



Publisher homepage: www.universepg.com, ISSN: 2663-7820 (Online) & 2663-7812 (Print)

<https://doi.org/10.34104/cjbis.022.086099>

Canadian Journal of Business and Information Studies

Journal homepage: <http://www.universepg.com/journal/cjbis>

Canadian Journal of
**Business and
Information Studies**



Development of Mobile Application for Water Concessionaire towards Efficient Account Monitoring and Service Delivery

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ABSTRACT

Metro Roxas Water District (MRWD) is a Category B water district and Government Owned and Controlled Corporation in Capiz that provides safe and potable water for its concessionaires. The study aimed to develop an android mobile application for concessionaires of MRWD and evaluate its acceptability based on ISO 25010: 2011 criteria. This utilized the descriptive and developmental methods. Data were gathered using an evaluation form to evaluate the level of acceptability of the mobile application in terms of functional suitability, performance efficiency, compatibility, usability, reliability, maintainability, portability, and security. The android mobile application is a concessionaire centered app to deliver the services of MRWD to its clients anytime and anywhere. Viewing of current bill feature was based on the existing paper water bill of MRWD. As soon as a bill is created via MRWD's current billing and collection system, the functionality that reminds users of their bill due dates automatically sends them alerts. Viewing of payment history feature shows the last 30 payment transactions of the user. In other incidents feature, the user is required to type a description, remarks, and details about the incident. The reinstallation and reconnection notification feature is a way of informing the user that a job order will be performed with their account. The link to payment apps feature is to open directly the GCash and PayMaya apps in accepting payments. The respondents evaluated the MRWD concessionaires' android mobile application as very acceptable.

Keywords: Mobile, Application, Development, Concessionaire, Efficient, Service, and Delivery.

INTRODUCTION:

Metro Roxas Water District (MRWD) is a Government Owned and Controlled Corporation in the province of Capiz, Philippines. It runs safe and clean water for its consumers. As of December 31, 2020, more than 39,000 active concessionaires are billed by MRWD monthly using an integrated Billing and Collection System (BCS). Currently, water billing statements are printed using this system and directly hand delivered to home owners and business establishments, while some of the customer services of water district

such as billing inquiries, and leakage reports are done in the office. The mobility constraint induced by the COVID-19 epidemic is attributable to a paucity of alternate billing and service delivery systems (World Bank, 2020) resulted to several problems to the organization and posed danger to the bill delivery team of MRWD and the concessionaires. To decrease the face-to-face transaction in MRWD, the organization introduced online payment to concessionaires to improve the collection effort of the office. This is consistent

with the national government's advice that agencies give an alternative strategy to maintaining the organization's business activity. However, the effectiveness of this strategy is still contingent on timely delivery of water bills. According to Rao, (2012) billing procedures are important for generating income for a variety of public sector organizations, thus if bills aren't sent on time, collections may suffer significantly. Apps, mobile devices, and the internet can all be leveraged in this situation to give improved public services.

The foundation of mobile government (mgovernment), a subset of e-government, is the app. M-government can aid in ensuring that individuals and authorities have access to public information and government services at all times and locations. Despite the availability of numerous Android mobile apps in the Google Play Store, no single mobile app fits the needs of the Metro Roxas Water District (MRWD) in terms of billing and other services to its concessionaires.

To assist in addressing the issue, the researcher proposed the creation of a Concessionaire Mobile App. It is an alternative method in delivering water bill and other services to concessionaires supplementing the existing billing and collection systems. It uses mobile technology, the open-source Android platform, and the net as a tool to give its concessionaires with billing information and other services at any time and from any location. With this software, concessionaires will not wait for their billing statement to be sent to their homes, but will instead receive it on their mobile phones. This novel method may solve the lack of a bill monitoring and concessionaire-focused app on the market today (Akter *et al.*, 2021).

Bringing this new mode of billing system opens new means to view water bill and monthly consumption, and providing an easy method for bill reminder, reconnection, disconnection notification, customer service inquiry, and leakage reporting. It also evaluated its acceptability based from the criteria specified by the International Organization for Standardization (ISO) 25010: 2011 (based on its predecessor software engineering standard ISO/IEC 9126), particularly on functional suitability, efficacy of its performance,

dependability, usability, being compatible, safety, being maintainable, and convenience.

Fig. 1 illustrates how the mobile app interacts with the users and employees of the organization in accessing data from the centralized database of the billing and collection system of Metro Roxas Water District (MRWD). It signifies that users connect to the service via an application on their android phones, while personnel answer to queries on services using a web-based application.

MATERIALS AND METHODS:

Participants/Design

The respondents of the study were the technical experts that are proficient in the field of Information and Communications Technology (ICT). The descriptive and developmental methods were utilized. The descriptive method was used to describe the procedures in developing the concessionaire mobile app and technical details of the process it undergoes from data gathering, user design, rapid construction and its implementation. The development strategy was chosen since the primary goal is to create an android mobile application for Metro Roxas Water District concessionaires. Developmental research, according to Richey and Klein, (2007) is the systematic examination of design, development, and evaluation procedures with the goal of establishing an empirical foundation for the production of educational and non-educational equipment and goods to new or enhanced models that steer their development. It centers on a certain design, development, or evaluation process. They might entail developing and validating original design procedures and models and figuring out the circumstances that make it possible for them to successfully employ. The Rapid Application Development (RAD) concept is used to define the mobile app development process. The RAD is a software development process model that stresses a component-based construction methodology and an exceptionally fast development cycle. If the requirements are well defined and the scope of the project is limited, the RAD approach can provide a completely functional system in a very short period of time. The RAD, as shown in **Fig. 2**, has four (4) phases, namely: requirements planning phase, user design phase, construction phase and cutover phase, respectively.

