

LAND CERTIFICATION SYSTEM ON ANDROID

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ABSTRACT. *Land certification system is one of important public services that are provided by government. The system has been implemented manually so that processes that happen in the system such as registration need more efforts and take a long time. The research tries to solve the problem by developing a mobile-based application for the system. The system will then be easily to access and people need not frequently visit the government office to register and get land certificates.*

Keywords: Land certification, Mobile application, Android, GeoJSON, Ionic framework

1. Introduction. Rapid development in ICT (information and communication technology) has given a big impact to human life. It includes public administrations and services. Those who are not able to utilize this technology will have difficulty in the competition. The process of public service often found, for example, is the matter of the registration for land certification. During this time, mostly governments do the process of making the certificate manually.

The manual process has made the registration difficult for communities to obtain information about land, the registration of land title (certificate) and information about their land in detail before their land certificates are legally recognized. It is needed for government to have a system that could make the process easier and make each land owner and employees an easier system or application which could reduce the time of land registration.

The research is to develop a mobile application for obtaining land certification. Although the land certification system will be able to be used on a regular basis of land certificate registration, in this research, the land certification system will be developed to solve the problem of many people in this world to get a land certificate in which the flow is complicated. This system will replace printed forms, so that the land owner could directly fill the form through mobile application and it will be saved directly to the server. It will make the certification process faster and the land owner does not have to waste their time for registration and this system also will be able to check the progress of their certificate.

2. Literature Review. Generally, certification is the confirmation from an organization to a certain object, person or organization. Land certification itself is the confirmation from government to a certain size of land where the lands are belonged to. The land certification process includes analyzing the requirement of the certification, identifying the data integrity, surveying the location, measuring the land, land owner approval. Land certification is the core of the city development [1]. The steps of land certification in Indonesia consist of the following. 1) Prepare documents and data. The land owner

should prepare some documents and data to fulfill the requirement of land certification. 2) Location. The location for the land is not just only by address which will be very hard to find if it is only by address but the land owner could tag and draw their land in maps in polygon by using latitude and longitude of each point location. 3) Approval status. The approval status becomes the common problem in land certification since the land owners do not know the progress of the certificate.

Land certification is an official document issued by government for freehold and leasehold land [2]. Similar to a deed for un-registered land, it is a prima facie evidence of the ownership of land. Land certification is still a main problem especially in every country. In Indonesia, until 2013 BPN has registered around 44.5 million inquires from about 100 million plots of land in the territory of Indonesia [3].

In this digital era, almost every person has his/her own smartphone. With many kinds of mobile operating system, it will be expensive for a company to build a mobile application with different platforms. Fortunately, there exists a complete open-source SDK for hybrid mobile app development [4]. It was first released in 2013 by Max Lynch, Ben Sperry, and Adam Bradley from Drifty Co [5]. The more recent releases, known as Ionic 3 or simply “Ionic”, are built on Angular [6]. Ionic provides tools and services for developing hybrid mobile apps using Web technologies like CSS, HTML5, and Sass. Web-based applications can then be leveraged to become mobile applications.

3. Methodology. To complete this application, the agile model will be used. The model requires the involvement of all stakeholders in the development process [7]. Agile process is driven by customer descriptions of what is required (scenarios), recognizes that plans are short-lived, develops software iteratively with a heavy emphasis on construction activities, delivers multiple ‘software increments’ and adapts as changes occur.

