can create learning materials, quizzes, electronic journals and others. Moodle stands for Modular Object Oriented Dynamic Learning Environment.

Moodle is a Course Management System (CMS) application that is free downloaded, used or modified by anyone with a GNU (General Public License) license. The Moodle application was first developed by Martin Dougiamas in August 2002 with Moodle Version 1.0. Currently, Moodle can be used by anyone on Open Source. (Oproiu, 2015) examined the use of the E-Moodle Learning Platform as a learning resource, as a means of evaluating teaching and learning in addition to the traditional teaching, learning methods and assessment at OLITEHNICA University of Bucharest. Moreover, Rosenberg (2001) emphasizes that e-learning refers to the use of internet technology to send a series of solutions that can improve knowledge and skills.

Haughey (Rusman, 2007) states his opinion on e-learning development. He asserts that there are three possibilities in the development of an internet-based learning system; they are the web course, web centric course, and a web enhanced course.

Web course means using the internet for educational purposes, in which students or lecturers are completely separate and there is no need for face-to-face meetings. All teaching materials, discussions, consultations, assignments, exercises, examinations, and other learning activities are fully conveyed through the internet. In other words, this model uses a remote system.

Meanwhile, web centric course refers to implementing the internet which combines distance learning and face to face (conventional) learning. Some materials are delivered via the internet and some are given through face to face. Its function is complementary. In this model the lecturer can give instructions to students to study lecture materials through the web they have made. Students are also given direction to find other sources from relevant sites. In face-to-face meetings, students and lecturers have more discussion about the findings of the material that has been learned through the internet.

Then, web enhanced course is defined as the use of the internet to support the improvement of the learning quality carried out in the classroom. The function of internet is to provide enrichment and communication between students and lecturers, fellow students, group members, or students with other speakers. Therefore, the lecturer in this case is required to master the technique of searching for information on the internet, to guide students to seek and find sites that are relevant to lecture materials, to present interesting and motivating materials through the web, to serve the guidance and communication through the internet, and other skills needed. The concept of E-learning is to bring the influence of the process of transforming conventional education into digital form. Presently, this concept has been widely accepted by the world community, as evidenced by the widespread implementation of e-Learning in educational institutions (Kovacova and Vackova, 2015). For years, all of the learning processes occurred at Universitas Islam Riau still apply Conventional method. In other words, the learning process between lecturers and students can only be done by meeting with the condition that there is an interaction between lecturers and students in the class.

In addition, the process of transferring knowledge is almost entirely conducted in the classroom; this causes the transfer of knowledge will be interrupted if the meeting does not occur. This situation clearly hin-

ders the learning process at Universitas Islam Riau.

2 METHODOLOGY

System Development Life Cycle is a method in the development of popular information systems and can be implemented when an information system is first developed. The System Development Life Cycle was further expanded with the existence of several models and frameworks in the development of information systems. One model that can be used in developing information systems is Rapid Application Development (RAD) (Maheshwari and Jain, 2012). RAD method is the development of an information system in a relatively short time. The development of a normal information system requires a minimum of 180 days. However, a system can be completed in just 60-90 days with RAD method (Aswati et al., 2017).

Rapid Application Development is a term originally used to describe the process of software development introduced by James Martin in 1991. Martin's methodology involves the repeated development and prototypes making. Recently, the terms and acronyms have been used in a broader general sense that includes various techniques aimed at accelerating the development of application, such as the use of web application frameworks and other types of software frameworks. RAD approach might require compromise in function and performance in return for enabling faster development and facilitating application maintenance (Kendall and Kendall, 2013). Rapid Application Development, like other methodologies relying on an iterative approach, has been criticized for rapidly creating a succession of prototypes that individually make little real progress ((Daud et al., 2010).

3 RESULT AND DISCUSSION

3.1 Page Setup

There were 2 phases at this stage. Before turning to action, it is important to know that if we do not understand what the client wants, we will never build the right system. Thus, we determined the needs or conditions to fulfill the product. Just like the requirements, we tried to solve the problem in order to avoid possible conflicts from stakeholders. The processes were:

- Discover Process

In this phase, we tried to understand the process

Table 1: Software Tools

| No | Name of Software | Description |
|----|-------------------|--|
| 1. | Windows 7 | Operation System |
| 2. | Microsoft Project | Schedule Management |
| 3. | Microsoft Word | To apply in documentation |
| 4. | Adobe Photoshop | To edit the picture |
| 5. | Adobe Dreamweaver | Design Template for the website with architecture and system design includes coding and testing. |
| 6. | MYSQL | Database |
| 7. | PHP | Programming language |
| 8. | XAMPP | Template to write and run coding to make sure the system functionalities works well and creating and structuring the database for the system for storing data. |
| 9. | Moodle 1.9.11 | Framework E-learning |

on this website by interviewing clients or people appointed by knowledgeable clients and asking the employees of the Universitas Islam Riau to utilize the relevant processes, step by step.