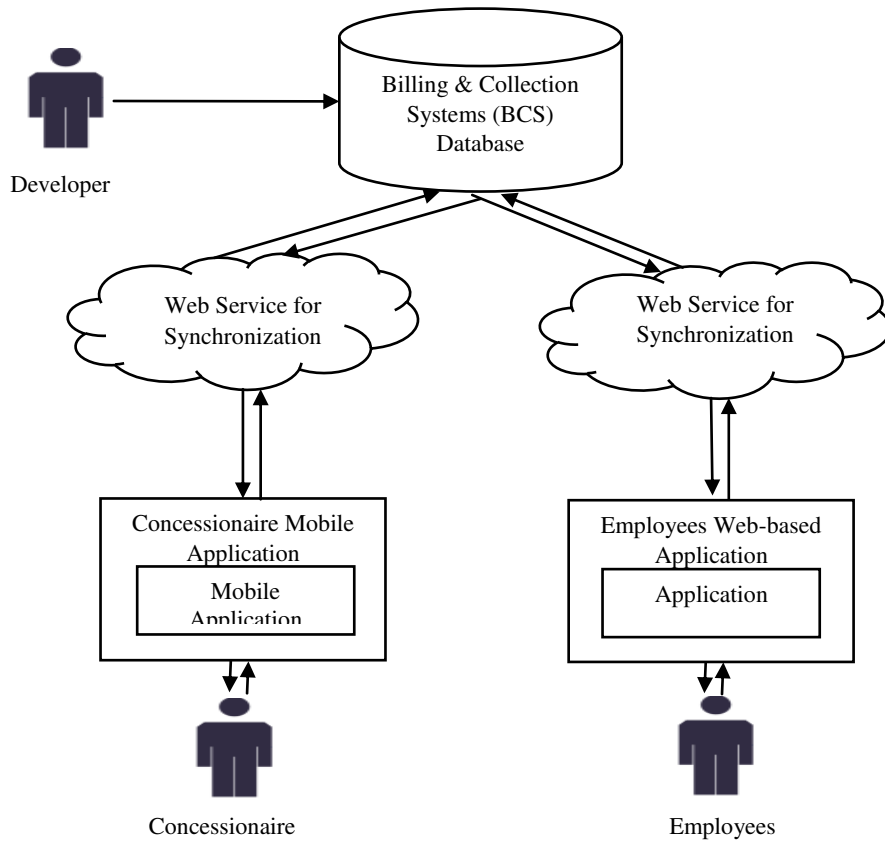


Fig. 1: A conceptual model of a mobile application for concessionaires.

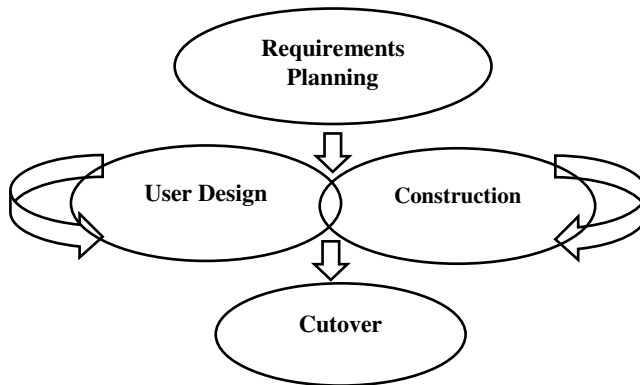


Fig. 2: Rapid Application Development model.

The Requirements Planning is where specific information needed to develop a simple and usable specified application for mobile. In this stage, the view current bill, bill due date reminder, payment history, reporting leakages, and other incidents to customer service, reinstallation and reconnection notifications, and links to online payments apps are the features that are identified to be included in the android mobile application. The view current bill function enables con-

cessionaires to view their most recent water bill, which includes the same information as paper water bills, such as the amount to pay and the payment date. The bill due date reminder tool alerts mobile app users to the current dues and due dates. To save further costs for the organization, the reminder was delivered using simply the built-in notification capability of Android, which is free to use and access. The payment history function displays information about the concession-

aire's most recent 30 payment transactions. Users can send photographs of leaks and messages to customer care using the reporting leaks and other occurrences tool. The reinstallation and reconnection notification feature sends messages regarding scheduled concessionaire reinstallation or reconnection. The linkages to online payment apps enable customers to access GCash and PayMaya using the android mobile app. Android Studio 4.2 was determined as the best development tool for building the app, while the Kotlin programming language was chosen as the best language for writing the app's code. The User Design is a phase that involves the complete design of the mobile application. This phase designs the database, which specifies the content of records and files were included. In designing, the researcher considered the user interface

and user friendliness of mobile application that affects the overall usability and ease of use of the app. The following figures show the user interface of the account validation and main activity of the mobile application. The splash screen shows the initial screen of the app when executed with the logo of the app and version, while the Welcome Screen is the screen of the app that follows after the initial installation of the app. The said screen served as the on-boarding interface of the app that briefly describes the purpose and function of the mobile app. To proceed to the next stage of the app, the user requires tapping the LET'S GET STARTED button that is responsible for opening the first stage of the validation process of the mobile application.



Fig. 3 (a): Splash screen and welcome screen of the mobile app.

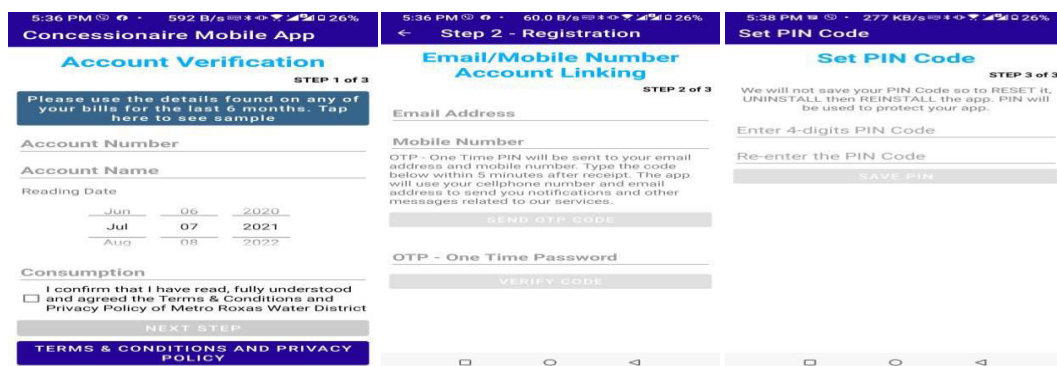


Fig. 3 (b): Account validation screen of the concessionaire mobile app.

The app's Account Validation Window is a three-step activity that is in charge of authenticating the app user's accounts. It is necessary to enter the account owner's information. The first screen depicts the first step of the validation method, in which the account

number, account name, reading date, and consumption must be entered. If the Metro Roxas Water District (MRWD) backend successfully validated the data, the app will advance to the subsequent screen, the second phase in the validation procedure. On the second phase

of the process, consumers must enter a valid email address and mobile number to which a One-Time PIN (OTP) will be sent. After receiving an OTP by email and text message, the user must enter the OTP within 5 minutes. If he fails to enter the OTP within the time

limit, he must request a new OTP code. After entering a valid OTP code, the app will proceed to the final step of the validation procedure, which requires the user to create a four-digit PIN code to safeguard the app from unauthorized users (Sizan *et al.*, 2021).

