COMPUTING PROJECT

Reservation System

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Throughout this project, the author developed the project and created this report to share the subtle element of the entire project. The author also encountered mutlple issues during the development of this project such as unknown bugs, no related informations regarding the project and more.

In addition, the author would like to express sincere gratitude to lecturer, Mr. Lim Eng Lye for his guidance with tolerance and passion. Other than that, Mr. Lim Eng Lye moreover gives helpful information and practical advice that have made a difference during the research of this project. This project would not have been complete without Mr. Lim Eng Lye's guidance.

ABSTRACT

The main goal of this research is a reservation system made for the clients in the hostel to book the washing machine at anytime and anywhere. The reservation system will be released as an online application, so clients are able to access the reservation system without reaching the washing machine. Other than that, clients also will be informed when their reserved time is close and the reservation will be automatically skipped if the client didn't use it in time.

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LIST OF TABLE AND DIAGRAM

LIST OF ABBREVIATION

TULC   Taylor's University Lakeside Campus

SOCIT   School of Computing and IT (Information Technology)

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……….   …………………………………………..

Project Background

A hostel encountered a situation that the clients are complaining about the efficiency of the washing machines. In this project, a new washing machine reservation system will be developed and implemented into this hostel's washing machine.

Problem Statement

Once the residents packed their clothes and going down to the laundry room, they found out that all washing machines were occupied and they must go back to their room and wait and check the laundry room later by going down again and again till one of the machines to be available. When residents finally find available washing machines, they need to stay in the laundry room until washing finishes. Or, when they find available washing machine and washing starts, they can go out to do their work, but they might forget about their laundry and washing machine will be occupied for no reason which might cause overcrowding. The reason of the problem is that residents are not able to check availability of washing machines without going down to the laundry room and they are not able to check whether washing process finished unless they stay in laundry room and wait till it finishes.

Therefore, by implementing a reservation system, residents will be able to check all available washing machines at a specific time in their PC or Mobile and be notified when their laundry is ready to be collected.

Project Objectives

Main function of the system is to perform reservation of available washing machines.

Users will be able to reserve machines a maximum of one week before. Meaning, they can check and reserve the machine on one of the next 7 days. We will implement user database to setup login and register to make sure there will not be the same reservation at the same time.

To reserve the machine, users should choose the type day and time. Upon reservation, the user will receive the code which needs to be entered to use the washing machine. The code will only work in their reserved time.

When reserved time has come, the system will wait 5 minutes for the code to be entered. If user didn't attend the reservation, the system will automatically cancel the reservation and post the washing machine on the list of available machines.

Stakeholders

The stakeholders in this project will be the residents and students in the hostel. They are the main stakeholders in this project. Improvement of the user experience of the washing machine will help our stakeholders wash their cloths more efficiently than before.

Project Scope

This project final deliverable will be a reservation system for the washing machine in the hotel. The reservation system will help our clients to improve their user experience for the washing machine. The reservation system will arrange a time for the client to wash their cloths. To access to reservation system, clients must use the mobile web application and get a time arrangement to wash their cloths.

Conclusion

All the project arrangement such as project scope, project requirement, project outcome is discussed in this chapter. This discussion will decide how fast and efficient this project will go because we already had a clear goal.

Project Scheduling

Planning

Name	Subitems	Status	Priority	Timeline - Start	Timeline - End
Scope Statement		Done	Medium	2021-08-29	2021-09-01
Establish Project Calendar		Done	Medium	2021-09-01	2021-09-05
Control	Risk management, Resource management	Done	High	2021-09-06	2021-09-10
Subitems	**Name**	**Owner**	**Status**	**Date**	
	Risk management		Done		
	Resource management		Done		
				2021-08-29	**2021-09-10**

Design

Name	Subitems	Status	Priority	Timeline - Start	Timeline - End
UI/UX of web application	Design wireframe, Design prototype with Figma	Done	High	2021-09-11	2021-10-03
Subitems	**Name**	**Owner**	**Status**	**Date**	
	Design wireframe		Done		
	Design prototype with Figma		Done		
				2021-09-11	**2021-10-03**

Prototyping

Name	Subitems	Status	Priority	Timeline - Start	Timeline - End
Develop functional prototype		Done	High	2021-10-04	2021-10-17
Setup and prepare to operate		Done	Medium	2021-10-18	2021-10-31
				2021-10-04	**2021-10-31**

