

ORIGINAL ARTICLE

Development of a Survey Instrument Mobile App to Determine the Map Location of a Drugstore

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ABSTRACT

Introduction: WHO estimates that more than half of all drugs in the world is prescribed, administered and sold inappropriately and half of the patients use drugs inappropriately. Most people in Pekalongan Regency do not know the location of pharmacies in the area where they live, so to realize an android-based pharmacy application, surveyors need a digital maps-based survey application because the area of Pekalongan Regency is $\pm 836.13 \text{ km}^2$. To build an android-based Pharmacy Survey Instrument application to determine the Map Location of a Drugstore that can be used by surveyors in registering pharmacies in Pekalongan Regency. **Methods:** Method used research and development with four steps to design an application-based pharmacy survey application on android. System developers are using the waterfall method which is also called Classical Life Cycle Model or Linear Sequential Model. This model requires a sequential and systematic system in system development. **Results:** The result of this research is the creation of an Android-Based Pharmacy Survey Instrument Application to Determine Pharmacy Location Maps that can be used by Surveyors in registering Pharmacies in Pekalongan Regency. The results of black box testing show that the application works well. **Conclusion:** The application can be used by researchers to make it easier to record the location points of pharmacies in Pekalongan Regency, that can be used by people in Pekalongan Regency to know the location of the pharmacy and the route to the pharmacy to buy drugs officially.

Keywords: Surveys, Software, Mobile app, Map, Drugstore

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INTRODUCTION

The Ministry of Health of the Republic of Indonesia aspires to promote the acceleration and attainment of the highest health status for all Indonesians, with the vision of “an autonomous society for healthy living” and the goal of “making people healthy” (1). WHO estimates that more than half of all drugs in the world is prescribed, administered and sold inappropriately and half of the patients use drugs inappropriately. Drugs are substances that are used for the prevention and cure of disease as well as the recovery and improvement of health for its

users(2). Each drug has benefits, but also has adverse side effects. Therefore, use the drug according to the instructions for use. Buy medicine at official facilities such as pharmacies, licensed drug stores, clinics and hospitals(3).

The rampant circulation of counterfeit and expired drugs must be watched out for because it makes people anxious. For this reason, the Food and Drug Supervisory Agency urges the public to be selective and careful in buying drugs(4). Medicines must be purchased at authorized pharmacies. The distribution of drugs is actually clear, namely through official pharmacies. The circulation of counterfeit and illegal drugs is widely circulated on unofficial channels. In addition, the weak supervision of distribution facilities causes the quality, safety, and efficacy of drugs to be not guaranteed, the

public as consumers is not protected(5). People should get medications from licenced pharmacies rather than from unknown sources. Because the person in charge is a pharmacist at formal places such as pharmacies. The public needs to know the characteristics of counterfeit drugs. Counterfeit drugs are usually sold at lower prices and the distribution license number is changed(6).

Illegal drug trafficking is a serious problem which is not only happening in Indonesia, but also global. According to the Reports collected by WHO that drug counterfeiting is widespread types, ranging from cancer drugs to contraceptives, expensive drugs, well-known brands, patents, nor generic(7). Fake drugs have an impact on every country. What was once thought to be a problem that only affected low- and middle-income countries has now become a worldwide issue. The development of the internet and easy access to manufacturing equipment has made large-scale unlawful distribution easier than ever before (8).

In low- and middle-income nations, the risk of fake medications continues to be higher, with the World Health Organization (WHO) estimating that one out of every ten medical items is fake or sub-standard. People who live in nations with weak, non-existent, or inaccessible health systems, or in places where medicines are scarce, are more prone to turn to alternative sources, putting their health at risk. Every year, an estimated 250,000 children die as a result of faking malaria and pneumonia drugs over the world. Vaccines, antibiotics, and medical equipment of poor quality or counterfeit contribute to more deaths(8).

Most people in Pekalongan Regency do not know the location of pharmacies in the area where they live, so to realize an android-based pharmacy application, surveyors need a digital maps-based survey application because the area of Pekalongan Regency is ± 836.13 km²(9). The rapid development of android-based technology is also in line with the increasing use of these handsets. The reason people use Android-based handsets is to make it easier for users to access information. Access to this information includes access to news info, access to social media, access to health, and various other information needs. The use of information technology, media, and communication has affected both society's behaviour and human civilization's conduct around the world. World interactions have become more borderless as a result of the rapid growth of information and communication technology, as well as substantial social, economic, and cultural developments. Information technology is currently a two-edged sword, because it may be used to break the law as well as contribute to human welfare, progress, and civilisation. Android devices are currently the most popular mobile devices (10).

