

Cash Exchange Rate Application

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Abstract: Nowadays, people are able to watch the current exchange rate through online such as google currency exchange rate. If they want to compare the exchange rate between bank, they need to open the website of the bank. Cash Exchange Rate application is an Android based application that developed to provide a platform help public users to check the cash exchange rate among different bank. The users are allowed to select the bank they wish to check the rate. Moreover, users are allowed to view the bank's rate and also bank's details in this application. Moreover, this application also provide user to find nearby bank. If user wish to go to the selected bank, this application also provides navigation function. The methodology used to develop this Android based application is Object-oriented Software Development (OOSD) model. Database used for this system is Firebase while software technology used to develop is Android studio.

Keywords: Cash exchange rate, Bank, Nearby bank, Navigation

1. Introduction

An exchange rate is defined as the rate at which one currency will be exchanged for another. It is also seen as the value of a country's currency relative to another country's currency. Cash Exchange Rate application is the application that allow users to check and compare the current exchange rate from different bank in Malaysia. User do not need to go to different bank to compare the exchange rate. This application will save their time and make their life easier. They just use the application to know the rate from different bank. Thus, user may know the best bank exchange rate using this application.

Not only that, there is also GPS function to guide the user to the nearest bank they choose. GPS technology is currently in common use, because GPS is already a must-have feature on smartphones because it can help us in daily life. For example, we want to go to a place we have never been to, and we do not know where to go, GPS can easily reach somewhere without worry about getting lost. At this time, GPS can also be used for various needs. One of them is to help people know the closest distance from the current location to the next destination [1].

2. Related Works

This section will illustrate about the literature review that had been done for this application.

2.1 Bank

A bank is a financial institution that having licensed to receive deposits and make loans to public. Some financial services, for instance wealth management, currency exchange, and safe deposit boxes are also provide by banks. In most countries, banks are regulated by national governments or central banks [2]. Banks are the link between customers with capital deficits and customers with capital surpluses. Banking is a business. Banks sell their services to make money, and they must market and manage these services in highly competitive areas [3]. Local banks and credit unions usually provide the best prices. The advantage of bank exchange is that most banks only charge very little currency exchange fees (if they have been charged in full), you will know that you are getting a good rate.

2.2 Exchange Rate

An exchange rate refers to price of a country's currency in terms of another currency. In other words, it indicates how many units of a foreign currency a consumer can purchase with one unit of their home currency. Exchange rates can be either fixed or floating. FX market is largely organized as an over-the-counter (OTC) market, meaning that there is no centralized exchange and that market participants can have only partial knowledge about the trades of other market participants and available liquidity in different market segments [4]. Fixed exchange rates are decided by central banks of a country whereas floating exchange rates are decided by the market supply and demand mechanism. The exchange rate is sensitive to the imbalance of financial markets and rarely plays a role in shock absorption. This is the core of traditional theoretical macroeconomic analysis [5].

2.3 Global Positioning System (GPS)

GPS stands for Global Positioning System (GPS). It is a radio navigation system that allows land, sea and air users to determine their exact location, velocity and time 24 hours a day, in all weather conditions around the world. If the receiver is also equipped with a display that displays the map, the location can be displayed on the map. If you are moving, the receiver can also calculate your speed and direction of travel and give you an estimated time of arrival to the specified destination. The Global Positioning System (GPS) is a utility that operated by US, it provides users with positioning, navigation, and timing (PNT) services [6]. GPS make it possible for people with ground receivers to determine their geographic location because it is a "constellation" of about 30 well-spaced satellites that orbit the Earth [7].

2.4 Study of Existing Related System

Three existing applications will be discussed in this section and their features of each application will be studied in order to compare those similar applications with the proposed application.

2.4.1 CoChange

CoChange is a mobile application that developed to allow public user compare the currency based on user requirement. User can search the location that he or she nearby and enter the value and currency they would like to change. The map in the application will show all the money changer nearby with their currency. When user want to view about each money changer, they can click the symbol with money on the map. Then it will show the name of money changer, address and distance to the money changer from current location in a bar at bottom of the page. User can click the bar to get more information about the money changer. User also can get the direction to money changer, phone number, website (if any), quality, review and extra service of the money changer. Not only that, this application also built in a currency converter.