Testing

Name	Subitems	Status	Priority	Timeline - Start	Timeline - End
Test web app on automated app testing platform		Done	High	2021-11-01	2021-11-14
Get user feedback and achieve at least a total of 70% of the acceptance		Done	Low	2021-11-15	2021-11-21
				2021-11-01	**2021-11-21**

Deployment

Name	Subitems	Status	Priority	Timeline - Start	Timeline - End
Deliver the final product		Done	High	2021-11-26	2021-11-27
				2021-11-26	**2021-11-27**

<u>Conclusion</u>

In this chapter, every task in this project will be fine arranged to make sure that we have enough time to complete the project in time. Other than that, every task is also displayed by work break down structure and the project scheduling graph.

Chapter 3: Research and Development Methodology Introduction

As mentioned before, the hostel's laundry is overcrowded most of the time and residents are physically waiting in line, which is too time-consuming. And in most cases, at the end they give up and wait for the next day, but the next day, repeats the same thing repeatedly. So, the mission we have chosen to carry out is to reduce laundry overcrowding and help residents/students manage their time more efficiently.

To solve this problem, we decided to develop an Online Reservation System. So, below we will discuss why and how an Online Reservation System can help solve this problem and which development method suits us most to develop this project.

<u>Literature Review</u>

What is an Online Reservation System and why is it important?

As we know, online reservation systems are software you can use for managing   reservations for service. Be it a pool, fitness center, or a restaurant system allows all kinds of service businesses to accept bookings and appointments online and manage them with ease. But why do we need it?

1. It saves time.

Online Reservation System helps you do more with less by delegating the booking-related tasks to an automated platform. System enables you to automate notifications to the users.

2. Increases the efficiency of operations.

Users today expect instant gratification, and an online reservation system can help to provide it. Nobody today has the patience to wait at the front desk. So, booking software can help you manage the waitlist. No more long queues and crowded rooms. System automates everything with booking software with a waitlist management feature.

3. Accessibility.

One of the most significant benefits of an online reservation system is that they can accept bookings 24/7. Users have the convenience to book when it's right for them. Plus, bookings can be made at their own convenience from the comfort of their home.

How Online Reservation System works and what are main features?

Reservation Systems can be integrated into websites, mobile apps or social media. They are designed that when a user visits your website or application, they can see a booking calendar with available appointments. Then they just choose the service they want, the time and fill out the booking form online. By setting up booking form, users give out all the necessary information needed for the reservation.

There are several features of Online Reservation System:

1. **Calendar Incorporation**
   When booking, it helps users when they are shown a calendar. They can then click on the desired day and book from there. The calendar should make it clear which appointments are available.

2. **Reservation Management**
   Available times and service should be clear to customers when they are making a booking. They should also be aware of the cost and time available for the reservation.

3. **Reminders & confirmations**
   After the user has made a reservation, the system should confirm the reservation, and close to the reserved time should remind the user of their reservation. This can be done using in-app notifications and automatic emails. These notifications may include booking confirmation, arrival information, and payment requests.

Development Methodology

The methodology our group has chosen is the Rapid Application Development model. RAD methodology is a software design methodology that is designed to counter the rigidity of other traditional software development models where you cannot make changes easily after the initial development is complete.

The reason our group has chosen the RAD development model is because the RAD methodology is designed to be flexible and to accept new features and functions at every step of the development process. RAD development model also allows us to transfer deliverables as scripts, high-level abstractions and intermediate codes easier.

The strength and weaknesses of the RAD development model is the development productivity can be increased in a brief time with fewer people by using the RAD development model. RAD development model is also an excellent choice when you must reduce the overall project risk. Other than that, the RAD development model delivers the highest priority functionality to clients in each phase of it. The weakness of the RAD development model is if the developers are not committed to delivering software on time, RAD projects can fail. Next, Using RAD development model also reduce scalability because a RAD developed application begins as a prototype and evolves into a finished application. Then, highly skilled developers must use RAD development model.

There are 5 phases in RAD development model, which are requirement planning, user design, rapid construction and cutover. In the requirement planning phase, every member in this project communicates to set up the goals and deliverables for the project and the potential issues that would occur during the project. Next, in the user design phase, developers will work with clients to make sure the design fits client's requirements. Then in the rapid construction phase, the prototype from the earlier phase will be converted to a working model. Lastly, cutover phase. In this phase, all final changes are made while the coders and clients continue to look for error and bug in the system.