Open source development is a great opportunity for

the emergence of various new applications to answer user needs. Therefore, as an effort to facilitate surveyors in conducting pharmacy information surveys, it is necessary to create an Information System Application for Pharmacy Survey Instruments with Digital Maps Applications. Build an android-based Pharmacy Survey Instrument application to Determine the Map Location of a Drugstore that can be used by surveyors in registering pharmacies in Pekalongan Regency.

MATERIALS AND METHODS

This type of research is research and development with four steps to design an application-based pharmacy survey application on android with the following steps: a) The first stage, the analysis of the research will begin by looking for definitions, specifications, theories, datasheets, application notes, results -Results of related research in the repertoire of scientific knowledge to determine the specifications of the application. b) The second stage, the results of the analysis stage will be used to determine the specifications of each sub-system that forms the overall application prototype so that it can be used as data to design hardware and software used to build the application as a whole. c) The third stage, the results of the proposed system prototype design will be realized or made at the development stage. d) The fourth stage, the last stage of the proposed system development is the overall system testing stage using the test criteria and specifications of the system that has been obtained in the previous step(11).

System development using the waterfall method(12). The waterfall method is also called classical cycle or linear sequential. This model requires a sequential and systematic system in system development. This model consists of several stages, namely system engineering and modeling, system requirements analysis, design, program writing, testing and maintenance(13). One of the most popular methods for managing software development projects is the waterfall method. From one phase to the next, the programme is handed on. Each team involved in the previous stage transfers the programme over to the next without any more input or responsibility. Because the outputs are predictable and closed, this strategy is regarded as one of the most straightforward to implement. The notion that once a phase is completed, the work of that phase is done forever is a key flaw in this approach. In fact, though, analysis does not always end with design (13).

The system design stage is carried out after the system analysis stage. The system design uses notation to assist in providing an overview or explanation to the user about the system to be created, namely the database, Unified Modeling Language (UML) design, and information on everything from data input to data output. To obtain structured data, it is necessary to define the database that will be stored and which will be used includes data

storage structures, data formats, and access points. UML design starts from the design of Use Case Diagrams, Class Diagrams, Sequence Diagrams, Activity Diagrams, and Deployment Diagrams. Interface design is needed to provide an attractive appearance so that it is easy to understand(14).

Ethical Clearance

Ethical was approved by Research and Development Planning Agency (BAPPEDA) No. 070/855 in Pekalongan, Indonesia on dated 17 July 2019.

RESULTS

1. Overview of Pharmacy Survey Instrument Information System with Digital Maps Application

The features contained in the Pharmacy Survey Instruments application with the Digital Maps Application are as follows:

a. Surveyor

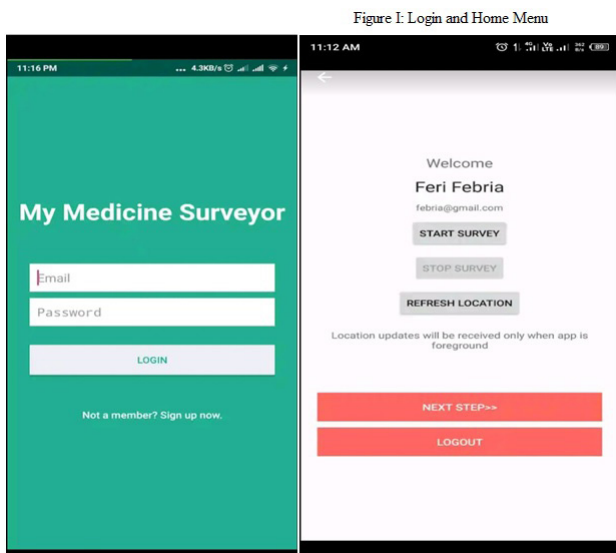


Figure 1: Login and Home Menu

Figure 1 shows the login menu for surveyor. The login menu is used by surveyors to enter the Pharmacy Survey Instruments application by entering an email and password.

Figure1 also shows the Home menu for surveyor. The login menu is used by surveyors to enter the Pharmacy Survey Instruments application by entering an email and password. The home menu contains features to start a pharmacy survey and a feature to end a pharmacy survey. The home menu also contains a feature to refresh the pharmacy location so that the location is truly accurate. The use of the pharmacy survey application requires an internet connection because this application uses digital maps to record the location of the pharmacy. The home menu also contains a feature to go to the next menu and a logout feature from the pharmacy survey application.

