**Chapter 3**

**METHODOLOGY**

This chapter contains the project design, project development flow, operation and testing procedure, and evaluation procedure.

**Project Design**

The project is designed to make a queuing system using QR code. The queuing system includes allowing companies to post the transactions each window or counter caters to, generating of QR code that has the customer’s queue number, providing customers an estimated time left before their turn, allowing the customers to set the notification time, notifying customers on the given time left before their turn that they specified, and allowing customer to view the real-time update of the queue, view the customers’ generated QR code and view the customer’s past transactions. The customer will choose what type of transaction he/she would like to make. The customer will be able to see the estimated time per transaction as well as the counter or window managing the transaction. Then, he/she will be given a QR code with their queue number. Next, the customer will be notified depending on when the customer wanted to be notified. He/she will be able to see the real-time update of the queue. The customer will also have an option to cancel the customer’s transaction. If he/she responds saying that he/she will be late, the customer will be the priority when he/she goes to the establishment.

Generated QR Code + Estimated Time + Real-time Processing + Notification

Generated QR Code

Company

Request for Transaction

Customer’s Transaction

Customer

*Figure 2.* Context Diagram of the System

**Use Case Diagram**

The use case shows the roles of each user in the system. There are three actors in the developed system, the administrator, company, and the customer.

<<include>>

**Administrator**

<<include>>

<<include>>

<<include>>

*Figure 3.* Administrator Use Case Diagram

Figure 3 shows the Administrator Use Case Diagram of the system. It consists of the main processes that the admin handles. These are:

* Manage Company’s Accounts
* Manage Customer’s Accounts

<<include>>

<<include>>

**Company**

<<include>>

<<include>>

<<include>>

*Figure 4.* Company Use Case Diagram

Figure 4 shows the Company Use Case Diagram of the system. It consists of the main processes that the company handles. These are:

* Manage Transaction
* Manage Account

**Customer**

<<include>>

<<include>>

<<include>>

<<include>>

<<include>>

<<include>>

<<include>>

*Figure 5.* Customer Use Case Diagram

Figure 5 shows the Customer Use Case Diagram of the system. It consists of the main processes that the customer handles. These are:

* Manage Transaction
* Manage Notification
* Manage Account

**Entity Relationship Diagram (ERD)**

The Entity Relationship Diagram shows the graphical presentations of entities of the database and their relationships. It shows how the data are shared between entities.



Manages

Manages

Admin

Customer

Transaction

Manages





Makes



Company



*Figure 6.* Entity Relationship Diagram of the System

Figure 6 shows the relationship of the following entities from the database. The diagram shows that there are 4 modules in the system. Every company and customer can only have one account. The admin manages the accounts of the counter and the customer while the counter manages all the transactions that the customer makes.

**Project Development**

The algorithms of the android application that will be developed will be coded using the following steps:

1. Plan and design the desired user interface of system activities.
2. Create the activities and order it based on its function.
3. Create a database using web hosted phpMyAdmin.
4. Application Modules
   1. Checking Internet Connection
      1. Create a message box showing “Checking Internet Connection” that would check the application’s internet connection
   2. Splash Screen
      1. Create a Splash Screen activity that would notify the user that the application is in the process of loading.
   3. Home
      1. Create the functions of buttons and spinner present such as Create Account, Login, and Exit Application.
      2. Use the onClick method that would call the corresponding action based on Java codes.
   4. Login
      1. Create the function of the Login button that will send data about the username and password of the customer and will redirect to Profile.
   5. Create Account
      1. Create the function of Create Account button that would send data about the information of the customer and will redirect to Profile.
   6. Profile
      1. Create the functions of buttons and spinner present such as Make Transaction, View Past Transaction and Logout, and will display the information of the customer.
      2. Use the onClick method that would call the corresponding action based on Java codes.
   7. View Past Transaction
      1. Create the function of View Past Transaction button that would retrieve data about the past transactions of the customer.
   8. Make Transaction
      1. Create the functions of buttons and spinner present such as Get Queue, View Transaction and Exit Application.
      2. Use the onClick method that would call the corresponding action based on Java codes.
   9. Get Queue
      1. Create the function of Get Queue button that would send data about the time the customer will be notified and will display the Process Queue button.
      2. Use the onClick method that would call the corresponding action based on Java codes.
   10. Process Queue
       1. Create the function of Process button that would send and retrieve data about the chosen counter/window, the number of queue and position in the queue, display the countdown timer of the user’s remaining time before the user’s turn, and would display the View QR Code button.
       2. Use the onClick method that would call the corresponding action based on Java codes.
   11. View QR Code
       1. Create the function of View QR Code button that would display the QR code.
   12. View Transaction
       1. Create the function of View Transaction button that would display the number of queue and the estimated time of the transaction.
   13. QR Code Display
       1. Create the function of displaying the generated unique QR code from the retrieved data of the chosen counter or window and position in the queue.
   14. Real-Time Process Countdown
       1. Create the function for the Time Remaining that would display the countdown timer of the user’s remaining time before the user’s turn.
   15. Notification
       1. Create the function of displaying the notification message “It’s your turn!”, the On My Way button, and Cancel Transaction button.
       2. Use the onClick method that would call the corresponding action based on Java codes.
   16. On My Way
       1. Create the function for On My Way button that would redirect to View QR Code.
   17. Cancel Transaction
       1. Create the function for Cancel Transaction button that would cancel the transaction of the queue number and redirect to the Profile.
   18. Queue Expired
       1. Create the function of displaying a message box “Your QR Code has expired” and will redirect to Profile.
   19. Logout
       1. Create the function to logout the customer’s account.
   20. Exit
       1. Create the function to close the android application.