- Discover System Requirements

In this phase, the team collected information after the interview in order to start the system and tried to find the right conditions. This session merged the decision makers from staff organizations, potential users and members of the development team. A facilitator moderated the session. The facilitator was responsible to get what the decision makers and users want from the website.

3.2 Analysis

Then, the project members continued to the results of segment requirements and improved their understanding about the problem. Some actions had even began during the requirement segment. Meanwhile, the object models began to improve the system processes. There were three main tasks at this stage, such as task analysis, user analysis, and use-case scenario.

3.2.1 Task Analysis

- The purpose of task analysis was to understand in detail what tasks the users wanted to achieve in their interface, and how they wanted to solve them.
- After that, in this phase, the technical information such as hardware and software were utilized. Table 1 and 2 show the details about the hardware and software requirements.

Table 2: Hardware Tools

| No | Name of Hardware | Description |
|----|------------------|--|
| 1. | Computer | Intel® Core 2 Duo processor 2.0GHz 512 RAM DDR 2180 GB hard disk |
| 2. | Optical mouse | Cable mouse |
| 3. | RAM | 3GB |

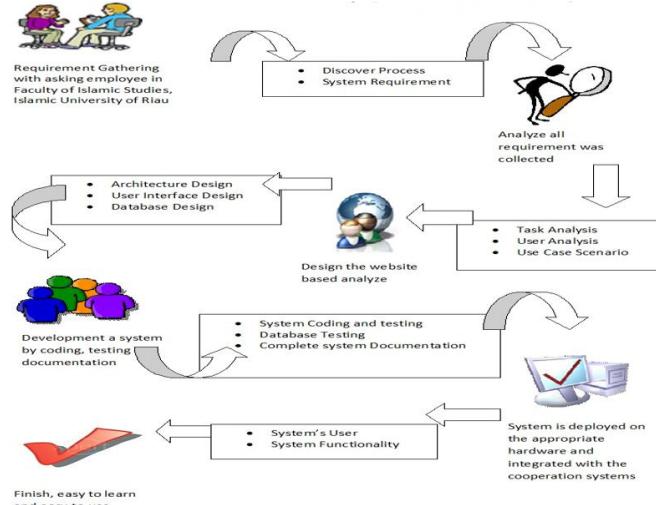


Figure 1: Rapid Application Development of E-Learning at Universitas Islam Riau

3.2.2 User Analysis

- The purpose of user analysis was to understand, at a high level, the users who would use the user interface and how they would use it.
- User analysis was carried out before project planning began, in other words, at the initial stage of the project.
- When no formal project was established, user analysis was carried out before project planning in order to provide management systems with an understanding of the workplace that could help determine system development needs.
- Workplace evaluation was implemented to determine the scope of the project and the project approach and problem statement.
- The user profiles should also be specified for the authorization of each user.

3.2.3 Use Case Scenario

The system flow needs to be refined and it has been compiled as use case diagrams, use case specifications, and sequence diagrams. This is crucial to understand the system flow more easily and effectively. The use case diagram of E-learning is shown in Figure 2. The use case Login shown in Figure 3 is for all users (Admin, Lecturer, and Student), which allows users to log in with valid username/ passwords to access the system. The use case Manage Course shown in Figure 4 is for admins and lecturers to manage course and assign at course in the system. The use case Manage Assignment is for admins, students

and lecturers to manage course assignment in the system. Figure 6 shows sequence diagram of Login Admin and Figure 7 shows sequence diagram of Manage Course.