2.4.2 Get4x

Get4x also a mobile based application that provide service to compare the currency between money changer based on user requirement. User need to select their destination and enter the value and currency they would like to change. User can either choose the recommended money changer to show on the map or just display all the money changer available on the map. When user want to view information about each money changer, they can click the symbol with money on the map. Then it will show the name of money changer, currency rate and location in a bar at middle of the page. User can click the bar to get more information about the money changer. User also can get the currency exchange rate, address of money changer, working hour, phone number and also can get the direction to the money changer. Besides, this application allow user to book with some specify money changer and also add the money changer to their favorite outlet list.

2.4.3 CurrenSeek

CurrenSeek is a mobile application that developed to allow public user com-pare the currency based on user requirement. User can search the location that he or she nearby and enter the value and currency they would like to change. After that, the map in the application will show all the money changer nearby. When user want to view about each money changer, they can click the symbol with money on the map. Then it will show the name of money changer. User can click on the name of money changer, and it will show out more information about the money changer. For examples address, rating, phone number, direction to money changer and review from user. Besides, user also can add new money changer themselves if found out any new money changer outlet.

2.5 Study of Existing Application

Table 1 shows the comparison of three existing applications that have been discussed in the previous section with the proposed application based on their own characteristics and features. The comparison is shown from different aspects which are registration or login, operating system, manage profile, list of banks, currency converter and so on.

Table 1: Comparison between existing system and proposed system

Feature	CoChange	Get4x	CurrenSeek	Cash Exchange Rate Application
Registration/ Login	X	Required Once	Required Once	Required Once
Operating System	Android Based	Android Based	Android Based	Android Based
Manage Profile	X	Provided	Provided	Provided
List of Bank	X	X	X	Provided
Currency Converter	Provided	X	X	Provided
Nearby Bank	X	X	X	Provided
Navigation	Provided	Provided	Provided	Provided

*Cross or 'X' = not available.

3. Methodology

This section describes the software process model for developing cash exchange rate applications and the activities in each phase are listed.

3.1 Object-Oriented Software Development

“Object-oriented software construction is the way of software development which bases the architecture of any software system on modules deduced from the types of objects it manipulates (rather than the function or functions that the system is in-tended to ensure)” [8]. Object-oriented software development is purpose to decomposition user needs into executable language constructs [9]. The

object-oriented software development can be separated into five phases that are planning, analysis, design, implementation and testing phase.

3.1.1 Object-oriented Planning Phase

The planning phase is the phase of determining the structure and overview of the Cash Exchange Rate Application. This phase explains how to develop the application and help to structure the testing process. The planning phase include Gantt chart to help developers determine the time duration of each activity. Observed and investigated research on the functionality of existing applications such as CoChange and Get4x in order to estimate the needs and improvement of the proposed application. Afterward, a comparison table is created to determine the strength and weak-ness of the existing applications.

3.1.2 Object-oriented Analysis Phase

The aim of any analysis activity in the software life cycle is to create a model for the functional requirements of the system that is independent of implementation constraints [10]. The user requirements and the system requirement are identified in analysis phase. The investigated information that collected and analyzed during the planning phase are used to help determine the requirements of the proposed application. In order to analyze the system requirements, Android smartphone users are identified and the functionality of the proposed application are met. Use case diagram, user activity diagram, sequence diagram and class diagram are create using yEd Graph Editor. This phase also discusses about the hard-ware requirement and software requirement to develop Cash Exchange Rate application

3.1.3 Object-oriented Design Phase

The design phase is started after the Cash Exchange Rate Application requirements has been analyzed. In order to determine the design of the proposed application category, the requirement obtained from the analysis phase are used. Based on the general user knowledge, the database design and user inter-face are determined. The design of user interface should be simple and easy for user to check the current exchange rate in the application. Database must be designed appropriately to store data of application or system to prevent from data error. Thus, data-base plays an important role in developing system or application:

3.1.4 Object-oriented Implemented Phase

All the features and functions designed in the previous phase were implemented as actual program during implementation phase. This application will use An-droid Studio. Android Studio is the official Integrated Development Environment (IDE) for Android app development. Based on IntelliJ IDEA, on top of IntelliJ's powerful code editor and developer tools, Android Studio provide even more features that improve productivity when building Android apps [11]. Database also implemented at this stage. Firebase is a mobile and web application development platform. According to Wikipedia, the initial Firebase product was a “real time database that provides an API that allows developers to store and synchronize data between multiple clients” [12].

