Design Smart Home Application Using Rapid Application Development (RAD) Method On Hybrid Mobile

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ABSTRACT

Information technology and computing technology are currently being developed simultaneously to be able to provide information that is processed automatically so as to provide a system that can be used to facilitate human activities. Currently, the smart home is a technology that continues to be improved, such as speed and accuracy in the process inside. This study aims to design a Smart Home application that uses the basic concept of the Internet of Things (IOT) using Rapid application development (RAD) method on Hybrid mobile. The Rapid Application Development (RAD) method focuses on developing an application quickly, precisely and adaptively. By using the RAD method, the smart home application can be applied to Hybrid Mobile where the condition of some electrical equipment in the house can be controlled remotely, namely using a smartphone application or WEB application. From the results of this study the system can monitor and control several electrical equipment at home using the button command feature on mobile and web based system.

1. INTRODUCTION

Technological developments are currently so rapid both in various fields such as computer technology, telecommunications, electronics and automation systems. The system is currently capable of producing various kinds of sophisticated and intelligent applications that can help human activities today and in the future. In reality, the house is a place that cannot be separated from human needs which is used as a resting place or as a

place to shelter from outside disturbances, whether noise, danger or others. Meanwhile, most human activities are currently outside the home, so to control or monitor the conditions inside the home, an integrated system is needed, in other words, it can be monitored automatically by the home owner but at a long distance.

One of the developments in technology is that it cannot be separated from the development of the internet, one part of developments in the world of the internet, known as the Internet of Things or abbreviated as IOT. In short the Internet of Things is a technology that can communicate two or more objects that are around in an Internet network. It can be concluded that IoT has the ability where an object utilizes the internet network to be able to transfer data [1]. In this study the internet is used to help automate the smart home application which will be designed so that activities in the house can be controlled or controlled more quickly over long distances.

The internet is one of the important roles for humans, the internet is one of the communication networks that functions to connect electronic mediawith other electronic media more with more speed and precision[2]. The communication network created conveys some information that is sent via a transmission signal with a predetermined signal frequency. In global standards, the use of the internet network can use a common protocol like Transmission Control Protocol/Internet Protocol (TCP/IP)). With this Internet technology, people very easily get information from various media. One of the developments of the internet is the Internet of Things (IOT) which has a conceptual meaning in which internet connections are extended to physical devices used in everyday life. These devices can exchange information with other devices, where an object has the ability to transfer data via the internet network, one of the supporters of IOT development with the Rapid Application Development (RAD) method. This method is a method that focuses on making prototypes quickly and relying on feedback from users.

In 2021 there is a research journal regarding the application of the RAD method to the Umrah service information system at PT. Galang Saudi tourism Jakarta is website-based with Unified Modeling Language (UML). This Umrah service information system is illustrated with four diagrams, namely diagrams of use cases, activities, ERD and Logical Record Structure (LRS). The results of this study indicate that the design of the Umrah service information system at PT. Galang Saudi tourism Jakarta which was previously done manually has now been computerized properly, quickly and accurately [2]. Several other references also apply the Rapid Application Development (RAD) method because it has advantages in the process of making the system fairly fast but the results in the design are of good quality [3].

Research on Smart Home was previously carried out by Designing a Smart Home System with the Concept of Hybrid Internet of Things Based on the Message Queuing Telemetry Transport Protocol where the devices contained in the house can be controlled anytime and anywhere using an internet connection but there are still weaknesses where electronic devices are controlled. static [1]. Other research on Smart Home which was

carried out using MQTT data communication was also carried out with commands for the device using the Google Aiy Voice Kit. Other research using RAD in monitoring smart greenhouses using Android with test results proving that 94 percent of this application is easy to use for users [4]. Departing from some of these studies, this research will use a design for making Smart Home with a faster method, namely Rapid Application Development (RAD) based on Hybrid Mobile so that remote control and control of several devices in the house can be faster and more precise.

Development of smart home applications continues to this day to ensure that we get faster and more efficient results. Smart from the meaning of the word Smart while Home from the word Home if combined into a smart home, Smart home or smart home is defined as a place to live that does not only get comfort in it, one of the smart home facilities is information technology that can respond to the needs of residents of the house, work with relying on efficiency, device automation, convenience, security, savings, and entertainment that can be obtained through technology management from inside the house and connections to the outside world that can be controlled by homeowners remotely. At this time Smart Home allows us to be able to control devices in the house anywhere and anytime by using the Android application [5]. Smart home application is assisted by a computer which provides the facilities the user wants automatically and has been properly programmed [6].