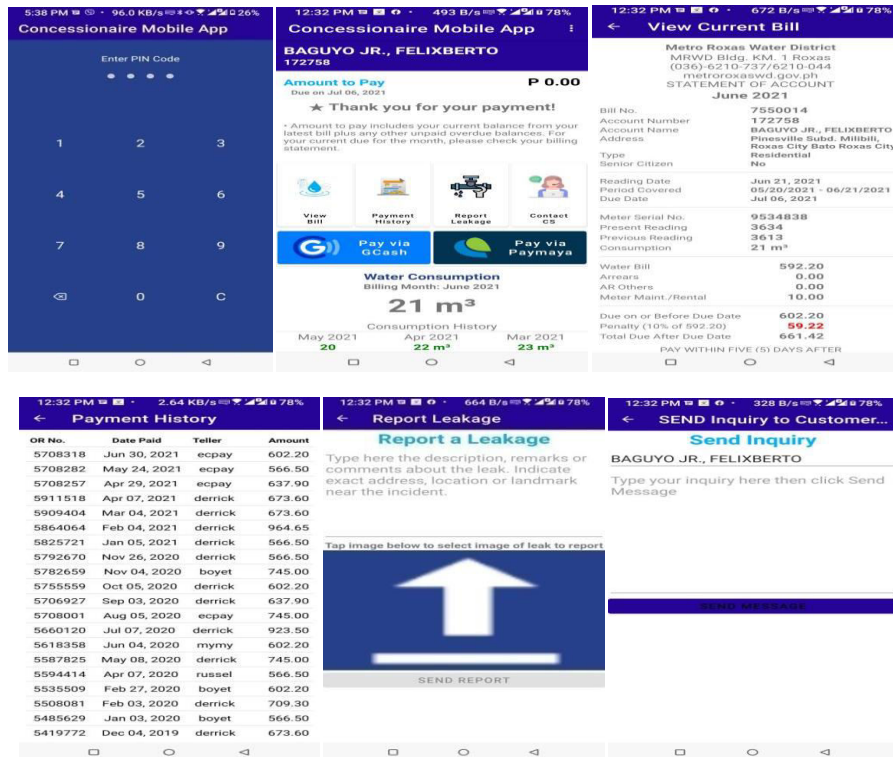


Fig. 4: Design of the main activity screen of the application.

The account validation screen is the phase of the app where the unique device token of the mobile device is recorded and kept in the backend, in addition to validating users and configuring Personal Identification Number (PIN) for the app. The one-of-a-kind device token is used to send mobile push notifications to a specific Android handset. It is critical information required for sending messages to the concessionaire's mobile device. The app's primary activity screen displays the entire function of the mobile app. It is composed of the PIN Code Screen, main screen, view current bill screen, payment history screen, report a leakage screen, and contact customer service screen. The PIN Code Screen is the screen responsible for requiring 4-PIN code before accessing the full feature of the app. The Main Screen is the screen that will be shown after the PIN was entered correctly. This is the main interface for the users to use in accessing the uses and features of the mobile app. View Current Bill Screen displays information about the current bill of the

concessionaire. It retrieves information from the Metro Roxas Water District's database in JavaScript Object Notation (JSON) format with the following data structure

```

json[
  {
    "billmonth" : "<billmonth_data>",
    "billno" : "<billno_data>",
    "fullname" : "<fullname_data>",
    "address" : "<address_data>",
    "class" : "<class_data>",
    "senior" : "<senior_data>",
    "pcto" : "<pcto_data>",
    "billperiod" : "<billperiod_data>",
    "duedate" : "<duedate_data>",
    "msn" : "<msn_data>",
    "prev" : "<prev_data>",
    "pres" : "<pres_data>",
    "cons" : "<cons_data>",
    "waterbill" : "<waterbill_data>",
    "arrears" : "<arrears_data>",
    "arothers" : "<arothers_data>",
    "mm" : "<mm_data>",
    "duebefore" : "<duebefore_data>",
    "penaltyrem" : "<penaltyrem_data>",
    "penalty" : "<penalty_data>",
    "dueafter" : "<dueafter_data>"
  }
]
    
```

Fig. 5: Data structure in JSON format for the view current bill screen.

The Payment History Screen displays the last 30 payment transactions of the concessionaire. It retrieves the data from the backend with the following JavaScript Object Notation (JSON) data structure:

```

json[{"response":
  [
    {
      "refno"      :    "<refno_data>",
      "transdate" :    "<transdate_data>",
      "username"  :    "<username_data>",
      "amtpaid"   :    "<amtpaid_data>"
    }
  ]
}]
    
```

Fig. 6: Data structure in JSON format for the payment history screen.

The Report a Leakage Screen allows the user to make a leakage report with a message and a photo of the leakage obtained by the mobile device's camera, and the Contact Customer Service Screen allows the user to send a question or message to the Metro Roxas

Water District's customer service. The Miscellaneous Screen contains other activity of the app, which includes a log of notifications where all notifications sent to the app are stored. The app's menu system includes functionalities that allow users to access various app screens such as the creating new account screen, switching to another account screen, notifications screen, privacy policy screen, about the app screen, and exit action. The privacy policy screen displays Metro Roxas Water District's official data privacy policy, which discusses how concessionaires' data privacy is maintained.

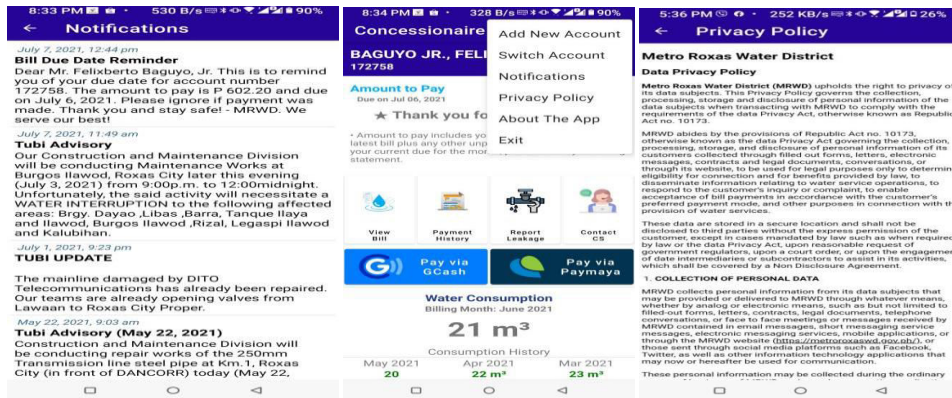


Fig. 7: Miscellaneous screen of the mobile app, notifications screen, menus, and privacy policy screen.