3.1.5 Object-oriented Testing Phase

Testing phase is the final phase in Object-oriented software development (OOSD), which is an important stage in ensuring the work is fulfilled the requirements. The system consists of two parts of testing, which are functional testing and non-functional testing. Functional testing is a method of checking software to ensure that the software has all of the required features specified in its functional requirements [13]. Besides, the non-functionality test is user acceptance testing which is a phase of software development in which the target audience tests the software in “real world” [14].

3.1.6 Object-oriented Maintenance Phase

Maintenance phase is the final phase in Object-oriented software development (OOSD). The maintenance phase is a phase that making change in hardware, software, and documentation to support its operational efficiency. It is due to improve a system's performance, correct problems, enhance security, or reach user requirements. Modularity in object-oriented technology is designed to minimize software systems interruption cause by routine software maintenance required by bug fixes, updates, and extensions [15].

3.2 Hardware and Software Requirement Analysis

Computer hardware and software systems are critical to success of a system development. Some software is used to develop the proposed application to ensure that the system can run smoothly and easily.

3.3 General System Architecture

The system architecture is a concept modeling that defines the structure, behavior, and more views of the system. The particular system architecture is implementable using specified hardware and software and that are available to implement the general system architecture [16]. Figure 1 shows the system design diagram of the proposed system

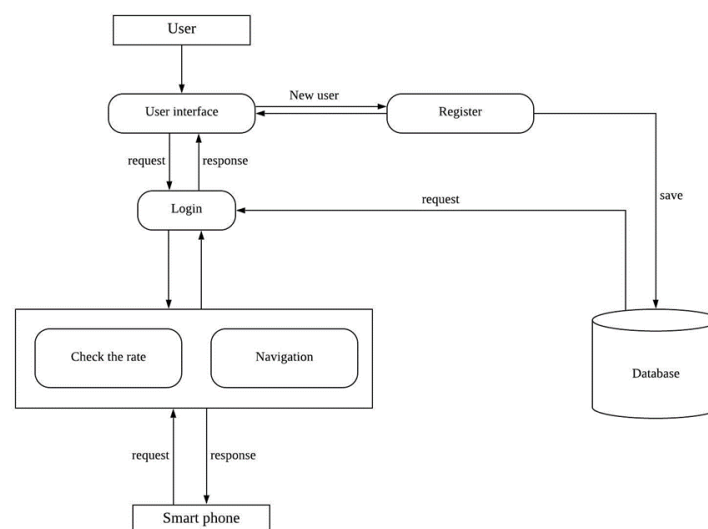


Figure 1: System Design Diagram

3.4 Requirement Analysis

Requirement analysis is an integral part of information systems development and is critical to ensuring that the system delivers the expected benefits [17]. User requirement analysis is created in this process to describe the action that user able to do in Cash Exchange Rate Application. Besides, functional requirement is used to describe the condition that application should fulfill while non-functional requirement is used to describe the performance characteristic of application.

3.5 Unified Modelling Language (UML)

Unified Modeling Language (UML) is a standardized general-purpose modeling language consisting of a set of diagrams that used for specifying, visualizing, constructing, and documenting the artifacts of software systems. The UML is much important part in developing object-oriented software and the software development process. By using the UML, it helps project teams communicate, explore potential designs, and validate the architectural design of the software [18]. The UML mainly uses

graphical notations to express the design of software projects. There are two types of diagrams in UML which are structure diagram and behavior diagram. Structure diagram consists of Class Diagram while behavior diagrams consists of Use Case Diagram, Sequence Diagram and Activity Diagram. Both of these diagrams are used to explain behavior and overall activity structure of Cash Exchange Rate Application.

3.5.1 Use Case Diagram

Use Case Diagram is considered as the de-facto standard for modelling the user requirements at an early stage of the Software Development Life Cycle (SDLC) [19]. Figure 2 shows the use case model for the proposed system which define the interaction between the user and proposed application.

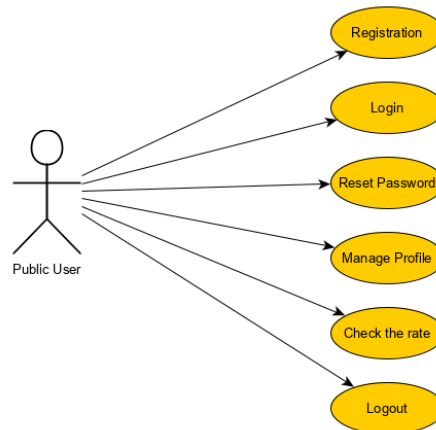


Figure 2: Use Case Diagram

3.5.2 Activity Diagram

Activity diagram is a flowchart to outline the flow from one activity to another activity as the operation of the application. Figure 3 display the activity diagram of the Cash Exchange Rate Application for user.