Internet of Things or abbreviated as (IoT) is a concept that aims to be able to expand the benefits and connectivity of the internet that is connected continuously [1]. The Internet of Thing is a platform or device that can be a solution to increase human effectiveness [7]. The internet of things can now also be used in mobile applications. In this study, mobile phones will be used to control devices that are in the house where the use of mobile phones has the highest range, because they can be used from anywhere [8]. Objects in IoT can be used to produce services that can work together for a common goal [9] . With this capability, it can support the application of Smart Home to control or control devices or objects in the house anywhere and anytime. Some previous research from the Internet of Things is not only used in the development of smart home applications but also in smart parking applications, one of which is smartphone research which can maximize the amount of parking availability with quite good results [10].

The Hybrid approach can be seen as a bridge between Website and approach Hybrid Applications are built using HTML, CSS, and JavaScript which are website technologies and are executed in this Hybrid approach using the device's engine browser which renders and displays the HTML in a full screen Website display control. Basically, this hybrid-based application combines two native-type applications and web-type applications into one application package, then installed on the user's device or can also be directly uploaded to a mobile application store that matches the user's platform, such as the Google Playstore for Android or the App Store for Android. iOS [11]. Hybrid applications usually use a browser to be able to access various application features

available on mobile devices such as Push Notifications, Contacts, or Offline Data Storage [12]. Hybrid applications have limitations in accessing hardware devices although how to access can varies, depending on the system mobile operation and framework being used[13]. In other words, application mobile hybrid takes a development approach involving web technology that can run on native apps, which can provide the advantage of optimizing the advantages of both technologies [14].

Figure 1. Hybrid Application Process Flow

There are three approaches to developing mobile applications, namely with Native App, Mobile Website, and Hybrid [15]. Native Applications are applications that have been installed or installed on mobile devices such as Android, IOs, or Windows Phone. The advantages of a hybrid application are the application loading process and faster performance and can also be run completely offline like a native application [12]. However, compared to the use of cellular phones, computers or web-based services are considered to have lower coverage because their use cannot be accessed as flexibly as cellular telephones. Web-based applications, in this case accessed using a computer, are widely regarded as tools used for work [8].

2. RESEARCH METHOD
2.1. Rapid application development (RAD)

The system development technique applied in this study is the Rapid Application Development (RAD) method. RAD is a system development method that has advantages because it has short and fast stages, at the requirements planning stage it is used to identify the goals of the application or system to be built, the RAD design workshop (modeling) stage is used to make a visual appearance of the design and user workflow and the implementation phase is used for system development and testing [16]. RAD is a combination of various techniques that focus on its development [17]. Another advantage of this method is that it can involve the user directly in the development process. This method is able to reduce the time to develop software [18]. In developing an information system in general it takes at least 180 days, while using the method RAD to create a system can be completed simply within 30-90 days [19].

There are 3 stages in the development of Rapid Application Development (RAD), namely [20]:

1. Planning

The planning stage is the initial stage in developing a system where this stage will identify problems and collect some data needed by Stakeholders obtained from users who have the goal of being able to identify information and the ultimate goal of the system to be built. At this stage, the user is expected to be able to actively provide input and comments on the designs made so that the system you want to create can be resolved quickly.

2. RAD system Modeling

At this stage, the design process and the improvement process of the design are carried out. This stage can be carried out continuously if there is still a discrepancy from what is required by the user which has been identified in the previous planning stage. The output that will be obtained from this stage is a software specification which includes the organization contained in a system in general such as data structures, data models and others.

3. Implementation

This stage (Figure 2) is the final stage after the design planning and modeling of a system to be made have been approved in the two previous stages. In this stage there is also a process of testing the program to detect errors that exist in the system to be developed.

Figure 2. Stages in Rapid Application Development (RAD)

2.2. System design flow

The Smart Home system that will be designed in this study utilizes a hybrid-based RAD method to provide a faster development process to users. The description of the Smart Home system flow that will be designed is as follows:

a. Designing a scheme of internet of thing based on hybrid mobile

An analysis of the parts and components will be used in each part of the smart home design with the mobile hybrid-based Internet of Things (IoT) concept. This section briefly analyzes user needs as well as framework requirements.

b. Laravel

At this stage, Laravel as a framework has been determined to create a Hybrid Mobile-based Smarthome Application program.

c. Rapid Application development (RAD).