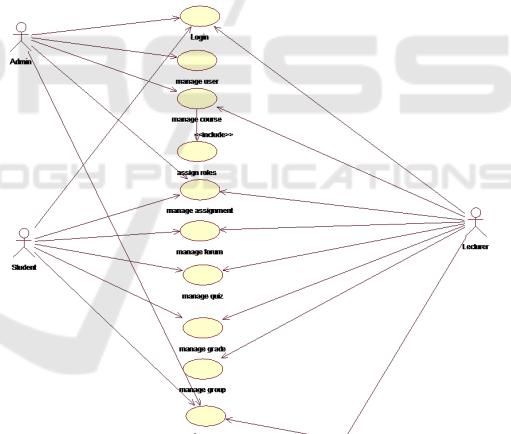


Figure 2: Use Case Diagram E-Learning

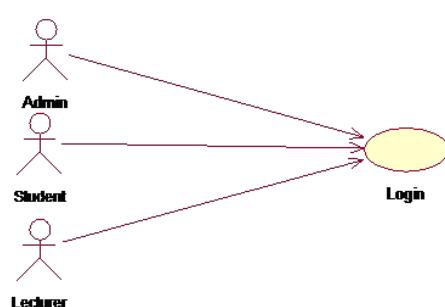


Figure 3: Use Case Login

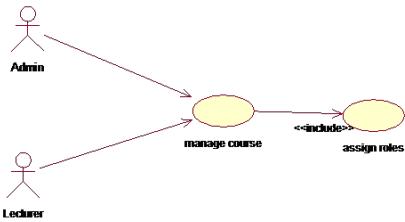


Figure 4: Use Case Manage Course

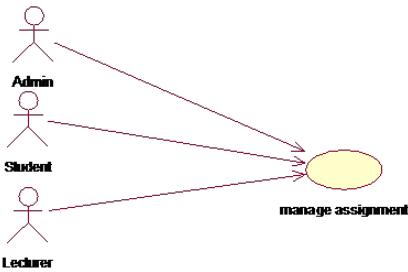


Figure 5: Use Case Manage Assignment

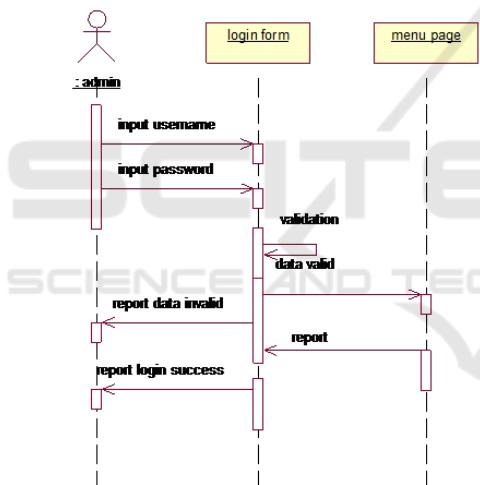


Figure 6: Sequence Diagram of Login Admin

3.3 Tools: Hardware, Software and Database

This system uses XAMPP as a web server, the application was created by Macromedia Dreamweaver by implementing PHP Programming Language and Database by MySQL. The hardware specification is 180 GB hard disk, Intel® Core 2 Duo processor 2.0GHz, and 3G RAM. The system built under Windows 7 operating system. This system uses XAMPP as a web server, the application was created by Macromedia Dreamweaver by implementing PHP Programming Language and Database by MySQL.

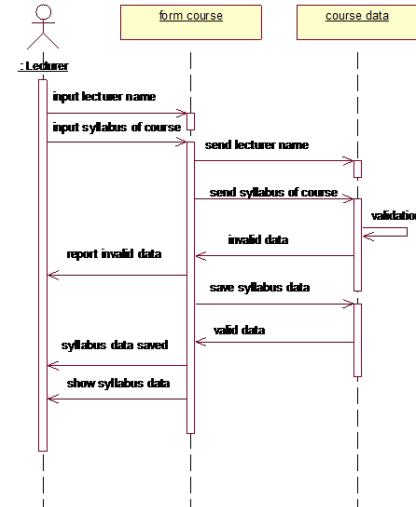


Figure 7: Sequence Diagram of Manage Course

Table 3: Admin Requirements

| No | Requirement ID | Requirement Detail | Priority |
|----------------------|----------------|---|----------|
| Login | | | |
| 1 | ELUIR-01-01 | Admin has to input username and password | H |
| 2 | ELUIR-01-02 | Login failed | L |
| Logout | | | |
| 3 | ELUIR-02-01 | Users have to log out by clicking 'Logout' after using the system | H |
| 4 | ELUIR-02-02 | Users can directly log out from the system without clicking 'Logout' button | L |
| Manage User | | | |
| 5 | ELUIR-03-01 | Admin fills all the required fields about the new user | H |
| 6 | ELUIR-03-02 | Admin click button "update profile" to save into data | H |
| 7 | ELUIR-03-03 | Admin can view list of user after add new user | H |
| 8 | ELUIR-03-04 | Admin can edit the user by clicking "edit" | H |
| 9 | ELUIR-03-04 | Admin can delete the user by clicking "delete" | H |
| Manage Course | | | |
| 10 | ELUIR-04-01 | Admin create category for new course by clicking "add new category" | M |
| 11 | ELUIR-04-02 | Admin fills all the required fields about new course | H |
| 12 | ELUIR-04-03 | Admin click button "cancel" to cancel the confirmation. | L |
| 13 | ELUIR-04-04 | Admin click button "changes save" to save into data | H |
| 14 | ELUIR-04-05 | Admin assign role lecturer and student for course | H |
| 15 | ELUIR-04-06 | Admin click "teacher" and then choose the user to assign role as lecturer | H |
| 16 | ELUIR-04-07 | Admin click "student" and then choose the user to assign role as student | H |
| 17 | ELUIR-04-08 | Admin click button "Assign roles in course" to save into data | H |