Table 1.

*Use Case Title and Description*

|  |  |  |
| --- | --- | --- |
| **Use Case Number** | **Use Case Title** | **Use Case Description** |
| UC01 | Internet Connection | This use case will allow the user to use the application. |
| UC02 | Splash Screen | This use case will be displayed when the user start the application. |
| UC03 | Home | This use case will allow the user to make an account or login to an existing account. |
| UC04 | Login | This use case will allow the user to input the user’s username and password. |
| UC05 | Create Account | This use case will allow the user to input the user’s information needed to make an account. |
| UC06 | Profile | This use case will display the information of the user and will allow the user to view its past transactions and to make a transaction. |
| UC07 | View Past Transaction | This use case will display the list of all the user’s past transaction. |
| UC08 | Make Transaction | This use case will display a choices containing the different transactions and will allow the user to view the transaction or get a queue in a transaction. |
| UC09 | Get Queue | This use case will allow the user to set the time the user wanted to be notified. |
| UC10 | Process Queue | This use case will allow user to see the counter or window of the user’s transaction, the number of queue, the user’s position in the queue and the countdown timer of the user’s remaining time before the user’s turn. |
| UC11 | View QR Code | This use case will allow the user to view the unique QR Code generated. |
| UC12 | View Transaction | This use case will allow the user to view the number of queue and the estimated time of the transaction. |
| UC13 | Notification | This use case will notify the user according to time set by the user. |
| UC14 | On My Way | This use case will allow the user to tell the bank that the user is on its way. |
| UC15 | Cancel Transaction | This use case will allow the user to cancel its transaction. |
| UC16 | Queue Expired | This use case will inform the user that the QR Code of the user has expired. |
| UC17 | Logout | This use case will allow the user to logout its account. |
| UC18 | Exit | This use case will allow the user to close the application |

Table 1 shows the Use Case Title and Description which presents all the options and menus that would be seen in the application such as Internet Connection, Splash Screen, Home, Create Account, Profile, View Past Transaction, Make Transaction, Get Queue, Process Queue, View QR Code, View Transaction, Notification, On My Way, Cancel Transaction, Queue Expired, Logout and Exit. The table also gave the description and the function for each menu and option existing in the application.

**Operation and Testing Procedure**

**Operation Procedure**

For the operation procedure of the web application, the following are the steps to follow:

1. Install WAMPServer.
2. Open and run the web servers.
3. Copy the program files of web application.
4. Open and access the web application.

For the operation procedure of the android application, the following are the steps to follow:

1. Copy the installer of the application.
2. Install the application.
3. Connect to an internet connection.
4. Open and access the android application.

**Testing Procedure**

Table 2.

*Functionality and Reliability: Test of the developed system*

|  |  |
| --- | --- |
| **Module** | **Steps to be Undertaken** |
| Administrator | 1. Login using the default administrator username and password. 2. View Dashboard 3. Add, update or delete company 4. View company 5. Add, update or delete customer 6. View customer |
| Company | 1. Login using username and preferred password 2. View Dashboard 3. Update account |
| Customer | 1. Login using username and preferred password 2. View Profile 3. View past transactions 4. Create transaction 5. Choose transaction 6. View the transaction 7. Get queue in a transaction 8. Set the notification time 9. View the generated QR code |

**Evaluation Procedure**

The system will be evaluated by 30 respondents composed of 10 CS professors and 20 students of the Technological University of the Philippines-Manila using random sampling.

The evaluation procedure will be conducted as follows:

1. The system will be demonstrated by the researcher.
2. The evaluators will be asked to rate the performance of the system.
3. Each respondent will be given a set of questionnaires.
4. The system will be carefully evaluated by the respondents and they will be allowed to raise questions.
5. The respondents will be requested to rate the system based on the criteria in the evaluation instrument.
6. The results will be tallied to determine the mean of each criterion and the overall mean.
7. The results will be interpreted using Table 3.

**Evaluation Instrument**

The criteria for evaluation will be focused on the project’s functionality, reliability, usability, efficiency, maintainability, and portability based on ISO 25010 criteria.

The evaluation instrument that will be used is a 4-point Likert Scale that will be shown in Appendix A. Likert Scale is a psychometric scale commonly use to questionnaires and is most widely used to survey research. By using the scale, the researcher can determine the acceptability of the project based on experience and user’s opinion of the acceptability of the system.

**Statistical Tool**

Relative Frequency is the repetition of a data in a distribution.

Formula:

Relative Frequency =

Where:

f = represents the number of times the scores repeated in a set

n = represents the number of respondents

The Mean is the average of the numbers calculated central value of a set number.

Formula:

X =

represents the summation

X = represents the scores

N = represents the number of scores

Table 3.

*Rating Scale for the Evaluation Instrument*

|  |  |
| --- | --- |
| **Numerical Rating** | **Qualitative Interpretation** |
| 4 | Highly Acceptable |
| 3 | Very Acceptable |
| 2 | Acceptable |
| 1 | Not Acceptable |

Table 3 describes the criteria and indicators of the evaluation instrument to measure the acceptability of the system.

Table 4.

*Scale Range and its Qualitative Interpretation*

|  |  |
| --- | --- |
| **Range** | **Qualitative Interpretation** |
| 3.4 – 4.0 | Highly Acceptable |
| 2.6 – 3.3 | Very Acceptable |
| 1.8 – 2.5 | Acceptable |
| 1.0 – 1.7 | Not Acceptable |

Table 4 describes the range scale of criteria and indicators of the evaluation instrument to measure the acceptability of the system.