Construction Phase focuses on the program and application development task. It includes programming and application development, coding, unit-integration and system testing. In the development of the concessionaire mobile application, the Android Studio 4.2 is used as the development tool and compilation. The Kotlin programming language is used to code the app's user interface actions and events, whereas the PHP

programming language is utilized to code the system's backend answers. In constructing the app, a new project is created using Android Studio. It requires selecting a minimum System Development Kit (SDK) or version of Android, where the mobile app can execute. The concessionaire mobile app uses API 21: Android 5.0 (Lollipop) as its minimum SDK.

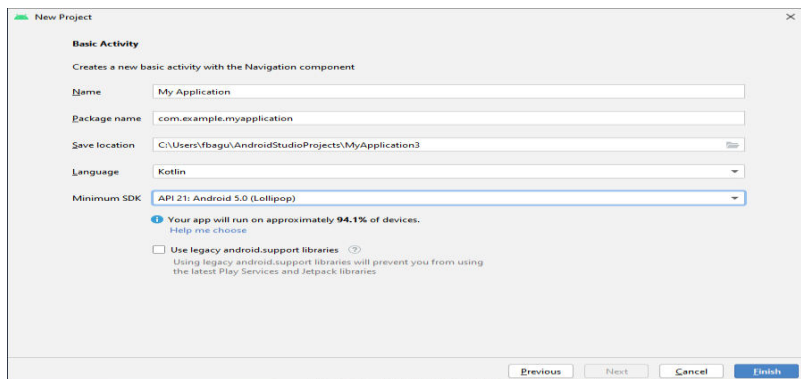


Fig. 8: New project window of android studio 4.2.

Fig. 9 shows the flow chart for the Account Validation process and the basis for writing the code for the Account Validation phase of the mobile app. The data are required by the app and validated by requesting a response from the data server in the app's account validation activity. Backend answers are all in JavaScript Object Notation (JSON) format since it is known for being light-weight, readable and does not overwhelm the network connection with its small byte size compared to raw HTML response. The request for response from the backend is sent by the mobile app via a secure socket layer technology or SSL. This assures that information is secured and protected throughout internet transfer. Following a valid response from the server, the account number the user enters is encrypted using the advanced encryption standard, AES 256-bit encryption. The encrypted account number will be stored in the internal storage of the mobile device and will be used as reference for loading the data of the concessionaire.

The same encryption is used to store the PIN code to protect the app. Following the initial level of validation, users will be requested to enter a valid email address and mobile number. The system will send One-Time PIN code to the email and mobile number to check the existence of the said details. The backend used its internal mail server to send email and the Short Messaging System (SMS) of Twilio. **Fig. 10** shows the visual flow chart of the main activity of the mobile app. It indicates that all activities are rooted to the app's main screen, implying that other activities can be accessed via the app's main screen. Each screen of the app's main activity is designed in XML format using Android Studio's built-in screen designer, while the events and actions of each layout are written in Kotlin language. After all codes are in place, the project will be compiled and the APK file will be built.

The APK is the file used by Android system as its installation file. The APK file contains the compiled project and can be published in Google Play Store or distributed by copying it to the mobile device. **Fig. 11** illustrates how the Android Studio source code is structured and handled. Each code is organized into manifests, java, and assets folders, as shown in the figure. The Cutover Phase is the Rapid Application Develop-

ment implementation phase that comprises conversion of data, validation, system changeover, and training of user. The system was sent through APK format to the target respondents. The researcher provided a presentation file including basic information about the system's use and operation.

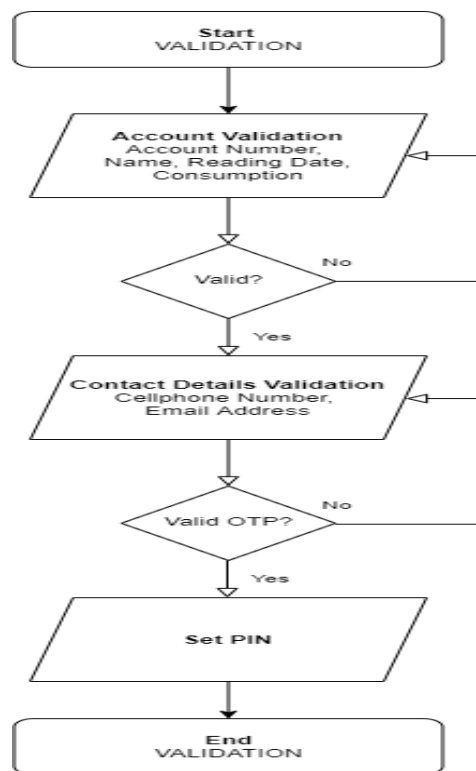


Fig. 9: Account validation flow chart.

Research Instrument

The data needed for the study were gathered using an evaluation form. This was employed to assess the app's acceptability level relative to its functional suitability, performance efficiency, compatibility, usability, reliability, maintainability, portability, and security, as specified by the ISO 25010:2011 standard. The evaluation form was subjected to face validation zeroing on its content.

The validators were Capiz State University faculty members from the Graduate Pro-gram and technical/IT academics who are considered experts. It was validated based on its content so that the information gathered served their purposes. The suggestions and recommendations of the validators were considered.