<u>Conclusion</u>

In this chapter we decided which methodology we want to implement during the whole project and explained why the reservation system is important and how it works. With the right methodology, our development process will be faster than before.
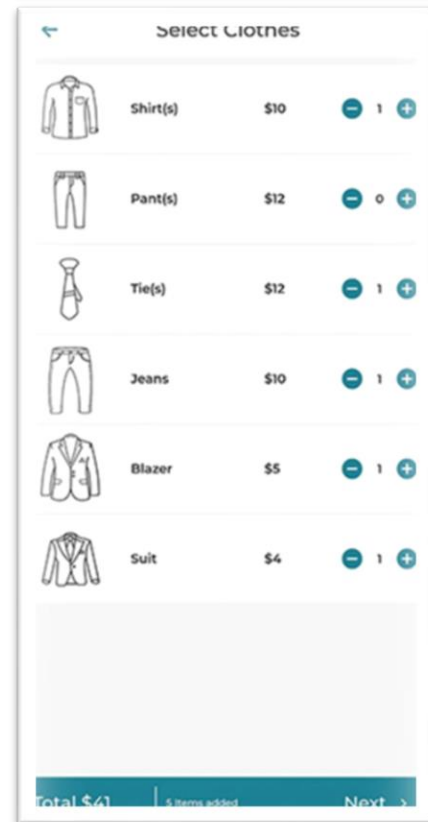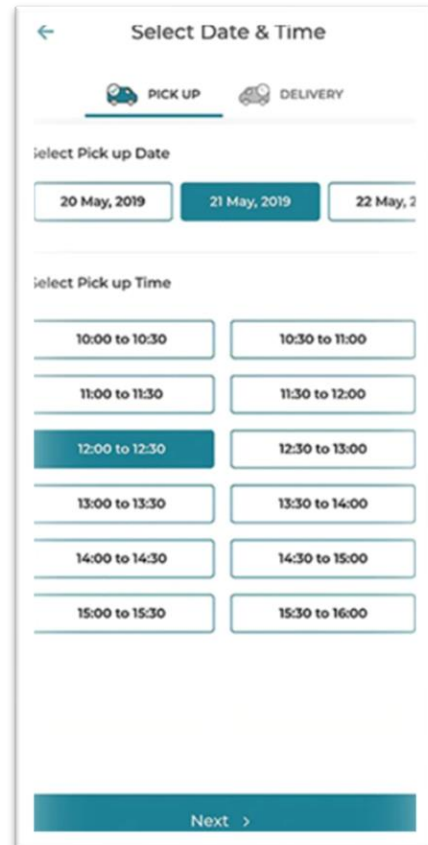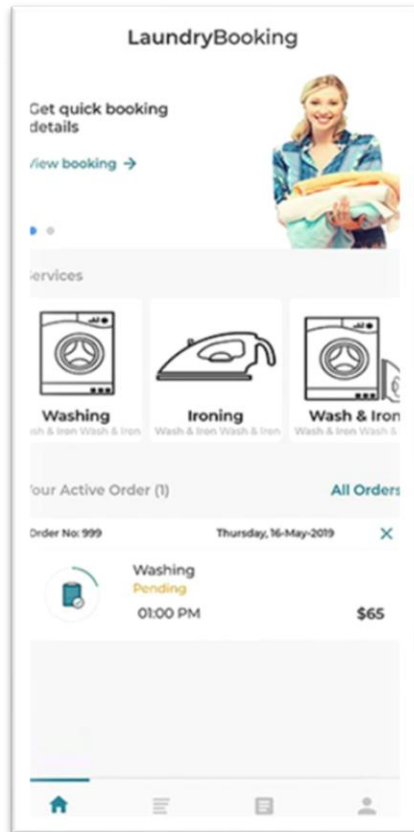
Chapter 4 System Analysis
Existing System

- As our project goal is to make reservation system for self-service laundry room only for hostel residents, without public access, we couldn't find existing system that fully meets these criteria. Most of the existing systems that are related to laundry reservation is for private businesses and widely accessible. As an example, we selected "Laundry Booking" mobile application developed by Broadview Innovations.

- "Laundry Booking" app is developed to manage laundry businesses and its online bookings. The main function of this app is "search engine" which allows user to find closest laundry service and book directly through this app. The app asks user to enter zip code to show the laundry services nearby.