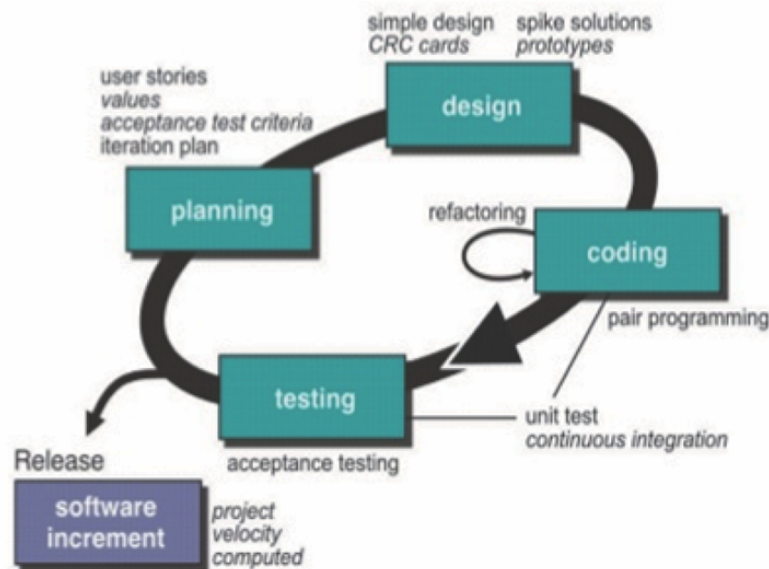


FIGURE 1. Extreme Programming [1]

There are many agile software development frameworks; in this research the Extreme Programming will be used. According to Pressman (2009), Extreme Programming (XP) is a software development methodology aimed at improving quality software and responsiveness to customer needs changes. This type of development is meant to improve productivity and introducing checkpoints where new customer requirements can be adopted. The stages of Extreme Programming consist of:

- 1) Planning

Planning phase begins by creating user stories that describe the output, features, and functions of the software to be created. User stories then will have priority and grouped for the next delivery process is incremental. In addition, this stage also defines the output to be generated.

2) Design

This method emphasizes simple application design. To design the application the developer can use Class-Responsibility-Collaborator (CRC) cards that identify and manage classes in object-oriented.

3) Development

This stage starts by constructing a series of modules' tests. After that developers will focus to implement it. XP implements Pair Programming, i.e., the coding processes are done in pairs. Two programmers work together on one and same computer to develop and test the codes. By doing this will get real-time problem solving and real-time quality assurance.

4) Testing

This stage more focuses on testing features and functionality of the application. This stage is done to comply with XP acceptance test or commonly called customer test. This test is performed by the customer who focuses on the features and functions of the system as a whole. This acceptance test comes from user stories that have been implemented.

This method brings together the beneficial elements of traditional software engineering practice to the "extreme" level, so this method is named Extreme Programming. The characteristics of this methodology are simplicity, communication, feedback, and courage.

The research also implements the output of current research especially in mobile computing for developing the system. The research also develops a better system by benchmarking other similar products.

4. The Result.

4.1. Business workflow. The land certification system works according to a set of systematic activities. The verification process starts soon after the user completes the personal information. The user will receive verification code by email upon succeeding sign-up and registering the request. The user can then activate and use the account by the code.

After they successfully verified the email, they can log in to the system. When users have only verified their email, users could not request a certificate but they have to fill and complete their personal information. When the user has filled the personal information correctly the officer will verify whether the profile is correct or not, if it is correct then the officer will update the user account status to verified. Once the users are verified, they could not change their personal information except they go to office and ask permission to the officer. Verified user will be able to request for a certificate by going to request page from the home page. Users will have to fill all the requirements form correctly and draw their land location in maps. After the user request, the officer could verify the data and the status and update it.

In the server, officers have to log in first before to access the system. After they successfully log in to the system, the officer will be directed to dashboard page which will show the graph for the request and user statistics. The officer could check the user or request list and can update the data or the status. When the officer does the update, the officer will send a push notification to the user device. The complete business workflow can be seen in Figure 2.

4.2. Use case diagram. The following diagram (Figure 3) illustrates the activities that can be done by the end land owner in the land certification system. At first, all the users must sign their selves up into the system, which requires them to fill in their name, e-mail, username and password.