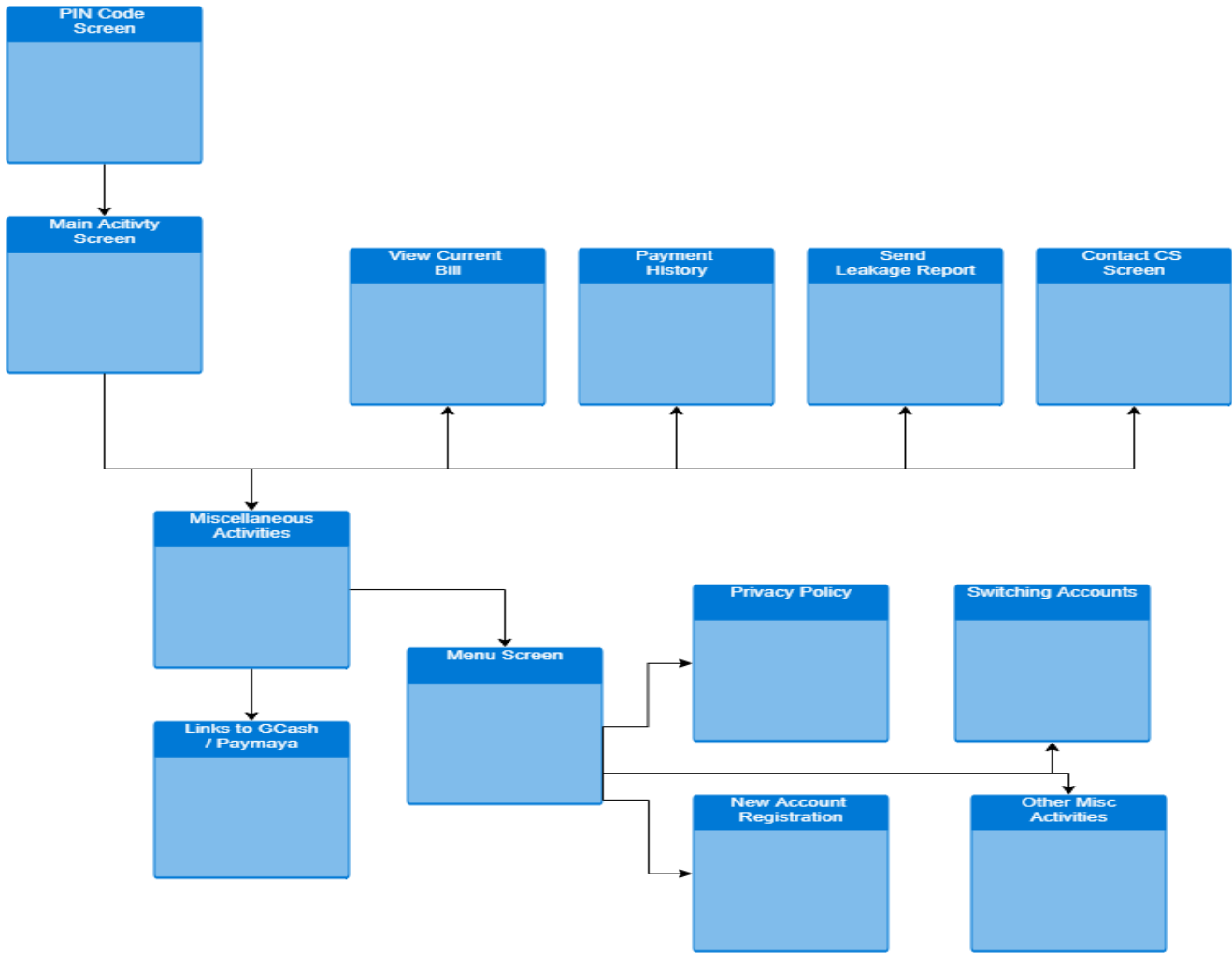


Fig. 10: Visual flow chart of the core activity of the concessionaire mobile application.

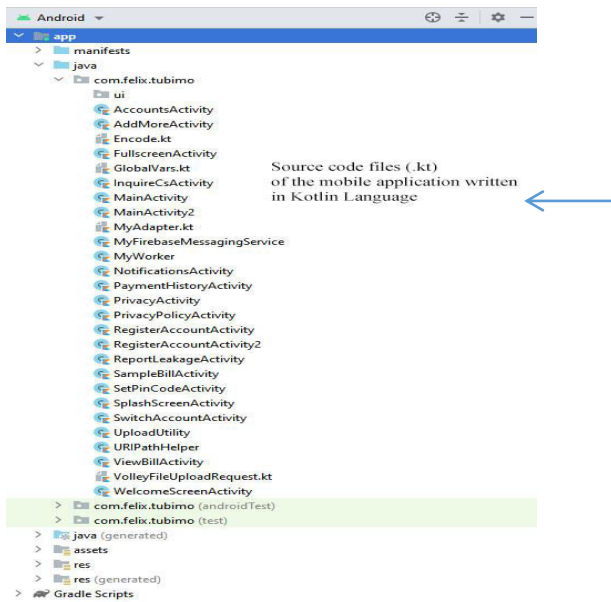


Fig. 11: Project structure of the mobile app in android studio.

Procedure

Following the validation of the assessment form, the researcher distributed and administered the evaluation sheet to the respondents to guarantee complete retrieval. The evaluation form was converted into Google Forms format for ease of access and for the technical experts to easily fill out. The link of the Google Form was sent through the social media accounts or email of the technical experts along with the installation file of the mobile application to be evaluated. Table discussions and mobile application presentations with Metro Roxas Water District management and Board of Directors were also facilitated to seek support for the project's continuance and implementation. After the evaluation sheet had been retrieved, the results were collated, scored, entered in the master data, and processed through a licensed IBM SPSS Statistics 26 program. The researcher made sure that the responses were pro-

perly scored and assigned the respective qualitative description for each indicator. The frequency, percentage, and mean were the descriptive statistical tools used to analyze and interpret the gathered data.

Ethical Considerations

The researcher developed the mobile phone app to run on rooted or unrooted Android handsets. In addition, the application runs with mobile push notification expressly enabled. This is done because it is an important factor that has a significant impact on the successful function of delivering messages and notifications to concessionaires. Furthermore, the device token, which uniquely identifies the mobile device, the model of the device, contact information, and other personal information were acquired from the user. The researcher ensures that these sensitive data were used with highest regard to objectivity and data privacy. The ownership of this mobile phone application developed for this research belongs to Capiz State University (CAPSU)

but its source code and idea are solely owned by the researcher. In case this application will be adapted by Metro Roxas Water District (MRWD) for implementation, CAPSU and MRWD should form an agreement with regard to this developed app's use.

RESULTS:

Fig. 12 illustrates the app's whole screen activity, including the Account Verification screens, Splash screen, PIN code entry, and other features. Viewing the current bill, bill payment date reminder, payment history, reporting leakages, reconnection/reinstallation notification, and links to payment apps such as GCash and PayMaya are all included in the app. In February 2020, the researcher conceptualized the Smartphone app and began learning the Kotlin programming language. The app's development began after learning the language and gathering the necessary data to begin coding the app.