3.4 Design

Maestro was designed based on information gathered in the previous stage. The design was referred to the requirement specifications from the organization and users (Hoffer et al., 2008) such as Architecture Design, User Interface Design, and Database Design.

Table 4: Lecturer Requirements Login and Logout

| No | Requirement ID | Requirement Detail | Priority |
|----|-----------------|---|----------|
| | ELUIR-05 | Login | |
| 1 | ELUIR-05-01 | Lecturer has to input username and password | H |
| 2 | ELUIR-05-02 | Login failed | L |
| | ELUIR-06 | Logout | |
| 3 | ELUIR-06-01 | Users have to log out by clicking 'Logout' after using the system | H |
| 4 | ELUIR-06-02 | Users can directly log out from the system without clicking 'Logout' button | L |

Table 5: Lecturer Requirements: Manage Course

| No | Requirement ID | Requirement Detail | Priority |
|----|-----------------|--|----------|
| | ELUIR-07 | Manage Course | |
| 1 | ELUIR-07-01 | Lecturer view his course | H |
| 2 | ELUIR-07-02 | Lecturer can edit his course by clicking "setting" in "administration" menu | H |
| 3 | ELUIR-07-03 | Lecturer fills all the required fields about his course | H |
| 4 | ELUIR-07-04 | Lecturer click button "cancel" to cancel the confirmation. | L |
| 5 | ELUIR-07-05 | Lecturer click button "changes save" to save into data | H |
| 6 | ELUIR-07-06 | Lecturer can registered/add student take his course by clicking "assign role" in administrasi menu | H |
| 7 | ELUIR-07-07 | Lecturer click "student" and then choose the user to assign role as student | H |
| 8 | ELUIR-07-08 | Lecturer click "add" to add student for take his course | H |
| 9 | ELUIR-07-09 | Lecturer click "remove" to delete student from his course | M |
| 10 | ELUIR-07-10 | Lecturer click button "assign roles in course" to save into data | H |

Table 6: Lecturer Requirements: Manage Assignment

| No | Requirement ID | Requirement Detail | Priority |
|----|-----------------|---|----------|
| | ELUIR-08 | Manage Assignment | |
| 1 | ELUIR-08-01 | Lecturer can add assignment to his course by clicking "Assignment" in add activities menu | H |
| 2 | ELUIR-08-02 | Lecturer fills all the required fields about assignment | H |
| 3 | ELUIR-08-03 | Lecturer click "save and return to course" to save into data and return to course | H |
| 4 | ELUIR-08-04 | Lecturer click "cancel" to cancel add assignment | L |
| 5 | ELUIR-08-05 | Lecturer click "save and display" to save into data and display that | H |

3.5 Development

The system code was tested to make sure that there was no error and to detect any malfunction of the system before implementing the system. The system was tested using <http://localhost> to make sure it runs smoothly, in order and consistent. During the testing, a lot of shortages and errors have been successfully found. The errors found from the testing were wrong page link, invalid data and page error. All mistakes

have been corrected and now the system completely functions well.

During the system testing, all the data inserted by users were checked in the database to make sure all the data were successfully stored. Besides, the functions that needed the data to be retrieved back were also tested. To retrieve the data in the database, users faced a session that prompted them to enter specific data correctly for security purposes. The entire database had no error and functioned well.

Complete System documentation or draft report finished after the system coding and testing was done. The documentation is important as it contains everything about the system from start to end.

3.6 Project Requirement

Project requirements is divided into two parts, functional requirements and non-functional requirements. Admin requirements are explained in Table 3 and lecturer requirements are explained on Table 4 to Table 9. Non-functional requirements are the functions of non-technical aspects in order to make the users interested to come to E-Learning UIR system. For that, I created the design of E-Learning UIR system as interactive as possible and provided good content on it so users would come to see it.