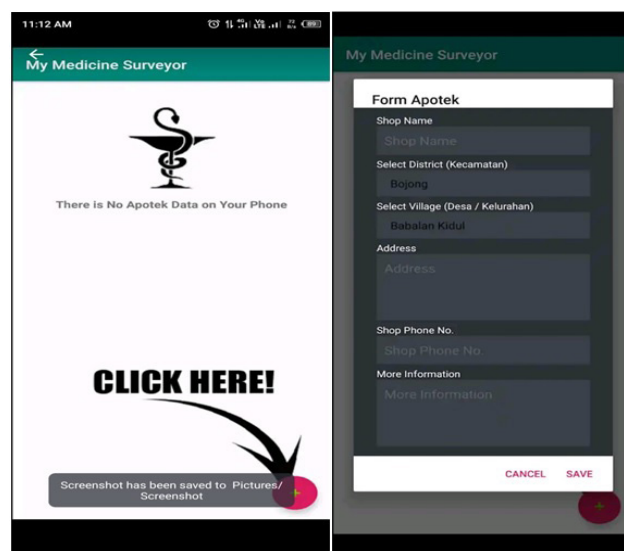


Figure 2: Menu add pharmacy

Figure 2 shows the menu add pharmacy for surveyor. The add pharmacy menu is used by surveyors to add a pharmacy. This menu is used by surveyors to add existing pharmacies anywhere according to the place being studied by pressing the plus symbol. In this study, surveyors added pharmacies in Pekalongan District, Indonesia.

Figure 2 also shows the menu form pharmacy for surveyor. The pharmacy form menu is used by surveyors to fill in information about the name of the pharmacy, sub-district, village, complete address, cell phone number, and other information such as opening hours and closing hours of the pharmacy.

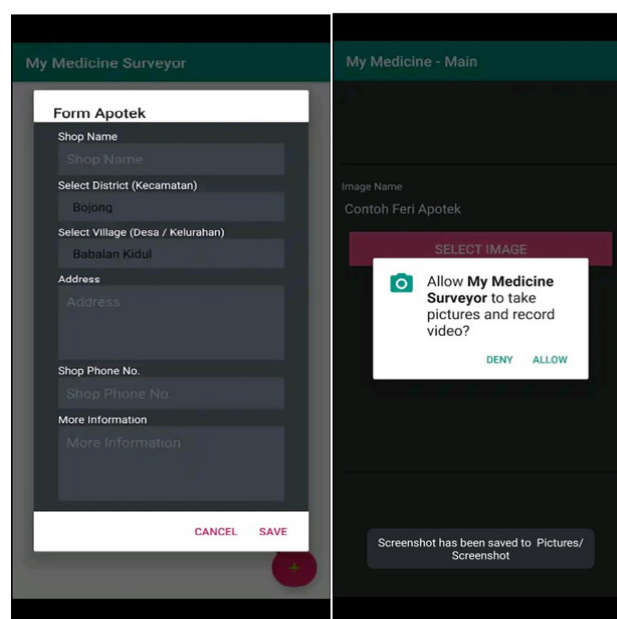


Figure 3: Sub-District Selection, Urban Village Selection and Shooting and Video Recording Menu

Figure 3 shows the sub-district selection menu for surveyor. The sub-district selection menu is used by surveyors to select the sub-district where the pharmacy is located. The sub-district selection menu provides information about all sub-districts in Pekalongan Regency which consists of 19 sub-districts. The sub-districts in Pekalongan District include Kandangserang, Paninggaran, Lebakbarang, Petungkriyono, Talun, Doro, Karanganyar, Kajen, Kesesi, Sragi, Siwalan, Bojong, Wonopringgo, Kedungwuni, Karangdadap, Buaran, Tirto, Wiradesa, and Wonokerto.

Figure3 also shows the urban village selection menu for surveyor. The urban village selection menu is used by surveyors to select the urban village where the pharmacy is located. The urban village selection menu provides information about villages in Pekalongan Regency.

Figure3 also shows the shooting and video recording menu for surveyor. The shooting and Video Recording menu is used by surveyors to take pictures of the pharmacy, for example the front of the pharmacy, which is then used for the pharmacy display image. The video recording menu is used to record videos of the area around the pharmacy and the interior of the pharmacy.

