



Design of Microcontroller Course Video Tutorial Application using User Centered Design Method Based on The Android

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ABSTRACT

The Microcontroller course is one of the compulsory courses contained in the Informatics Engineering study program at the Methodist University of Indonesia. The purpose of holding the Microcontroller course is so that students had been an understanding of the basics, architecture, work principles, minimum systems, hardware and software components in the microcontroller system and the application of the microcontroller. Based on experience, there are several difficulties in studying Microcontroller courses such as understanding the circuit images contained in the Microcontroller lesson manual and also applying the series on the Breadboard board. The purpose of this study is to build applications that can help students understand microcontroller courses using the User Centered Design (UCD) method. The system built will later provide video tutorials that can help students understand microcontroller courses.

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1. INTRODUCTION

The Microcontroller course is one of the compulsory courses contained in the Informatics Engineering study program at the Methodist University of Indonesia. The purpose of holding the Microcontroller course is so that students had been an understanding of the basics, architecture, work principles, minimum systems, hardware and software components in the microcontroller system and the application of the microcontroller.

This course will discuss Microcontroller architecture, instruction devices, addressing models, Microcontroller interface systems, basic programming, and simple microcontroller applications [1]. The material that has been studied during theory will then be proven by doing practice. Based on experience, there are several difficulties in studying Microcontroller courses such as understanding the circuit images contained in the Microcontroller lesson manual and also applying the series on the Breadboard board.

This application will provide video tutorials for learning Microcontroller courses, which are expected to help students understand Microcontroller courses. Based on the background above, the main purpose of this study to design and analysis of microcontroller course video tutorial application using user centered design method based on the android.

2. RESEARCH METHOD

In this study we used the User Centered Design (UCD) is a process for developing systems, objectives or characteristics, context and system environment based on user experience [2].

The principles that must be considered in UCD are [3]: Focus on the user by design must relate directly to real users or potential users through interviews, surveys, and participation in design workshops. The aim is to understand the user's cognition, character and attitudes as well as anthropometric characteristics. Its main activities include data retrieval, analysis and its integration into design information from users about the characteristics of the task, technical environment, and organization. Integrated design by the design must include the user interface (user interface), system assistance (helps), technical support and installation and configuration procedures. And since the beginning of development, users are involved in testing activities

The only successful approach to user-centered system design is that it requires empirically observations of user behavior, careful evaluation of feedback, problem-solving insights, and strong motivation to change the design. The system being developed must be defined, designed, and tested repeatedly. Based on the results of the behavior test of the function, interface, help system, user documentation, and training approach. There are four processes in UCD namely (ISO, 1999), understand and determine the context of use, determine the needs of users and organizations, and produced design solutions, evaluate designs against user needs [4].

Assessment of the system that has been built is done by doing usability testing. Usability can be used to measure the level of user experience when interacting with system products. In general, usability refers to how users can learn about and use a product to achieve its goals and how satisfied users are with its use [2]

The International Standards Organization (ISO) defines that usability is the extent to which a product can be used by users to achieve their goals with effectiveness and efficiency. Usability has five quality attributes, namely [5]; The first, learnability, which shows how easily users can learn the main system functions and achieve the skills to do work, the second, efficiency, namely after learning the system, how fast users can perform their tasks using the system. The third, memorability, it is very important for irregular users to be able to use the system without having to learn again. This feature helps users to remember the working system after a certain period of use. The fourth, Errors, namely the number of user errors and how easily they can recover them. And the last satisfaction, which shows whether the user is happy or not in using the system.

Measurements are made to assess whether the interaction between the user and the application can run well and identify usability problems that can affect the interaction of the system (software) with the user in the results of application design [6].

3. RESULTS AND DISCUSSION

Based on the researcher's experience, there are several difficulties in studying Microcontroller courses such as understanding the circuit images contained in the Microcontroller lesson manual and also applying the series on the Breadboard board.