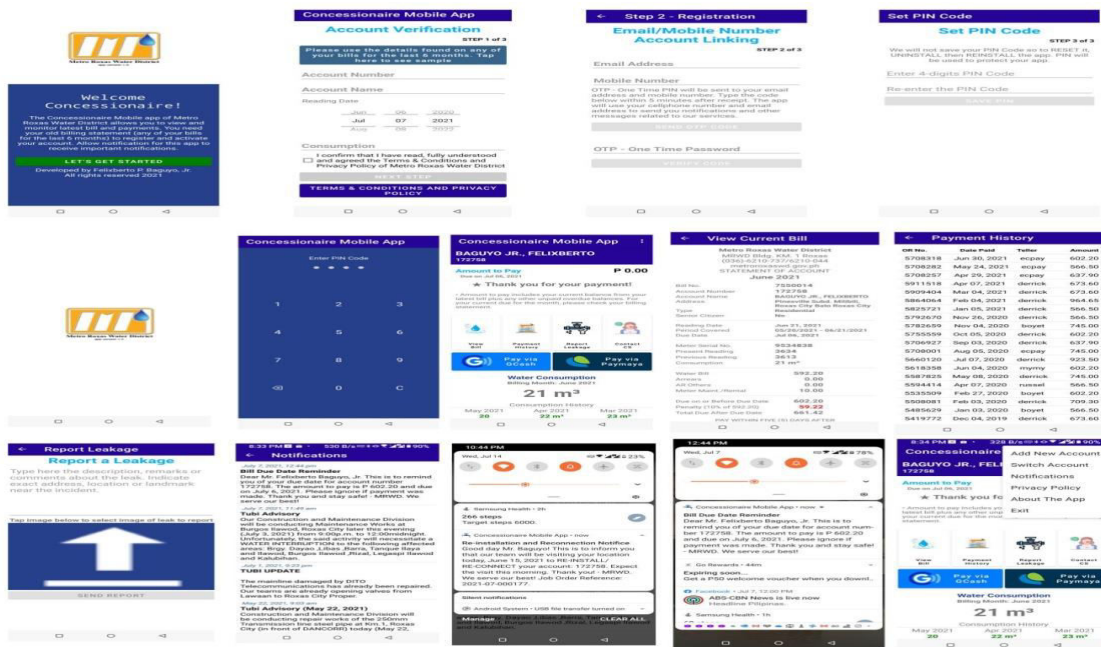


Fig. 12: The app's complete activity screen.

The app's current bill viewing feature was predicated on the Metro Roxas Water District's existing paper water bill. It includes the concessionaires' personal information, current month's use, meter serial number, water bill, penalty, senior citizen discount, arrears, payment schedule, and other bill information. **Fig. 13** illustrates the presentation of the bill information as seen through the app. The user can access the feature

by tapping the View Bill button on the application's main screen. The feature was designed as a scrollable view, allowing the user to drag the featured screen to view the entire water bill information. This was designed in this manner to ensure that even small screen devices may see the information despite the screen size limitation.

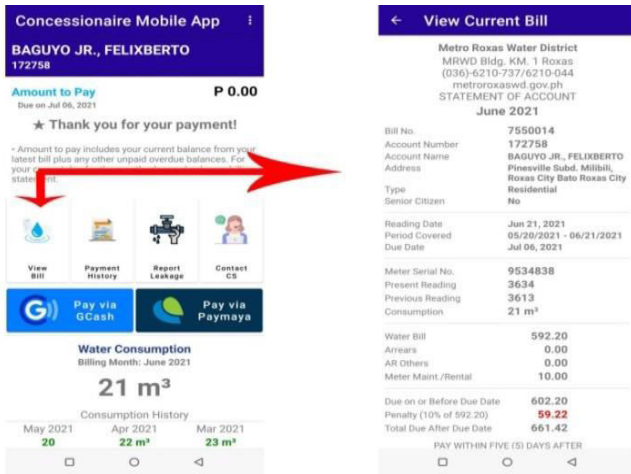


Fig. 13: View current bill feature.

Another function the app offers is the payment due date notification tool, which automatically sends notifications to the user when a bill is generated via the Metro Roxas Water District’s existing billing and collection system. Fig. 14 exhibits the notification's display on an Android device.

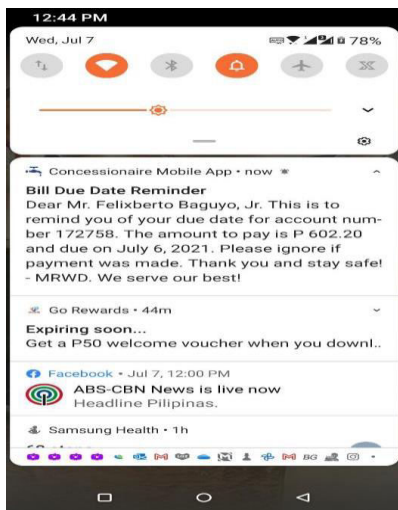


Fig. 14: Bill due date reminder feature.

The viewing payment history tool displays the user's latest thirty (30) payment transactions. It displays payment details such as the OR number, date paid, teller, and payment made by the concessionaire. The payments' transaction list is arranged in descending order, with the most recent transaction at the top. Fig. 15 illustrates the feature, which is accessible in the mobile app via the Payment History button on the screen. As shown in Fig. 16, the feature is accessible via the application's Report Leakage button. It will bring up a screen where you can report a leak or any other issue

with the Metro Roxas Water District. The user is required to provide a description, notes, and specifics regarding the incident in this function. This information is essential for Metro Roxas Water District to act on the report.

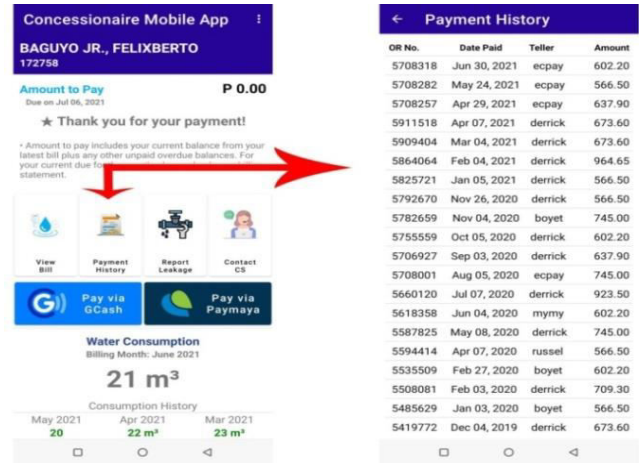


Fig. 15: Viewing of payment history feature.

The app also requires an image of the incident, that may be uploaded by tapping the upload image button on the Report Leakage screen. After selecting a picture, the client may send the report by tapping the send report button, which will only appear if the appropriate information is entered.

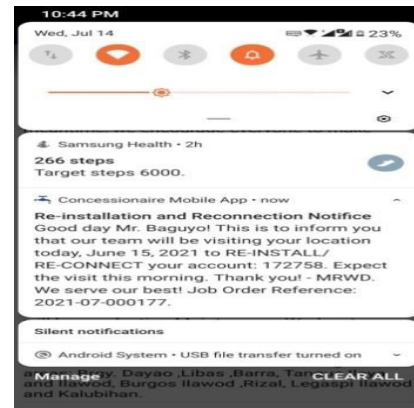


Fig. 16: Reporting leakages and other incidents feature.

The reinstallation and reconnection notification feature is the mobile application’s way of informing the user that a job order for reconnection or reinstallation will be performed with their account. The notice would be directed to the mobile device of the user through the built in Android notification system. Fig. 17 displays the notification’s appearance.