  After selecting the laundry service, app asks user to enter what type of clothing user would like to be cleaned, and after selection user can continue to choose pickup and delivery date & time. At the end of the process user needed to perform payment by selecting payment options.

LaundryBooking

Get quick booking details

View booking →

Services

Washing
Wash & Iron Wash & Iron

Ironing
Wash & Iron Wash & Iron

Wash & Iron
Wash & Iron Wash & I

Your Active Order (1)   All Orders

Order No: 999   Thursday, 16-May-2019   ✕

Washing
Pending
01:00 PM $65

← **Select Date & Time**

🚚 PICK UP   🚚 DELIVERY

Select Pick up Date

20 May, 2019   **21 May, 2019**   22 May, 2

Select Pick up Time

10:00 to 10:30	10:30 to 11:00
11:00 to 11:30	11:30 to 12:00
12:00 to 12:30	12:30 to 13:00
13:00 to 13:30	13:30 to 14:00
14:00 to 14:30	14:30 to 15:00
15:00 to 15:30	15:30 to 16:00

Next >

← **Select Zip Code**

Where would you like us to provide service?

Zip or Postal Code

VERIFY ZIP CODE

← Select Clothes

Shirt(s)	$10	⊖ 1 ⊕
Pant(s)	$12	⊖ 0 ⊕
Tie(s)	$12	⊖ 1 ⊕
Jeans	$10	⊖ 1 ⊕
Blazer	$5	⊖ 1 ⊕
Suit	$4	⊖ 1 ⊕

Total $41   5 items added   Next >

- What are weaknesses of this system?

  If look to it as an app for private non-self-service business, then there is not much to mention, except non-responsive timeslot. The timeslot doesn't check and show availability of selected laundry service at that time. So, let's say user selected timeslot 11:00 to 12:00 and the system will confirm the booking. But when user delivers laundry, there may not availably machines. Time is crucial part of booking/reservations, so the system must check/calculate availability of service and according to it must display the timeslots.

  Now, let's look to it as an application for self-service business. In this case, some of the activities is unnecessary. For example, we don't need search engine in our proposed system since our system focuses only on hostel. Also, user no need to enter what kind of clothes to be cleaned and no pickup/delivery options, since it is self-service laundry system.

Proposed System

- ## Requirements of proposed system:

Proposed system will be developed as mobile application for Android and iOS smartphones. To develop both versions, Ionic 5 framework alongside with Angular.js, Typescript and CSS will be used. Data will be stored by using Google Firebase. Mobile application shell will be created by using Apache Cordova and Node.js

Testing phase will be held by using Android Studio and iOS Emulator.

- ## Activities and features of proposed system:

- ### User database

The proposed system must have a login/registration function to handle bookings. Users need to be enter email, phone number as contact details. For log in credentials, system will use Email or Username as ID and password that has been created by user during registration.

- ### Responsive date & time slot

System must reserve only available timeslots and cancel booked timeslots automatically. System should be able to manage the reservations all user database and calculate amount of timeslots and dates has been reserved and manage them for future reservations.

- ### Secret code

Upon booking, the system will generate random code that has need to be entered to the washing machine once reservation time has come. This code will work only during reserved time. If user wants to use washing machine before or after reserved time, this code will not work.

- ### List of reservations

The system must be able to display all reservations of the user.

Hardware and software

- Hardware:

  Both existing and proposed system requires smartphone as a hardware to run. Because it is much convenient and faster than performing same thing in desktop. You can use the system in any place that has internet connection through the smartphone.

  Display:
  Application will support this mobile aspect ratios with resolution from 720p to 1440p:
  4:3   -   3:2   -   8:5   -   5:3   -   16:9

  Minimum required RAM (Random Access Memory): 512MB

  Storage: 30 – 50MB

- Software:

  Existing "Laundry Booking" app was developed only for Android OS (Operating System) and it is not available for iOS users, which are majority of smartphone users. So, we will develop proposed system both Android and iOS by using **Ionic framework** and **Cordova**. Cordova allows developers to create web application and run it as mobile application by making mobile (Android & iOS) browser shell that hosts web application. Hosting will be performed by **Google Cloud** services.

  As for developing languages will be used Angular.js, Typescript and Modern CSS. Android Studio and iOS Emulator will be used to test the developed application.