This problem can be overcome by creating an application where this application provides a video tutorial for learning Microcontroller courses, which is expected to help students understand Microcontroller courses. This application will be implemented based on android later.

The system to be built is a system to help users understand each material by viewing the video tutorials that have been provided where users can view the video tutorials by logging in first, as well as a question and answer forum for users to share / share information with other users. Use Case Diagrams are graphical descriptions of some or all of the actors, use cases, and their interactions that introduce a system. The admin use case diagram of the application, User Use case diagram and Admin Account Activity Diagram to be built can be seen in Figure 1.a-c.

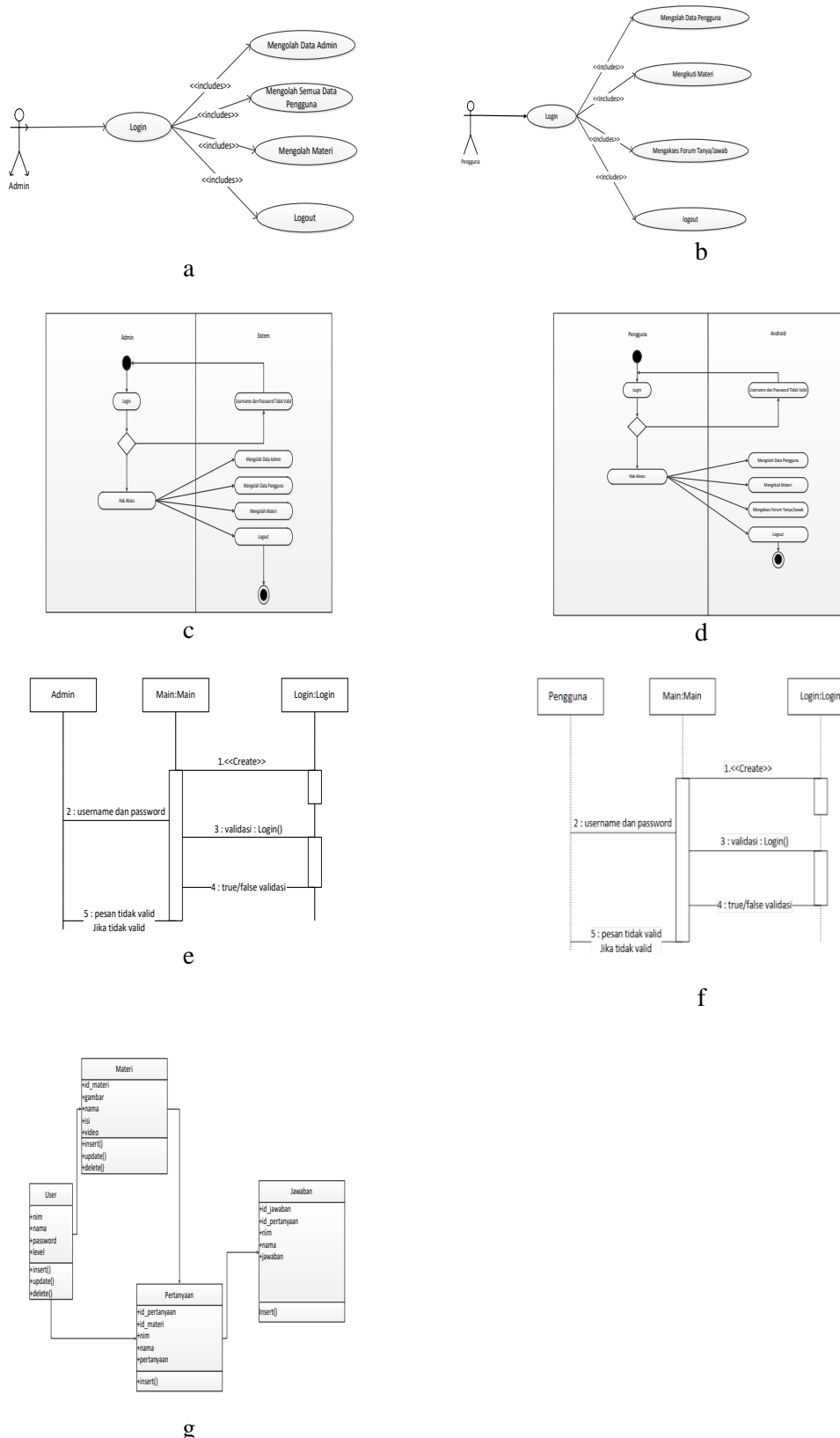


Figure 1. a. Use Case Diagram Admin, b. User Use Case Diagram, c. Admin Account Activity Diagram, d. User Account Activity Diagram, e. Admin Login Sequence Diagram, f. User Login Sequence Diagram, g. Class Diagram.

This activity is an activity that describes the tasks of an admin in the application. The admin must first log in to enter the admin account page. After logging in, the admin can perform tasks such as processing admin data, processing user data, and logging out of the system. This activity image can be seen in Figure 1c. This activity is an activity that describes the tasks of a user in Android. The user must first log in to enter the user account page. After logging in, users can perform tasks such as processing user data, following material, accessing question / answer forums and logging out of Android. Activity diagram of user accounts on Android can be seen in Figure 1.d. Sequence diagrams are used to describe behavior in a scenario. This diagram shows a number of examples of objects and messages placed between objects in a use case. The following is a sequence diagram of the application to be built: This sequence is the sequence for the login process from the admin. Admin is expected to be able to order the correct username and password in order to enter the admin account page. Admin Login Sequence Diagram can be seen in Figure 1.e. This sequence is the sequence in which the login process of the user is expected to provide the correct username and password in order to enter the user account page. User Login Sequence Diagram can be seen in Figure 1f. Class diagrams are static models that describe the structure and description of classes and their relationships between classes. Class diagrams are similar to ER-Diagrams in database design, the difference is that in ER-diagrams there are no operations / methods but only attributes. Class consists of class name, attribute and operation / method. The class diagram that is built can be seen in Figure 1g.

The login display functions for admins / users and The main user menu view functions for users to access every feature that can be accessed by the user to input username and password data before entering the main menu page. The login design can be seen in Figure 2.