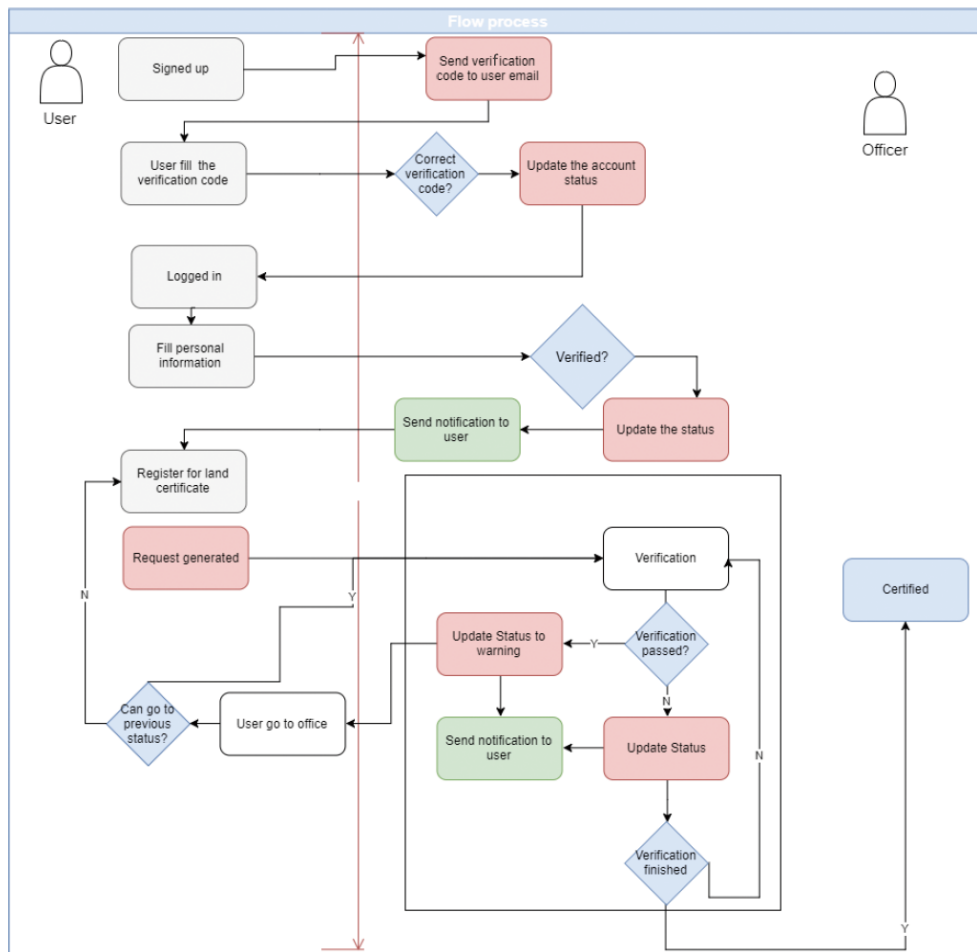


FIGURE 2. Business workflow

User needs to fill out data and information related to his/her profile. Later they will be able to request for a certificate.

4.3. Request certificate. This page is designed for the user to request for a certificate. User should fill all the requirements in the page and tag the land location in maps. There will be two type requests in this page, first is request for a new certificate and second is request for existing certificate that is not yet listed in application, with that existing option user should upload the certificate image to complete the request (Figure 4 and Figure 5).

4.4. Ionic framework structure. App component is one of the core parts in ionic framework. This component defines its template as app.html and it sets the rootPage for the app to HomePage.

Ionic Navigation component will be invoked to read the value of rootPage. This is needed for loading the HomePage whenever the application is launched.

The application uses some plugins to make it work properly.

The notification function will be declared in the App Component in order to make the notification run not only in some pages.

4.5. Angular Google Maps. The application will show map by using Angular Google Maps. It also provides search bar to search the area to be shown in the maps. The important part in this function is the search bar and google maps option should be loaded after all the view has been loaded, since the google maps #id should be declared first in the html. Figure 6 shows the pseudo code for the feature.