The implementation of smart home applications with the Internet of Things concept uses the Rapid Application Development method so that the development cycle can have a short and fast time.
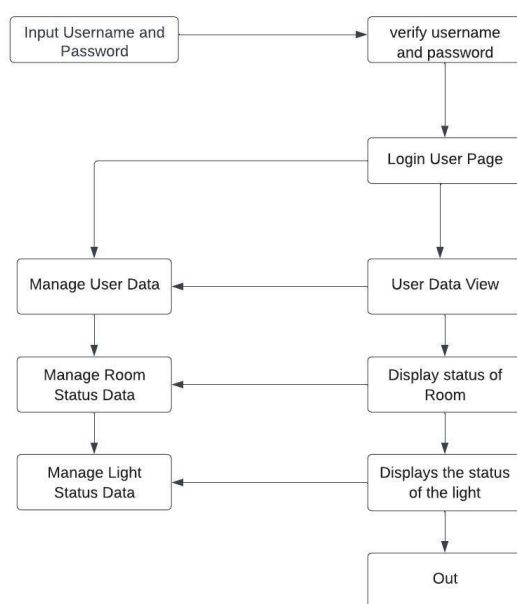

Figure 3. User and Software Activity Diagram

d.Designing programs

Design of a smart home is the concept of Mobile Hybrid-based Internet of Things (IoT), so software is designed that will later be included in the Laravel framework and Mobile Devices with supporting operating systems such as Android and IOS.

e. Perform design testing

On (Figure 4) all parts of the smart home design with the concept of internet of things (IOT) based on mobile Hybrid have been implemented using the laravel framework, in testing with a simulator it will be tested whether the lights are on or not with the on or off button, this condition can also be seen from API condition whether the condition is on and off. At this implementation stage it is dynamic, which means that the implementation of this research is integrated with the API.

91

3. RESULTS AND DISCUSSION

This research produces a Smart Home application based on Mobile Hybrid using the Laravel framework which is expected to help homeowners in monitoring electronic equipment that is turned off or on such as lights remotely wherever and whenever. The following is a realization of the system interface display when it is first opened on a mobile device. This system interface functions to display login and light data that will be made on or off on the user's mobile device.

a. Main page display

On this main page display Figure 5, users can log in with username and password to access several devices in the house.
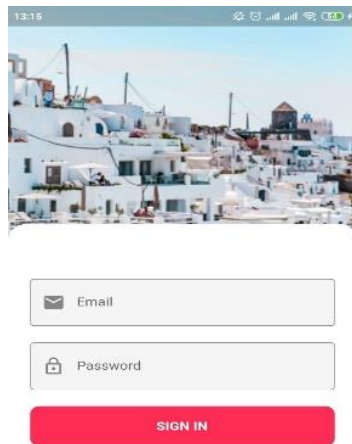

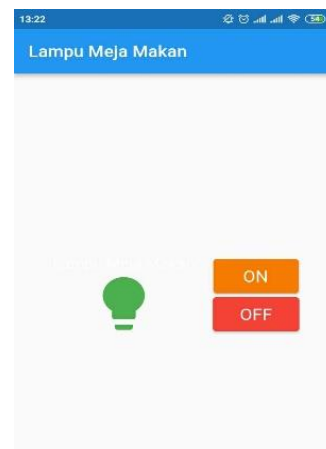**Figure 4.** Display of Main Page on Mobile Device

Figure 5. Dashboard View

b. Dashboard view

In the dashboard view Figure 6, you will see device features in the house that can be accessed by the user. This feature can be developed according to user needs later. In this view the user also adjust the lights in the house by pressing the On button to turn it on and Off to turn it off.