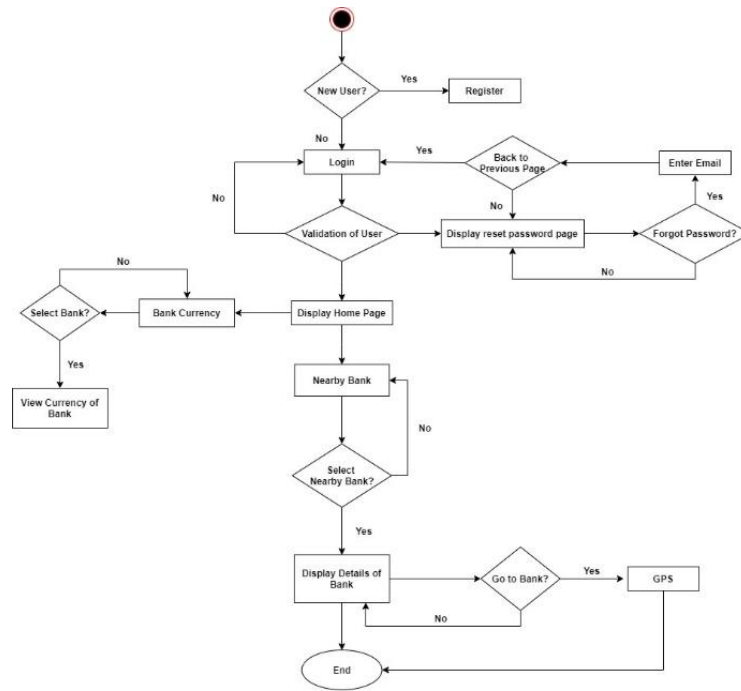


Figure 3: Activity Diagram

3.5.3 Class Diagram

In software engineering, a class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by displaying the system's classes, their attributes, operations (or methods), and the relationships among the classes [20]. Figure 4 describes the class diagram of proposed system which illustrate the relationship among classes in application.

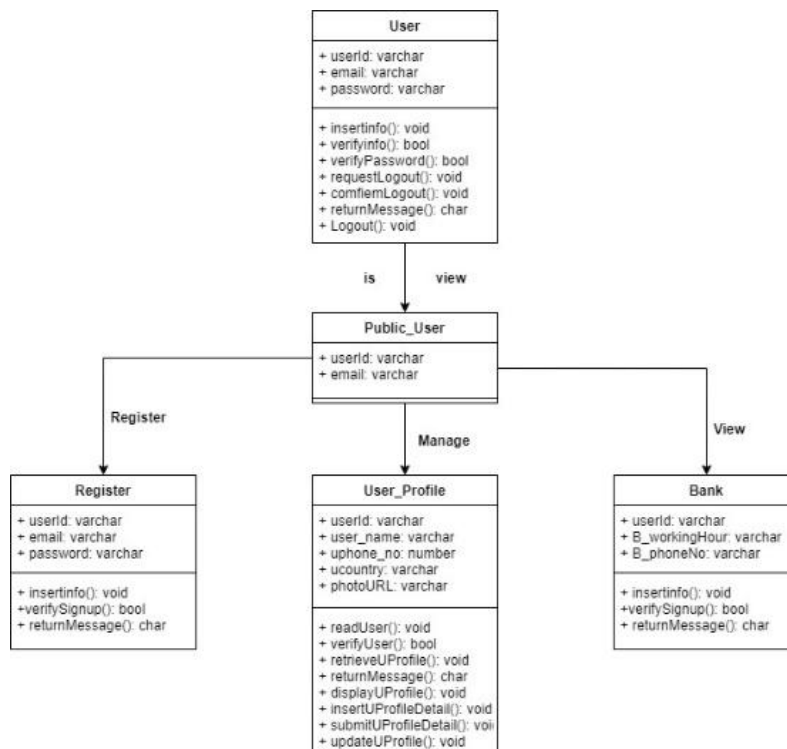


Figure 4: Class Diagram

4. Implementation and Result

In this section, implementation and result of this project will be presented. The functionalities that will be discussed in this section are login and register, manage profile, nearby bank and so on. Partial codes of the program for each function.