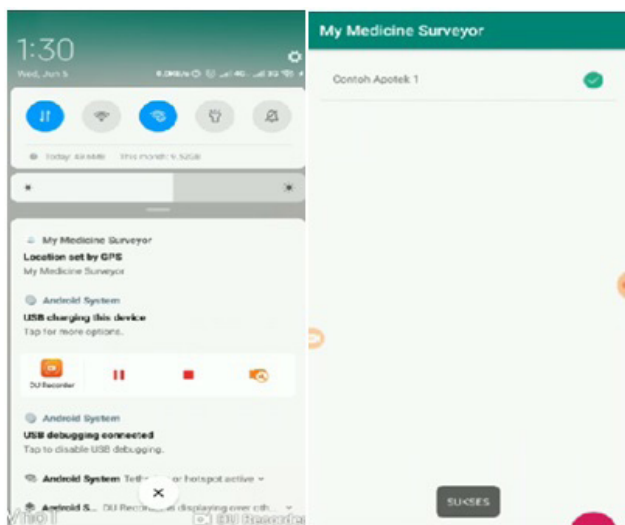


Figure 4: Recording Location with Global Positioning System (GPS) and Exit Menu

Figure 4 shows the recording location with Global Positioning System (GPS) Menu for surveyor. The Global Positioning System (GPS) is used by surveyors to record the location points where the pharmacy is located, such as details about the pharmacy address.

2. System Testing

To ensure that functional and non-functional requirements are met in the implementation of the Pharmacy Survey Instruments information system with the Digital Maps Application, several stages of system testing are carried out, including whether the interface runs as expected by using black box testing by the

Admin.

Table I: Login Menu Black Box Test

No	Test case	Expected results	Test result	Interpretation
1	The user presses the login menu	Displays username and password fields	Show user-name and password fields	Fulfilled
2	The user selects the login menu by inputting according to the user-name and password provided	Displays the administrator/operator page with its menu	Show administrator/operator page with menu	Fulfilled
3	The user selects the login menu by entering the correct username and password	Displays the administrator/operator page with its menu	Show administrator/operator page with menu	Fulfilled
4	The user selects the login menu by entering the wrong username and password	Displaying a warning message	Show warning message	Fulfilled

Table II: Home Menu Black Box Test

No	Test case	Expected results	Test result	Interpretation
1	The user presses the start survey menu	Displays a survey page extending downwards according to the position of the phone screen (mobile support)	The survey page appears widened according to the position of the cellphone screen (mobile support)	Fulfilled
2	The user presses the stop survey menu	Displays a survey page extending downwards according to the position of the phone screen (mobile support)	The survey page appears widened according to the position of the cellphone screen (mobile support)	Fulfilled

CONTINUE

Table II: Home Menu Black Box Test (CONT.)

No	Test case	Expected results	Test result	Interpretation
3	User presses the refresh location menu	Displaying the refresh location menu is already running well	The refresh location menu appears already running well	Fulfilled
4	The user presses the next step menu	Showing the next step menu is already running well	The next step menu appears already running well	Fulfilled
5	The user presses the logout menu	Showing the logout menu has gone well	The logout menu appears already running well	Fulfilled

In Table II, the results of the Survey Instrument Mobile App can be used properly, it is proven that when the user presses the start survey button, it can be seen that the refresh location button can be used by the user to refresh the location points of the pharmacies surveyed, the stop survey can be used by the user if they want to stop the survey. On that page there is also a next step button that can be used if the user wants to continue surveying the pharmacy location. And there is also a logout button if the user wants to exit the Survey Instrument Mobile App.

Table III: Adding Pharmacy, Form Pharmacy and Sub-district Selection, Urban Village Selection and Shooting and Video Recording, Recording Location with Global Positioning System (GPS) and Exit Menu Black Box

No	Test case	Expected results	Test result	Interpretation
1	The user presses the +button	Showing the + button is running well	Show button + is running well	Fulfilled
2	The user presses the pharmacy form menu	Displays the pharmacy form menu extending downwards according to the position of the cellphone screen (mobile support) and running well	The pharmacy form menu appears widen according to the position of the cellphone screen (mobile support) and runs well	Fulfilled
3	The user presses the menu select the sub-district	Displaying the select sub-district menu and it's running well	The select sub-district menu appears and it's running well	Fulfilled
4	The user presses the menu select the urban village	Displaying the menu select the urban village has been going well	The menu for selecting the village has been running well	Fulfilled

CONTINUE

Table III: Adding Pharmacy, Form Pharmacy and Sub-district Selection, Urban Village Selection and Shooting and Video Recording, Recording Location with Global Positioning

System (GPS) and Exit Menu Black Box (CONT.)