<u>Conclusion</u>

      In this chapter we discussed about existing systems related to our project by analyzing its activities and weaknesses. Also, we will discuss about user requirements, involved modules and activities of the proposed system. At the end, we compare existing system and proposed system based on hardware and software usage.
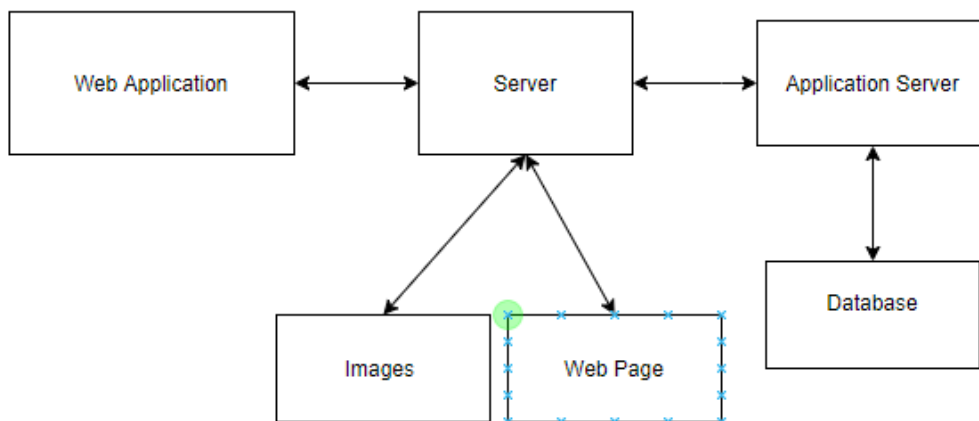
Chapter 5 System Design
Application System Design

Application Architecture Design

An application design portrays the designs and methods utilized to plan and construct an application. The architecture will show you a guide and best methods to take when developing an application.
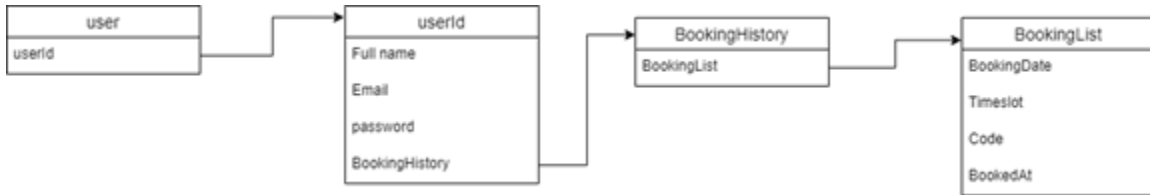
In this project, cloud-based architecture will be implemented. Cloud architecture defines the technology components that are combined to build a cloud, where resources are polled though virtualization technology

Design Class Diagram

Database Design

After the user registered their account in the reservation system, their account information will be saved in the Google Firebase database. If user want to change their account information, the information they changed will be updated in the database. The database structure will look like this:

Need to mention that Firebase is completely different than SQL databases. As we see in diagram there's no primary or foreign key in database. Unlike SQL, Firebase has "Collections" instead of Tables, and "Documents" instead of Columns and "Fields" instead of Rows.

Difference is not just different names; Firebase differs with how it handles the data and the types of data that can be stored. For example, we cannot store the arrays in SQL since the Tables already in array form. So there's no need of storing arrays in SQL. But in Firebase we can store multiple types of data inside the document. For example, we can story String variable, Array, Nested Array, Array of nested array and so on. And all of this can be stored inside one document. Also, documents are stored inside the collection where all other documents are stored.

Also, as we said documents are stored inside the collection, but need to mention that documents can have their own collections too. For example, as we see in diagram, we have "user" collection where "userId" document is stored, and as we see inside the "userId" document we have subcollection called "BookingHistory" which leads to "BookingList" document. This cycle can be repeated unlimited times and can be created multiple subcollections.

Input, Output, and Interface Design
Input, Output

What user must input is just choose what time they want to wash their cloths and the reservation system will automatically generate the code so user can use it to access the washing machine.

Other than that, users also need to input their email and password when they trying to log in the reservation system

Interface design

←

Welcome
Sign in to continue

Email

Password

Forgot Password?

SIGN IN

Don't have an account?