4.1 Implementation

Cash Exchange Rate Application is developed using a programming language, Java in Android Studio and uses a mobile view to display the application. Database that used to connect with the proposed application is firebase.

```

"project_info": {
  "project_number": "1065331366202",
  "firebase_url": "https://cashexchangerateapplication.firebaseio.com",
  "project_id": "cashexchangerateapplication",
  "storage_bucket": "cashexchangerateapplication.appspot.com"
},
"client": [
  {
    "client_info": {
      "mobilesdk_app_id": "1:1065331366202:android:21ae65392b5e18eec65803",
      "android_client_info": {
        "package_name": "com.example.cashexchangerateapplication"
      }
    }
  }
],

```

Figure 5: Source Code for Firebase Connection

Login activity is one of the modules used to verify the users to login to the application. In Figure 6 displays the source code on how to verify a user to login the application.

```

mLoginBtn.setOnClickListener((v) -> {
    String email = mEmail.getText().toString().trim();
    String password = mPassword.getText().toString().trim();

    if (TextUtils.isEmpty(email)) {
        mEmail.setError("Email is Required.");
        return;
    }
    if (TextUtils.isEmpty(password)) {
        mPassword.setError("Password is Required.");
        return;
    }
    if (password.length() < 6) {
        mPassword.setError("Password Must be >= 6 Characters");
        return;
    }
    progressBar.setVisibility(View.VISIBLE);
    //authenticate the user
    Auth.signInWithEmailAndPassword(email, password).addOnCompleteListener((task) -> {
        if (task.isSuccessful()) {
            Toast.makeText(context, "Login Successful", Toast.LENGTH_SHORT).show();
            startActivity(new Intent(getApplicationContext(), MainActivity.class));
        } else {
            Toast.makeText(context, "Error! " + task.getException().getMessage(), Toast.LENGTH_SHORT).show();
            progressBar.setVisibility(View.GONE);
        }
    });
});

```

Figure 6: Source Code for User Login Activity

When the user selects one of the banks in bank list, it will direct send user to website of the bank to view latest currency of bank. Figure 7 display the source code of convert bank's website URL into android base.

```

private void setPage()
{
    maybank = findViewById(R.id.view_maybank);
    WebSettings mysetting = maybank.getSettings();
    mysetting.setJavaScriptEnabled(true);
    maybank.loadUrl("https://www.maybank2u.com.my/maybank2u/malaysia/en/personal/rates/forex_rates.page");
    maybank.setWebViewClient(new WebViewClient());
}

@Override
public void onBackPressed() {
    if (maybank.canGoBack())
        maybank.goBack();
    else
        super.onBackPressed();
}

```

Figure 7: Source Code of Convert Website URL to Android Base

Nearby Place Activity is one of the modules of Cash Exchange Rate Application. User can get their current location in the maps and also get the nearby bank at surrounding of user. Figure 8 display the Google API of the project and Figure 9 shows the code to get nearby bank.

```
<string name="google_maps_key" templateMergeStrategy="preserve"
    translatable="false">AIzaSyDdIKbT0RLqSRjZkEU6rFs5Z0k9CbBy64E</string>
<string name="browser_key">AIzaSyD6xA9Ce73A5csJiSxE4v2M-9thHy_UIk4</string>
```

Figure 8: Source Code of Google API

```
private void nearbyPlace(final String placeType)
{
    mMap.clear();
    String url = getUrl(latitude, longitude, placeType);
    mService.getNearbyPlaces(url)
        .enqueue(new Callback<MyPlaces>() {
            @Override
            public void onResponse(Call<MyPlaces> call, Response<MyPlaces> response) {
                currentPlace = response.body(); //assign value for currentPlace
                if(response.isSuccessful())
                {
                    for (int i=0; i<response.body().getResults().length; i++)
                    {
                        MarkerOptions markerOptions = new MarkerOptions();
                        Results googlePlace = response.body().getResults()[i];
                        double lat = Double.parseDouble(googlePlace.getGeometry().getLocation().getLat());
                        double lng = Double.parseDouble(googlePlace.getGeometry().getLocation().getLng());
                        String placeName = googlePlace.getName();
                        String vicinity = googlePlace.getVicinity();
                        LatLng latLng = new LatLng(lat, lng);
                        markerOptions.position(latLng);
                        markerOptions.title(placeName);
                        if (placeType.equals("bank"))
                            markerOptions.icon(BitmapDescriptorFactory.defaultMarker(BitmapDescriptorFactory.HUE_BLUE));
                        else
                            markerOptions.icon(BitmapDescriptorFactory.defaultMarker(BitmapDescriptorFactory.HUE_RED));
                        markerOptions.snippet(String.valueOf(i)); //Assign index for marker
                        //Add to Map
                        mMap.addMarker(markerOptions);
                        //Move Camera
                        mMap.moveCamera(CameraUpdateFactory.newLatLng(latLng));
                        mMap.animateCamera(CameraUpdateFactory.zoomTo(11));
                    }
                }
            }
        });
}
```