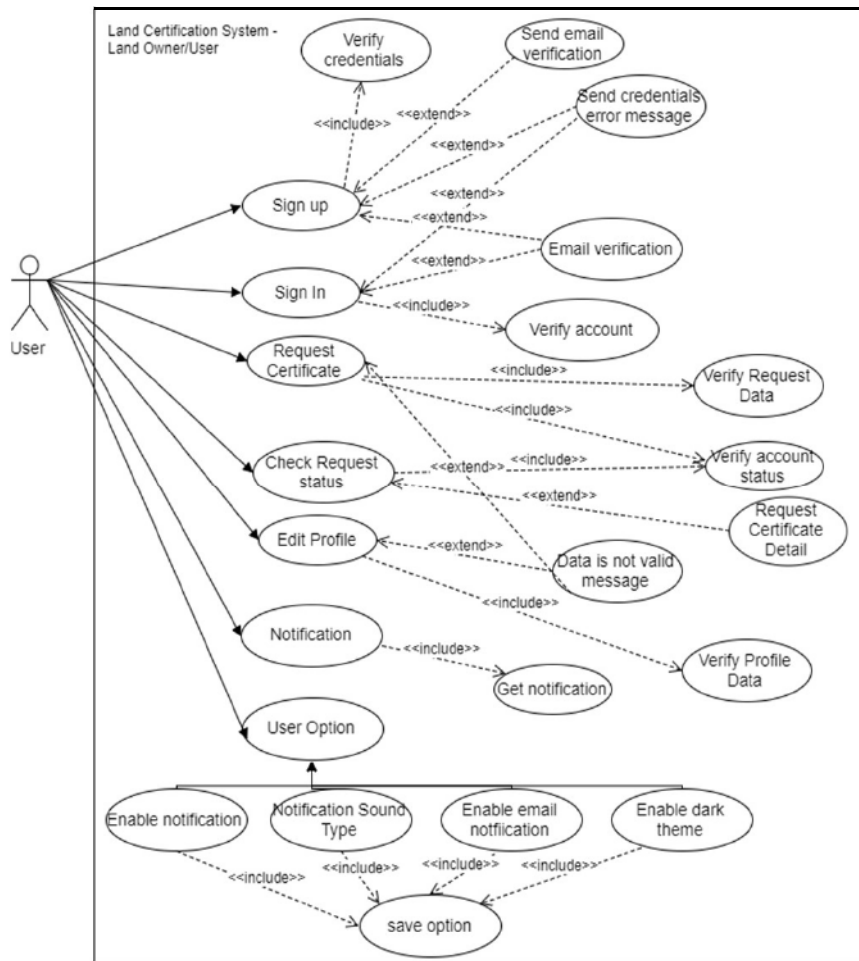


FIGURE 3. Land owner use case diagram

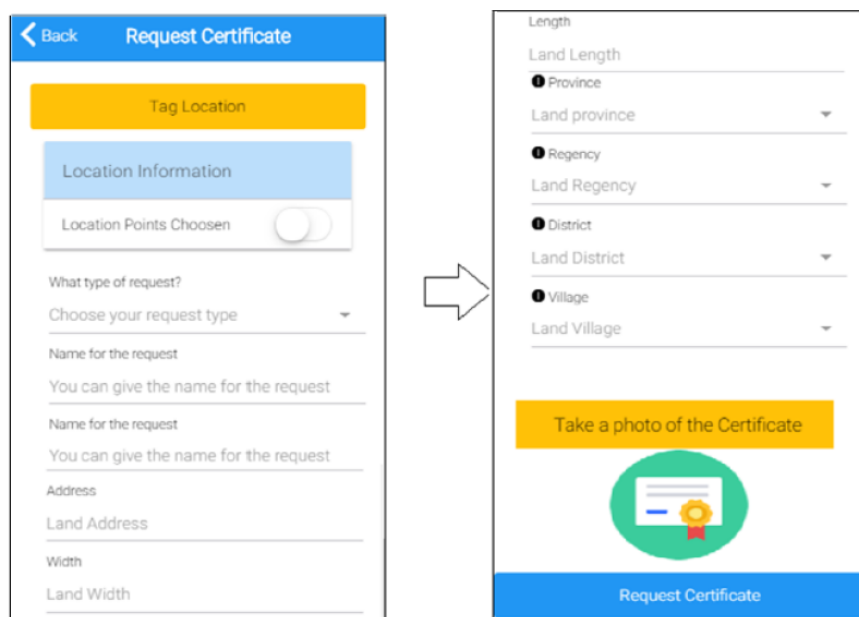


FIGURE 4. Request certificate



FIGURE 5. Tag location modal page

Pseudo Code for Searching Location

```

Show the map with country = 'id'
Provide search bar control
Wait for user entry in search bar
Get the entry
Parse the entry into latitude and longitude
Determine validity of the data
If the data is valid then
    Show the location in the map
Else
    Show the default location
End if

```

FIGURE 6. Search for location

Pseudo Code for Connecting Database

```

Set database entries (Server, Username,
    Password, Database, URL)
Get connection to the database based on the
    entries
In the successful attemp, run it in
    background
Show some message otherwise

```

FIGURE 7. Database connection

4.6. **Slim framework REST API.** First the API need to be connected to the database. It is because almost every operation on this application need to be connected to the server for storing or getting the information from it [9]. Therefore, Config file is created to become a connector of this mobile application to the server. Figure 7 shows pseudo code for the feature.