Fig. 17: Reinstallation and reconnection notification feature.

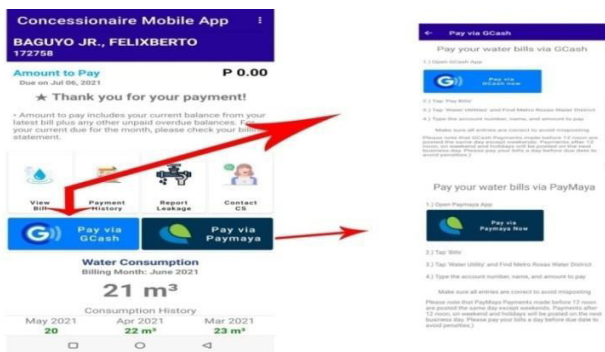


Fig. 18: Link to payment apps features.

The mobile application's link to payment allows users to directly access the GCash and PayMaya apps, the two online payment apps used by Metro Roxas Water District to accept payments. **Fig. 18** shows that tapping

the Pay with GCash button opens the GCash app, but tapping the Pay via PayMaya button opens the PayMaya app.

When the expert-respondents were taken as a whole group, **Table 1** discloses the grand mean score of 4.74 on the level of acceptability of the mobile application in terms of functional suitability, performance efficiency, portability, reliability, usability, maintainability, security, and compatibility. The result implies that the Metro Roxas Water District (MRWD) concessionaires' mobile application was very acceptable. The evaluators' comments were mostly positive, and they considered that the phone app may be very valuable for the clients, especially during this pandemic. It is not complicated and straight forward, whom it functions as expected and as described. They also stated some minor issues with the user-interface aesthetics and requested for more functionalities such as adding more information on the app regarding MRWD. Overall, the evaluators believe that the app is extremely useful and timely. This means that the app must be assessed using the software quality criteria specified by ISO/IEC 25010 before it is made available to consumers. Taking this into account, the result revealed that the developed mobile application is ready for distribution and could be customized by MRWD to be utilized as an alternate method of delivering services to concessionaires.

Table 1: The mobile app's acceptability level as evaluated by the expert-respondents as a whole.

Variables	Mean	Verbal Interpretation
Functional Suitability	4.81	Very Acceptable
Performance Efficiency	4.75	Very Acceptable
Reliability	4.67	Very Acceptable
Usability	4.71	Very Acceptable
Compatibility	4.77	Very Acceptable
Security	4.74	Very Acceptable
Maintainability	4.72	Very Acceptable
Portability	4.77	Very Acceptable
Grand Mean	4.74	Very Acceptable

Legend: 4.21-5.00 = Very Acceptable; 3.41-4.20 = Acceptable; 2.61-3.40 = Slightly Acceptable; 1.81-2.60 = Unacceptable; 1.00-1.80 = Totally Unacceptable.

In terms of app's functional suitability, it was very acceptable as indicated by a mean score of 4.81. The respondents find it responsive, work as expected, and provide necessary information as needed. They also asked for additional function such as adding more option on UniversePG | www.universepg.com

the payment section of the app. According to Rodriguez *et al.* (2012), functional suitability is one best relevant characteristic that generate the greatest interest. This is because having an evaluation available that indicates the acceptability level of the product's

functional requirements helps ensure that the software product is apt for the functions it must perform. The increasing usability relied inherently on basic functionalities (Mossey, 2019), which only means that functionality is important to the usability of the mobile application. The outcome also demonstrates that the produced mobile application fits the criteria of what to expect from a software platform designed for Metro Roxas Water District concessionaires (MRWD). The phone app may transmit invoices and display information that is required for users to complete their duties and objectives, which is a significant element. In terms of performance efficiency, the mobile application was very acceptable as shown by a mean score of 4.75. The respondents find the mobile app to be responsive and working as expected in normal or critical condition. They are just hoping that the developed app could support lower specs mobile devices and even Apple's iOS operating system. In a real-world situation, the functionality and usability of the developed app can only be appreciated by the users if it responds immediately to every action and no delay occurs. This is the reason that the mobile application developers should always consider evaluating the performance efficiency of their solutions to have a better grasp of how their application will perform in real life situation involving processing of data in mobile devices. In terms of reliability, the mobile application was very acceptable as specified by a mean score of 4.67. The respondents find the app very reliable and provide accurate information. They are just hoping that the app would be available on Google Play Store so that it could be utilized. Fast and reliable billing information is really vital in the collection effort of any organization. As Rao (2016) said, the procedures in billing play a vital role in income for a lot of government entities, and improving billing systems, in conjunction with strengthening collection processes, can significantly boost revenue collection. With this reliable mobile app, the Metro Roxas Water District target timely distribution of bills could be achieved in a very timely and innovative way. The reliability of the mobile application plays an important role to keep the trust in one's device, thus, by the result of the evaluation of the expert-respondents shows that the developed mobile application is very reliable and can be trusted by the users to provide them the functionality that they need

for paying their water bills. This suggests that the mobile application values the quality and consistency of the data it supplies. In terms of usability, a mean score of 4.71 implies that the program was very acceptable. The program is user-friendly and simple to use, according to the expert respondents. As stated in their remarks, they find some minor issues with the interface aesthetics of the user, especially when they use the app in dark mode or night mode of their device. The expert-respondents commend to fix this minor issue and rebuild it to make it work on low specs devices or different sizes of screen. As stated by Mossey, (2019) mobile app usefulness and usability is a critical factor in ensuring the application remain downloaded on the user's phone. With this in mind, it is anticipated that the concessionaires will download and utilize the software platform once it is published or available in the Google Play Store as it is usable and very valuable. The app's compatibility was very acceptable, as reflected by a mean score of 4.77. There were no issues discovered with the application's compatibility with their Android smart phones, although GCash and Pay-Maya are not opening properly in some circumstances. The result indicates that the program is ready for MRWD adaptation because there are no compatibility issues that will prohibit it from doing so. Akour *et al.* (2016) avow that because of the impact of mobile devices in our lives, there is a greater worry about the dependability and compatibility of software devices; hence, assessing this software becomes an essential part in the mobile device adaptation process. As to security, a mean score of 4.74 implies that the android mobile application was very acceptable. The respondents' remarks on the security of the app, confirmed their rating. They just added that the developed app should consider other security options in protecting the app such as fingerprint or facial recognition protection. Defects that can result in vulnerabilities could be in any kind of software, including desktop and mobile app. This is why it is critical to consider security while analyzing an app before it is officially published. Failure to do so will cause problems not only for the user of the mobile application, but also for the business that is supplying data to the users. The result further shows that the application exhibits high consideration, specifically to its security through AES-256 encryption and secure protocol for its web services, validating the

users so that only the authorized users could utilize the application, and logging activities of the users to monitor suspicious activities. As to app's maintainability, it was very acceptable as shown by a mean score of 4.72. The evaluators indicate that it is as flexible as it could adapt to the changing needs of the users of MRWD. It is costly indeed because the SMS cost used for the One-Time PIN (OTP) code of the validation process of the app varies on the provider, while the email OTP is free till the maintenance of the mail server on MRWD can cost them something. However, despite these considerations, it is still a small price to pay for the betterment of the service of the organization. The application must be maintained in order to be sustainable and valuable to future generations of users. For the app's portability, it was very acceptable as presented by a mean score of 4.77 as also stated in expert-respondents' remarks. They find the application to be portable and run on different versions of Android OS.