Figure 9 : Source Code of Nearby Place

Figure 10 shows the user interface of the Cash Exchange Rate application.

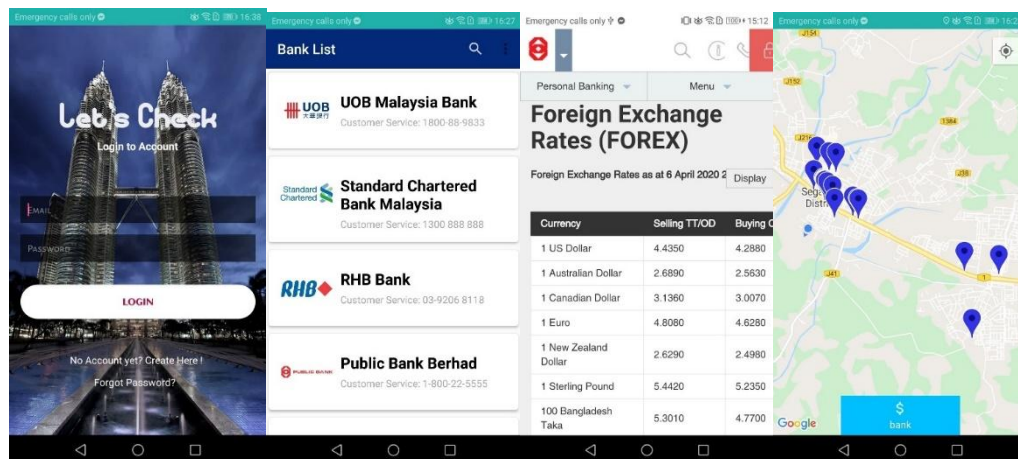


Figure 10: User interface of Cash Exchange Rate Application

4.2 User Acceptance Testing

Since the users are the person who use the application in their daily life, it is important to conduct user acceptance tests to give users the opportunity to interact with the application and determine if everything is working as expected. By using this testing, users can help developers to identify issues that might be missing and outline how “complete” an application is. 30 respondents are participated in this testing. Afterwards, the user’s “feedback” is collected and the result are analyzed and illustrated in graph. In terms of layout of content and text style, most of the respondents are satisfied with it. Only few of them think that there have some improvements on the interface design. In term of application

features, most of the features are satisfied by respondents. In overall, the graph shows the users are considered satisfy with the design and features provided by Cash Exchange Rate Application.

5. Conclusion

Cash Exchange Rate Application which is an Android based application has been successfully developed. Through this application, users are able to compare the ex-change rate between bank. The developed application consists of registration and login functions, which provide user authentication where any authorized access will be rejected and denied. User are able to convert current exchange rate from Malaysia Ringgit to other countries. Besides, users can view the currency of various bank in Malaysia and also look for nearby bank of user. In addition, users are also can view the details of bank and get the navigation to the selected bank.

Improvement can be done by enhancing the interface, functionalities and performance of the application. There are several recommendations for future works to improve the Cash Exchange Rate Application. This application currently allowed user convert exchange rate with 33 country only. In future, this application may al-low users to convert exchange rate with more other countries. The search part in nearby bank also can be improved. Not only that, this application may show currency name in full form in the future. The user profile image also can be improved by clicking to zoom profile image. Currently, the application is only can register with email and password. In future, this application may allow users register their account using Facebook, Twitter and also Google account.

In shorts, Cash Exchange Rate Application has achieved the objectives based on system requirements, scope and user requirements. Although the application contains some limitations, it can be improved by further efforts to address these limitations and enhance it with additional features to serves the public in a better way.

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