5. **Discussion.** Some institution in Indonesia has already implemented a system to make user easier to register and access the information. Also in some countries, they have implemented some similar systems in their land or property. There are three main related websites or applications that can be used as references, which are:

A. SentuhTanahku

Indonesia National Land Agency have just launched an online service for land registration called SentuhTanahku. If the land certificate has not been registered in the application, land owner can report it directly through this application with the detailed information of the certificate and your proof of certificate photograph. The application requires user (land owner) to register his/her ID to the nearest BPN office before being able to use it [9,10]. Figure 8 shows the services that are provided by the application.

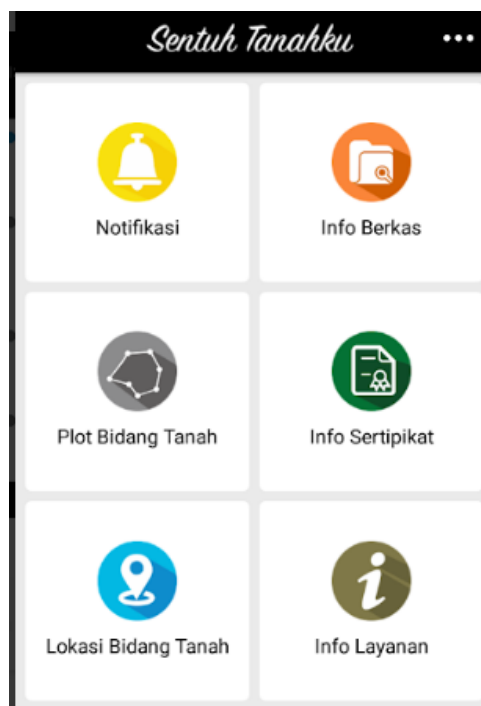


FIGURE 8. Services provided by Tanahku

B. Australia NSW Service – Property Certificate

Australia NSW Service has developed some public services system that can be easily used by people and businesses across NSW. They use digital innovation to deliver fast, efficient services to customers in a one-stop delivery channel. Single application provides services such as booking a driver license test, lodging a bond claim, paying a penalty notice, registering child's DOB, applying for a Seniors Card and applying for property certificate [11].

C. Land Registry Document Ireland

Ireland land registration online service will allow land owner to order Title Deeds (certificate) by simply entering the address in the fields in the mobile application. The application needs only house number or townland and retrieves and shows the document [12].

Table 1 shows the functionalities and features of Online Land Certification System and of other related works. The table indicates that there are 10 (ten) functionalities and features to be compared between Online Land Certification System and the other three similar systems.

Based on features comparison shown in the table, we could conclude that the system that is developed has more complete features and functionalities. We could also conclude that the system might have better services on land properties.

TABLE 1. Comparison of land certification system and others

No.	Features	Land Certification System	Sentuh-Tanahku	Australia NSW Service	Land Registry Document Ireland
1	Mobile application	✓	✓	×	✓
2	Online registration	✓	✓	✓	✓
3	Draw the land plot	✓	✓	×	✓
4	Real-time push notification report in application	✓	✓	×	✓
5	Real-time notification in Email	✓	×	✓	✓
6	Sign up and login for user in mobile	✓	✓	✓	×
7	Online account verification	✓	×	×	×
8	Custom application theme	✓	×	×	×
9	Enable disable notification option	✓	×	×	×
10	Notification sound option	✓	×	×	×

6. **Conclusion.** There are several conclusions that could be acquired from this research: 1) to enhance the system from manual process to online one, 2) to reduce effort and time for land registration, 3) to be able to monitor the process' progress, 4) to provide better features and services related to land properties.

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