This implies that the application can replace the existing manual bill delivery system of MRWD. The result of the evaluation shows that the application is highly portable in Android varieties only and can be reinstalled through the official installation distribution channel or the Google Play Store. This means that MRWD concessionaires can utilize the mobile application on their phones at any time and from any location. According to Pelandiana and Ado (2018), this results in better service delivery. It can be connected to the internet, and users and water consumers can access and make transactions, allowing them to be efficient in their everyday chores whether at work or at home.

DISCUSSION:

The Android mobile application for the Metro Roxas Water District concessionaires is a concessionaire centered app that is intended to deliver its services to its clients anytime and anywhere. It would improve the billing process of the organization leading to much efficient collection and better services. The mobile app can be a great device to attain the Metro Roxas Water District's goal, which is to serve its best. As Rao, (2012) stated, billing processes play a critical role in revenue for some government entities, including municipalities. Improved revenue collections lead to better delivery of projects and services. The app's viewing of current bill feature was established on the Metro Roxas UniversePG | www.universepg.com

Water District's existing paper water bill. It contains the concessionaires 'personal details, current month's consumption, meter serial number, water bill, penalty, senior citizen discount, arrears, payment date, and other bill information. The bill due date reminder feature is another service provided by the app that automatically sends notifications to the user when a bill is generated by the existing billing and collection system of MRWD. The viewing of payment history feature shows the last thirty (30) payment transactions of the user. It shows payment details such as the Official Receipt (OR) number, date paid, teller, and amount paid by the concessionaire. The list of payments is arranged in descending order, with the most recent transaction at the top. In the report leakage and other incidents feature, the user is required to type a description, remarks and details about the leakage or other incident.

This is important information for the MRWD to act on the report. The image of the incident is also required by the app, which can be uploaded by tapping the upload image from the report leakage screen. Once an image is selected, the user can send the report by touching the send report button, which will only enable if the required information is filled out. The reinstallation and reconnection notification feature is the mobile application's way of informing the user that a job order for reconnection or reinstallation will be performed with their account. The notice will be sent to the user's phone through the built in Android notification system. The link to payment apps feature of the program is intended for the user to open directly to GCash and PayMaya apps, the two online payment apps used by Metro Roxas Water District in accepting payments.

CONCLUSION:

The technical experts evaluated the developed application as very effective in respect to ISO/IEC 25010 as to its functional suitability, security, performance efficiency, portability, usability, maintainability, reliability, and compatibility. The respondents encountered mostly minor issues with regard to the user-interface design, compatibility to lower specification of the app's devices and functionalities. Enhancements can be implemented to solve these minor issues by adding functionalities to the app, improving its appearance on dark or night mode, and lowering its requirements to

make it usable on lower specs of mobile devices. As future work, the researcher intends to apply for a patent for the developed mobile app. Furthermore, the said app is intended to be ported to other mobile operating system like the iOS of Apple devices and Harmony OS for Huawei phones. The developed mobile app can be implemented by Metro Roxas Water District (MRWD) to offer an alternative method in providing services to its concessionaires.

ACKNOWLEDGEMENT:

Many thank the authority of the Capiz State University and Metro Roxas Water District for providing support to the successful study.

CONFLICTS OF INTEREST:

The author declares no conflict of interest.

REFERENCES:

- 1) Akour, M., Bouriat, S., & Alemerien, K. (2019). Mobile Software Testing: Thoughts, Strategies, Challenges, and Experimental Study, *7*(6), 2016. *International J. of Advanced Computer Science and Applications*.
- 2) Akter M, Rahman M, Rifat M, Hasan M, Nahar S, and Hasan S. (2021). Development and design of a humanoid Robot system MIRAA: intelligent & autonomous mobile assistant, *Aust. J. Eng. Innov. Technol.*, *3*(1), 10-20. <https://doi.org/10.34104/ajeit.021.01020>
- 3) Mossey, S. (2019). Crafting the Government Mobile Application: A Mixed Methods Analysis of Public Value Creation as It Relates to Citizen Engagement and Participation in the Development of Government Smart City Mobile Application, *ProQuestCen*. <https://www.proquest.com/dissertations-theses/crafting-government-mobileapplicationmixed/docview/2316839028/se-2?accountid=207723>
- 4) Pelandiana, A. & Ado, R. (2018). Web-Based Billing and Collection System for a Municipal Water and Service Unit. Research Gate. <http://dx.doi.org/10.18502/kss.v3i6.2371>
- 5) Rao, S. (2012). Impact of Municipal Billing System on Revenue Collection. Research Gate. <http://dx.doi.org/10.13140/RG.2.1.3898.2007>
- 6) Richey, R. C., & Klein, J. (2007). Design and Development Research: Methods, Strategies, and Issues. *Mahwah, NJ: Lawrence Erlbaum Associates, Publishers*.
- 7) Rodriguez, V. *et al.* (2012) Structure-function analysis of human TYW2 enzyme required for the biosynthesis of a highly modified Wybutosine (yW) base in phenylalanine-tRNA. *PLoS One*, *7*(6), e39297
- 8) Sizan NS, Dey D, and Mia MS. (2021). Application of IoT for developing sustainable and smart farming. *Aust. J. Eng. Innov. Technol.*, *4*(4), 78-89. <https://doi.org/10.34104/ajeit.021.078089>
- 9) World Bank. (2020). Philippines Digital Economy Report 2020: A Better Normal Under COVID-19 - Digitalizing the Philippine Economy Now. *World Bank, Washington, DC. World Bank*. <https://openknowledge.worldbank.org/handle/10986/34606>

Citation: Baguyo, Jr. FP. (2022). Development of mobile application for water concessionaire towards efficient account monitoring and service delivery, *Can. J. Bus. Inf. Stud.*, *4*(5), 86-99.

<https://doi.org/10.34104/cjbis.022.086099> 