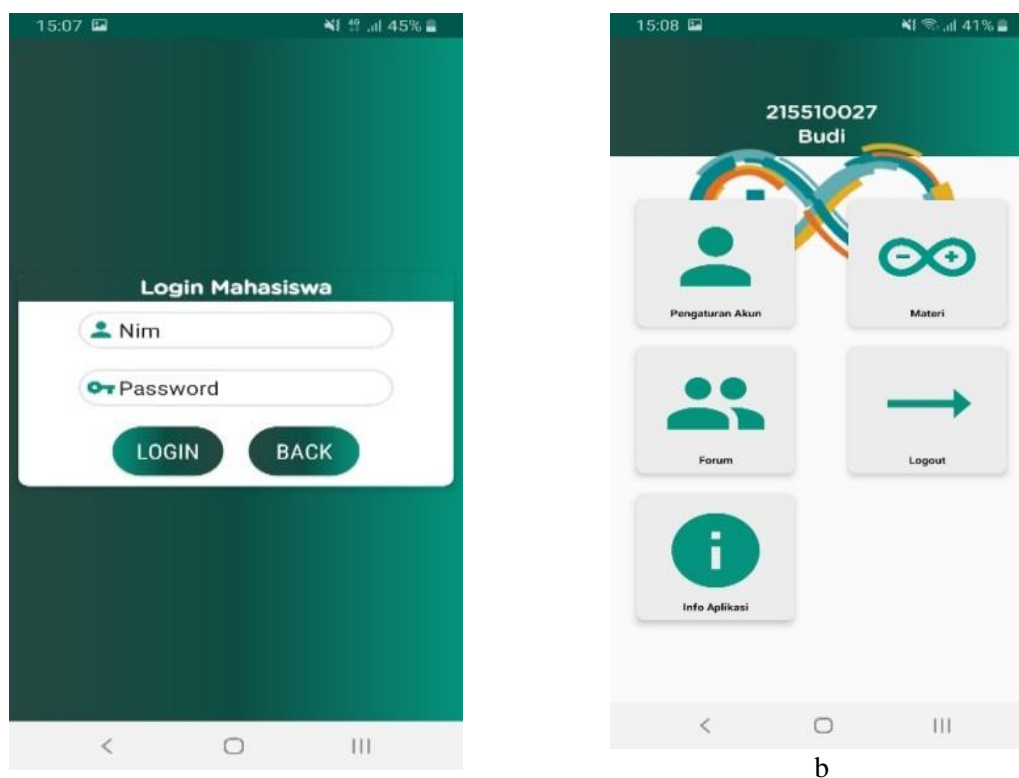


Figure 2. a. Login Display, b. User Main Menu Display

The assessment is done by giving a questionnaire to respondents who have used the application in order to gain user experience on the appearance of the application being tested, namely what the user sees and feels when using the application. The questionnaire contains 15 questions that represent the five aspects of usability (examples of questionnaires can be seen in the appendix). Each question in the questionnaire aims to show the level of usability according to user acceptance which will be assessed on a scale of 5. After distributing the questionnaire to 20 respondents, a

recapitulation was carried out by calculating the average results of usability testing. A recap of the results of usability testing can be seen below:

Table 1. Recapitulation of Usability Values

Declaration		1	2	3	4	5	Average	Total
Learnability	P1	0	0	4	7	9		
	P2	0	0	4	11	5	81,3%	
	P3	0	1	6	7	6		
Efficiency	P4	0	0	2	7	11		
	P5	0	1	6	9	4	82,0%	
	P6	0	0	6	7	7		
Memorability	P7	0	0	2	9	9		
	P8	0	0	4	7	9	84,0%	81,9%
	P9	0	1	4	9	6		
Error	P10	0	0	7	8	5		
	P11	0	0	5	8	7	81,0%	
	P12	0	0	3	11	6		
Satisfaction	P13	0	0	7	5	8		
	P14	0	1	4	11	4	81,3%	
	P15	0	0	3	9	8		

Based on the System Usability Scale, the range of usability values can be seen in the figure 3.

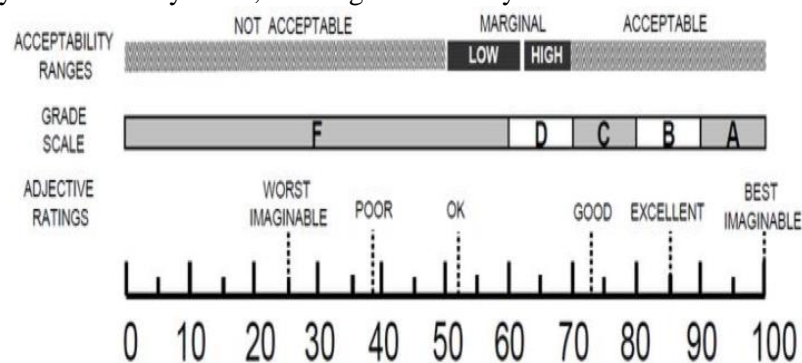


Figure 3. System Usability Scale (SUS)

Applications that have been built are at an excellent range of 81.9%. Therefore, it can be concluded that this application is user-friendly with a high level of usability.

4. CONCLUSION

Based on the analysis of the source of the video tutorial application for the microcontroller course with this application, it can help users to get learning materials for microcontroller courses. The applications built can provide learning material in the form of video tutorials. The application is built on an online basis so that users can access it anytime as long as they have internet access.

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