SIGN UP

Let's Get Started!
Create an account to get all features
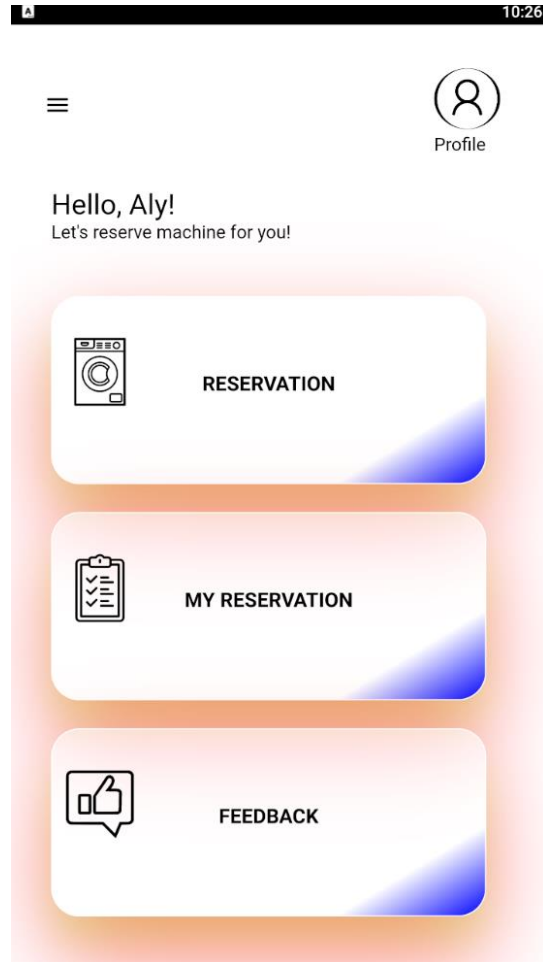
Full Name

Email

Phone

Password

REGISTER

←

Forgot Password?

Please provide your email address!

Email Address

RESET PASSWORD

≡

Profile

Hello, Aly!
Let's reserve machine for you!

RESERVATION

MY RESERVATION

FEEDBACK

Feedback

Full Name:

Email:

Feedback

Description

SUBMIT

Success

Code generated:

674598

Enter the code to washing machine in order to activate it.

You can check this code again in your "My Reservations" list.

CONFIRM

My Reservations

Date: December 07 2021
Time: 1 PM - 2 PM
Code: 159589
Booked at: Dec 1, 2021, 8:44:56 AM
——————————————————————

Date: December 06 2021
Time: 3 PM - 4 PM
Code: 724559
Booked at: Dec 1, 2021, 9:00:01 AM
——————————————————————

Date: December 02 2021
Time: 1 PM - 2 PM
Code: 189522
Booked at: Dec 1, 2021, 9:36:38 AM
——————————————————————

Date: December 04 2021
Time: 6 PM - 7 PM
Code: 472167
Booked at: Dec 1, 2021, 9:52:28 AM
——————————————————————

Date: December 03 2021
Time: 12 PM - 1 PM
Code: 255311
Booked at: Dec 1, 2021, 10:35:03 AM
——————————————————————

Date: December 08 2021
Time: 8 AM - 9 AM
Code: 275621
Booked at: Dec 2, 2021, 10:27:30 PM
——————————————————————

Reusable module

Apache Cordova

Apache Cordova may be a portable application development system that can be utilized to form cross-platform mobile apps utilizing HTML5 and pure JavaScript. By cross-platform, we cruel that the application code base can be composed once utilizing HTML5 and JavaScript and it can be run over different target mobile platform such as Android, iOS and window mobile

Firebase API key

Firebase API key is a string that is used to route requests to your Firebase projects when interacting with Firebase and Google services. Firebase API keys are not used to control access to backend resources while that can only be done with Firebase security Rules.

Conclusion

In this chapter, Application system design, database design, interface design and reusable model are discussed. Application system design briefly explained the process of the application response with the database. The database in the firebase online is also showcased in this chapter. Other than that, user input and output during using the application also discussed. Lastly, we listed out some reusable module that we going to use during the project.

Chapter 6 Implementation
Implementation Environment

The Implementation environment of this system will be in the laundry part of the hotel, before the washing machine reservation system is implemented, clients need to wait other client finish their washing then they only can use it. After this washing machine reservation system is implemented, client can use the washing machine without waiting, but the cost of it is to use the machine in time or client need to book the washing machine again to use it.

Testing plan

Every test will be executed once the changes of the washing machine reservation system are made. Here are the steps of creating a test plan for the washing machine reservation system.