c. Display login menu on the web

In this view is a web-based display for user login on Figure 7. Users can log in using the email and password that was created on the Mobile Device using the database.
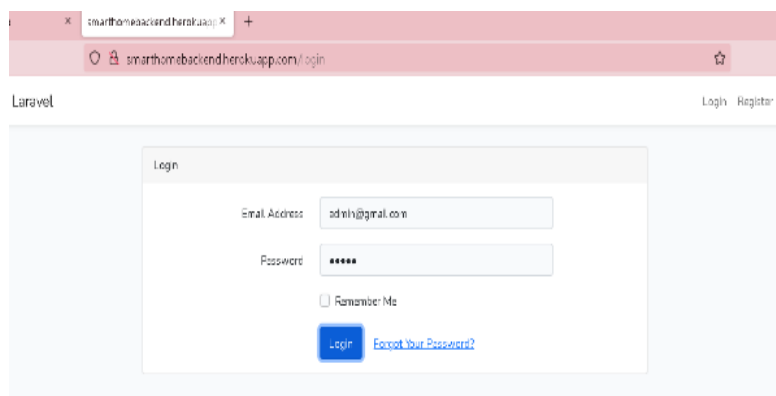
Figure 6. Login Menu on the Web

d. Dashboard view and user edit data menu display on web

The Dashboard menu page on the Web dashboard shows several features Figure 8, Home features, Master Data which contains Room Data and Lights Data and the top right corner is the admin user who is currently logged in to the Smart Home web. In this view the user can add data to several devices in the room for the lights to be used, in this view the user can also change the status of the lights whether they are off or on.
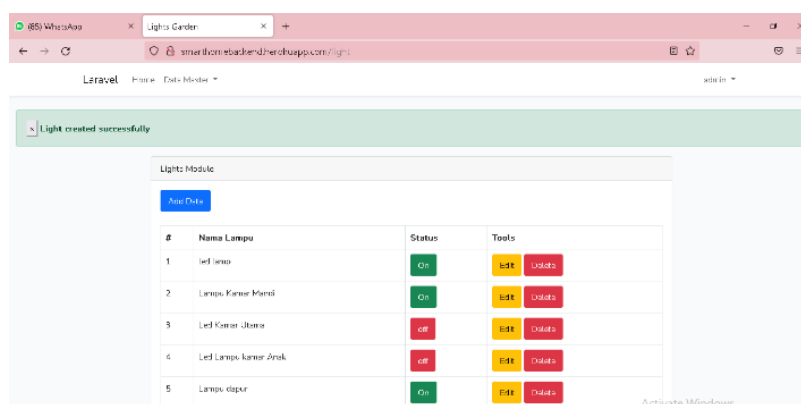

Figure 7. Dashboard view on the Web

On stage testing was also carried out on the Hybrid-based Smart Home application which was created to make it easier for users to control and monitor several devices in the house. In table 1 the following is the data from the results of application testing that has been carried out:

Table 1. Application Testing Results

Type of Testing	Type of Smartphone		Description Result
	Android	IOS	
App Build	Successful	Successful	Android successful using valid keystore – windows phone running on windows phone 8 x – ios requires devolepmnt key certificate from Apple Store
App Configuration	Simple	Simple	Keystore Setting, build Setting
File Installer for testing	file .apk	file .appx	For IOS, it can be published directly to the app store
Publish	Playstore	Microsoft Store	

Software developed using the mobile hybrid method is a multiplatform mobile software development where this software can be used by several leading operating systems, such as Android, Windows Phone such as iOS. After testing the application, the next stage will be testing the success or failure of the application that has been made to be able to control and control devices that are in the house. The test results can be seen in table 2.

Table 2. Testing User Functions on Android

No	Functions tested Display Testing	How to test	Display Testing	Result
1	Home user	Users can open the application on the smartphone	Home page or Login to the main Successful page	Successful
2	Room Status Page	The user clicks the status report button.	The status form page appears	Successful
3	Information page Edit and delete	User clicks button view information edit and delete	Information page appears	Successful

After the user performs the test directly, it can be seen that the default system works according to the system sequence that was previously designed, after that the system is also run according to the user's request (Android application). In the application there is an API (Application Programming Interface) module that is created using the PHP program. This API module contains modules that are used to query data directly between the smartphone application and the database.

4. CONCLUSION

The conclusions that can be drawn from the research are, from planning to testing the Smart Home system with the Hybrid Mobile-based Rapid Application Development (RAD) method has been successfully created and can be controlled anytime and anywhere

using an internet connection. This system functions as it was designed from the start, which is to make it easier for users or homeowners to remotely control and monitor electronic equipment used using Android and Web-based applications. In this study, only a few devices were controlled using one computer and one mobile device, but it could still be developed by utilizing the internet network so that the system achieves the goal of being able to be controlled anywhere and anytime. In future research, it can be designed for devices that are dynamic so that they can manage electronic equipment without changing the electrical circuits that have been made at this time. In further research, several other supporting tools such as cameras, servos and several security sensors can be added so that they can support a better smart home system.

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