No	Test case	Expected results	Test result	Interpretation
5	The user presses the shooting and records a video menu	Showing the shooting and recording video menu is going well	The menu for shooting and recording videos has been going well	Fulfilled
6	User presses record location with GPS	Displaying the menu recording the location with GPS is already running well	The menu appears, recording location with GPS is running well	Fulfilled
7	The user presses the exit menu	Showing the exit menu has been going well	The exit menu appears already running well	Fulfilled

In Table III, the results of the Survey Instrument Mobile App can be used properly, as evidenced when the user presses the button to add a pharmacy then a page appears consisting of the name of the pharmacy, the address of the pharmacy. In addition to writing the address of the pharmacy, users can also select sub-districts and urban villages by clicking on the available options. Users can also add the pharmacy's phone number and additional information about the pharmacy.

DISCUSSION

The pharmacy survey application is a Web-based program that can be operated with an ordinary Windows XP computer with at least 512 RAM and which can also be accessed with an Android Smartphone or Windows Phone on GSM, 3G and CDMA networks such as Smartphone which has reached Pekalongan Regency in the lower and upper areas. With the Mobile support facility, the display on the Smartphone will be better because it will adjust to the condition of the cell phone screen being used(15).

A constellation of 24 satellites orbits the planet to provide the Global Positioning System (GPS). GPS determines the user's location by comparing the times it takes for signals from different satellites to reach the receiver. Because GPS signals must be decoded, the smart phone must include a built-in GPS receiver. Assisted-GPS (A-GPS) is a new smart phone technology that combines the mobile network with the GPS to improve accuracy by 5 to 10 metres. This fixes the position in seconds, provides better coverage, and may be used within buildings in some circumstances. It also uses less battery

power and requires fewer satellites (16).

A-GPS, which is primarily designed for mobile devices, uses GPRS and, in some cases, network information from the service provider to pinpoint the current location correctly. Furthermore, by delegating the majority of the work to the help server, the amount of CPU and programming necessary for a GPS phone is minimized. A typical A-GPS-enabled cell phone establishes communication with the A-GPS assistance server using GPRS or another Internet-based data connection. We only pay for GPRS usage rates and nothing else because this technique does not take into account the entire cell phone service provider network.

AGPS reduces the amount of memory and hardware that must be installed into mobile devices in order to offer mobile devices with GPS-quality device locating capability. This simplifies the mobile device and extends the battery life. AGPS does not provide real-time solutions, but GPS does. Every time we leave the service area, we have to use the network. It is only good for pinpointing a specific location in a small area. Because the Assistance server knows the device's location, there is no privacy with GPS and A-GPS. The processing of GPS data necessitates wireless transmission, which could be costly.

Every point on the earth's surface can be expressed in two coordinates, namely longitude and latitude. All points having zero longitude lie on the Greenwich meridian (the great semicircle connecting the north and south poles and passing through Greenwich). Meanwhile, all points that have zero latitude lie on the equator (equator). East longitude is east of Greenwich, while west longitude is west of Greenwich. According to general agreement, east longitude is positive, while west longitude is negative. Meanwhile, all points located north of the equator are called north latitude, as well as points south of the equator are called south latitudes. North latitude is positive, while south latitude is negative. Figure 8 also shows the exit Menu for surveyor. The exit menu is used by surveyors when they want to exit the pharmacy survey application.

These are the several classes in the Location API package that can be used to access the pharmacy's location information. 1) Access to the location service is provided by the Location Manager class. It also allows you to find the best Location Provider based on your parameters. 2) Location Provider is a super class for location providers that are abstract. A device's geographical location is reported on a regular basis by a location provider. 3) Location Listener: This class contains callback methods that are invoked when the location changes. The location manager must be informed about the listener object. 4) Criteria: The class allows the application to select an appropriate Location Provider by giving it access to a set of required Location Provider characteristics.

The overall functionality of the Android-based Pharmacy Survey Tool app is promising. Pharmacy Survey Instrument is a GPS-enabled mobile app that determines the location of pharmacies. The GPS Tracker, also known as GPS Tracking, is an AVL (Automated Vehicle Locator) device that allows users to track the location of vehicles, fleets, or cars in real time. The coordinates of an object are determined using a mix of GSM and GPS technologies, and then converted into a digital map (17).

CONCLUSION

Android-Based Pharmacy Survey Instrument Application to Determine Pharmacy Location Maps that can be used by Surveyors in registering Pharmacies in Pekalongan Regency. The Pharmacy Survey Instrument application can make it easier for surveyors to record the location of the pharmacy with just one click on the cell phone. The pharmacy location points that have been recorded in the application can then be used by researchers to develop applications that provide the locations of pharmacies in Pekalongan Regency that can be used by people in Pekalongan Regency to know the location of the pharmacy and the route to the pharmacy to buy drugs officially.

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