1. **Analyse the application**
   In this step, we will decide who will use the application, what the main point of using this application is and how the application will work. Required information will be learned by interviewing the end users and developers, their suggestion and requirements will also be considered.

2. **Define the test objectives**
   In this step, every feature and function of the washing machine reservation system will be tested to find out as many systems bug or coding error as possible.

3. **Define test criteria**
   The test criteria will be specified when testing the reservation system, when the test criteria are not met, the testing phase need to be suspended and the developers will apply a fix and restart the test criteria, if the criteria are met, then the test is completed.

4. **Resource Planning**
   Resource planning is to list out all the possible resources for completing the project. The resources could be equipment, human and more that.

5. **Plan test environment**
   In this step, the testing team will test the application under the real circumstances. Everything related to the application will be tested, Example database connection, QR code and more.

6. **Find test deliverables**
   Every deliverable of the reservation system will be determined during this step. Test reports, results will be provided before, during and after the testing of the reservation system

Installation and deployment strategy

The deployment strategy will be implemented in this project is rolling strategy. Rolling strategy is a strategy that slowly upgrading the older version of the reservation system with a newer version of it.

Rolling deployment is useable because the washing machine reservation system cannot be down for long time, it would affect client's time arrangement, because they will not able to use the application if the down time it too long. Other than that, the new and old code of the washing machine reservation system can run at the same time.

<u>User training</u>

       We will give user training for hostel staff so they can provide more suggestion to improve the washing machine reservation system. When a system is newly implemented into a company, which is a big change for it. The suggestion they provided may decrease future human made errors when using the washing machine reservation system.

<u>Conclusion</u>

In this chapter, we discussed the project implementation environment, test plan, installation and deployment strategy and user training. We discussed what environment this project going to implement on so we have a clear sight on the way of development. Next, the test plan steps are also discussed to make sure every step of the test plan will be carried out during the test. Then, we also discussed how we going to install and deploy our newest update for the washing machine reservation system. Lastly, user training process is briefly explained.

Chapter 7 Conclusion
Critical Appraisal

Client can exploit a bug where they can create multiple account and book the washing machine, they can do this when they missed their reserved time or they have more clothes to wash. The main reason of it is the account of the application is created through the client's email

__Limitation__

There are some limitations of this washing machine reservation system.

Internet connection needed

Client's device needs to connect to internet connection to access the washing machine reservation system. This is extremely not friendly to those foreign clients that want to book the washing machine while they are outside of the hostel but they had no internet connection.

Multiple washing machine required to match up the reservation time

When this washing machine reservation system is released, the information about this washing machine reservation system will be announced in website of the hostel and after that every client in the hostel will book a washing machine in the specific time. So, hostel need multiple washing machine to match up the reservation otherwise for those clients are not able to book the washing machine in their free time must wait for the next day.

Future Enhancement

The current result of the project would not be perfect, but it is ready to be implemented. The possible enhancement of this project would be:

More improvement of the system so lesser maintenance is needed

Maintenance is one of the most important steps to make sure the reservation system is working normally. The maintenance routine will be once a month, it also can be once two months. If the reservation system completion is high enough to work consistently, then basically no maintenance is needed because the cost of the maintenance of the reservation system will be high.

Client can use the washing machine reservation system without registering

When a client is registered and reach the hotel, the staff of the hotel should create an account for him to use the washing machine reservation system so they don't need to register themselves and they cannot exploit the multiple account way.

Implementation of Notifications:

Main functionality of the application has been developed by using Angular.js but in order to implement notifications we need to use Java, Gradle and Android Studio which is quite time consuming to learn and it wasn't possible for us to make it in given time duration. So, for future enhancement we would like to add notification feature.

The next possible Enhancement would be adding Google authentication.

Implementing Google authentication was in our plan, but we ran into an issue where we need verify our application and get API key to implement into our code. The issue was app verification process. We would like to implement Google authentication as soon as we solve this issue.

<u>Conclusion</u>

This project goal is to develop an online reservation system for hostel clients. The application is ease of use designed and it is user friendly. The ease of use of the application makes the reservation easier and quicker. Clients can use the online reservation application even though they are not in the hostel, they can book the washing machine time when they want to wash their clothes. Furthermore, this project can save client's time by booking the washing machine without walking in front of the washing machine and wait until other client finish using the washing machine and use it.

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<u>Appendix</u>

Gantt Chart