3.7 Interface

As shown in Figure 8, the user login page is the first step that must be taken to enter the system in accordance with their respective rules such as student or lecturer. As shown in Figure 9, the home page is the main page after the user has logged into the system. In this page, the user will have a special menu according to their roles such as student or lecturer. For example, after students log into the system, the home-page will display courses taken by the student during the semester. As shown in Figure 10, Student Course page contains lecture materials presented by lecturers as well as assignments, quizzes and exams. With this anytime students can access lecture materials anytime and anywhere.



Figure 8: User Login

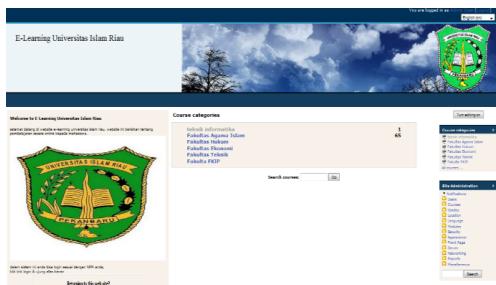


Figure 9: Home Page



Figure 10: Student’s Course Page

Table 7: Lecturer Requirements: Manage Quiz

| No | Requirement ID | Requirement Detail | Priority |
|----|-----------------|---|----------|
| | ELUIR-09 | Manage Quiz | |
| 1 | ELUIR-09-01 | Lecturer can add quiz to his course by clicking “quiz” in add activities menu | H |
| 2 | ELUIR-09-02 | Lecturer fills all the required fields about quiz | H |
| 3 | ELUIR-09-03 | Lecturer click “save and return to course” to save into data and return to course | H |
| 4 | ELUIR-09-04 | Lecturer click “cancel” to cancel add quiz | L |
| 5 | ELUIR-09-05 | Lecturer click “save and display” to save into data and display that | H |
| 6 | ELUIR-09-06 | Lecturer can add question into quiz by click list of question in “make new question” menu | H |
| 7 | ELUIR-09-07 | Lecturer fills all the required fields about question | H |
| 8 | ELUIR-09-08 | Lecturer click button “cancel” to cancel the confirmation. | L |
| 9 | ELUIR-09-09 | Lecturer click button “changes save” to save into data | H |
| 10 | ELUIR-09-10 | Lecturer add question into quiz by click “add to quiz” | H |
| 11 | ELUIR-09-11 | Lecturer click button “delete” to delete question. | L |

4 CONCLUSION

The development of E-learning System is very rapid and efficient by using the RAD method. E-Learning at Universitas Islam Riau is a management software/system which has complete functions for university activities about learning within students and lecturers. It totally changes conventional learning to fully automatic learning using computer machine. This project goal was to provide solutions for the students and lecturers in managing their course. This research obvi-

Table 8: Lecturer Requirements: Manage Forum And Grade

| No | Requirement ID | Requirement Detail | Priority |
|----|-----------------|---|----------|
| | ELUIR-10 | Manage Forum | |
| 1 | ELUIR-10-1 | Lecturer can add new forum in his course | H |
| 2 | ELUIR-10-2 | Lecturer click button “tambah topik baru” to add new topic | H |
| 3 | ELUIR-10-3 | Lecturer fills all the required fields about new topic | H |
| 4 | ELUIR-10-4 | Lecturer click button “browse.” To attach file | M |
| 5 | ELUIR-10-5 | Lecturer click button “post to forum” to save into data | H |
| 6 | ELUIR-10-6 | Lecturer can delete his topic | L |
| 7 | ELUIR-10-7 | Lecturer can response about student opinion by click “tanggapan” | M |
| | ELUIR-11 | Manage Grade | |
| 8 | ELUIR-11-01 | Lecturer can give grade for student | H |
| 9 | ELUIR-11-02 | Lecturer can give grade Quis for student by click link to kuis “name kuis” | H |
| 10 | ELUIR-11-03 | Lecturer can give grade Assignment for student by click link to assignment “name of assignment” | H |

Table 9: Lecturer Requirements: Manage Group

| No | Requirement ID | Requirement Detail | Priority |
|----|-----------------|---|----------|
| | ELUIR-11 | Manage Group | |
| 1 | ELUIR-12-01 | Lecturer can make a group for student in his course | H |
| 2 | ELUIR-12-02 | Lecturer click button “Auto-Created group” to make group by automatically | H |
| 3 | ELUIR-12-03 | Lecturer click button “cancel” to cancel add group | L |
| 4 | ELUIR-12-04 | Lecturer click button “preview” to pre-view group | M |
| 5 | ELUIR-12-05 | Lecturer click button “Continue” to save group into data | H |

ously has a concrete significance for students and lecturer because this project was developed for solving their problems in the learning process.

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