UTM
UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING
UTM Johor Bahru

(SECP1513)

TECHNOLOGY INFORMATION SYSTEM

SECTION 03

REPORT OF DESIGN THINKING

Due: 28/ 01 / 2024

TITLE:

Tactic Tech Laundry

(Internet of Things)

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GROUP:

Tactic Tech

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1.0 Introduction

1.1 Background

The current laundry system for students relies on traditional washing machines and a token machine system. However, the absence of a booking system and self-diagnosis capability poses challenges. Users must queue up in line, leading to impatience among some individuals who resort to queue jumping. Maintenance delays exacerbate the situation, and difficulties in finding change for tokens further inconvenience users. Clogged washing machine fillers result in unclean and unscented clothes, forcing users to seek alternative machines for rewashing. This not only wastes time and money but also underscores the need for a more efficient and user-friendly laundry solution.

1.2 About us

We are Tactic Tech, a group of first-year first-semester students from UTM specializing in Cybersecurity and Networking. Our project, "TacTic Tech Laundry (Internet of Things," is a reflection of our group's passion for innovation and technology. Comprising diverse talents such as creativity, our team is dedicated to revolutionizing the traditional laundry experience. Through the application of design thinking principles, we aim to integrate IoT technology into washing machines, addressing current challenges and enhancing user experience.

1.3 Objective and Overview of Project

The laundry app project aims to revolutionize the existing system for students by enhancing user experience, enabling direct reporting of maintenance issues, implementing a machine status detection feature, implementing a booking system, facilitating online transactions for token purchases, and providing geolocation features for efficient laundry process optimization. These features aim to minimize queue jumping, late maintenance responses, and wait times, while ensuring a convenient and seamless payment experience.

The project aims to create a user-friendly mobile application to address issues in the current laundry system for students. The app will enable users to report maintenance issues, check machine status, book machines, and conduct online transactions. It will also include a geolocation feature for easy access to nearby facilities, reducing time and monetary wastage while providing a modern, user-centric approach to laundry management.

2.0 Design Thinking Process

2.1 Empathy

As a student, our group members, through personal experiences and observations, recognized the challenges faced by students in laundry, such as queue jumping, late maintenance, and token issues. We were motivated to innovate and improve the existing laundry system by creating a user-friendly mobile application that would streamline the process, save time, and alleviate common frustrations. By putting ourselves in the shoes of fellow students, we aimed to transform and modernize the way laundry is approached on campus by incorporating features that directly address their needs and concerns.

2.2 Research and Survey

In our recent interview with the owner of a public washing machine shop in Arked Angkasa UTM, we gained valuable insights into the challenges faced by laundromat businesses. The owner expressed interest in adopting technology, specifically a mobile application, to address issues related to machine scheduling and maintenance tracking. Our proposed app, featuring real-time machine availability, advanced reservations, and convenient payment options, garnered positive feedback. The owner anticipated improved operational flow and enhanced convenience for patrons, emphasizing the potential long-term positive impact on their business. The collaborative exploration highlighted a mutual commitment to innovative solutions, reflecting a promising avenue for enhancing the laundromat experience.

Our survey of 35 UTM students highlighted challenges such as difficulty in exchanging small change and issues related to queueing and machine availability. Respondents favored a mobile app with features like cashless payments, refunds, and booking functions to address these concerns. Additionally, suggestions to add more machines in each college were coupled with a call for regular upgrades based on monthly usage statistics. These findings guide our software development, aiming to meet user needs and enhance the overall campus laundry experience efficiently.

2.3 Brain Storming

During our group's brainstorming session, we identified key challenges in the current laundry system, particularly in public washing machine laundry on campus. Common issues included queue jumping, late maintenance responses, difficulties in obtaining change for tokens, and unclean clothes due to machine malfunctions. To address these challenges, we collectively brainstormed the concept of developing a mobile application for laundromat management. The app would empower users to report maintenance issues directly, detect machine status, book machines in advance, and conduct cashless transactions. Additionally, a geolocation feature would help users locate nearby laundry facilities, enhancing overall efficiency. The brainstorming session emphasized the importance of improving the user experience, streamlining operations for laundromat owners, and introducing a modernized approach to laundry management on campus.

2.4 Prototype

The creation of the prototype began with a comprehensive analysis of the identified challenges and desired features gathered during the brainstorming session. Our team then translated these concepts into a design diagram, outlining the app's basic structure and functionalities. We focused on user-friendly interfaces for reporting maintenance issues, detecting machine status, booking machines, and conducting online transactions. The geolocation feature was integrated to enhance user convenience in locating nearby laundry facilities.

2.5 Testing

Testing the prototype is an important part of building our project. We get feedback from users to understand what they like and to fix any problems with how the app works. It helps make sure the features we planned actually work well and meet what users need. By testing early, we find and fix issues before the final version. We keep improving the app based on what users say to make it better and easier to use. This testing step also helps everyone involved in the project understand where it's going and avoids big problems later.

3.0 Content of Report

3.1 Problems and Solutions

Client Background

This IoT technology is targeted toward the students of Universiti Teknologi Malaysia who are staying within the vicinity of the campus and use the laundry services of the laundromat located inside the campus.

No.	Problem	Solution
1.	Some people don't have the patience to wait and decide to cut the line or queue jump.	Users can book the washing machine early through Tactic Tech Laundry.
2.	The people in charge of maintenance were late.	Users can directly report to the maintenance crew through Tactic Tech Laundry.
3.	Hard to find someone to exchange for chump change in order to buy a token.	Users can use online transactions through Tactic Tech Laundry.
4.	Unclean clothes/unscented clothes due to clogged washing machine filler. It wastes money and time because users need to find another washing machine to rewash their clothes.	Users can detect any damage or problems through Tactic Tech Laundry. Besides, users can have a refund if the machine doesn't function properly through Tactic Tech Laundry.
5.	Some people would not take the clothes out of the machine in time, causing the queue to get stuck.	Users can detect and be notified of the washing machine's status such as the washer finishing its spins or it is still in maintenance through Tactic Tech Laundry.
6.	Some people don't know where to find laundry near them.	Users can detect any laundry/washing machine nearby from their location through Tactic Tech Laundry.
7.	Users are unable to provide timely feedback on problems they encounter with laundry.	Users can directly ask for help once they face a problem in the support center through Tactic Tech Laundry.

Other than that, Tactic Tech Laundry also offers a rewards system to encourage customer loyalty and repeat business. Additionally, Tectic Tech Laundry offers multiple options for wash modes and drying temperature levels for clothing types. These features will greatly enhance the user experience and make laundry no longer be a worry for users.

3.2 Team Working

The Tactic Tech team effectively collaborated on our IoT washing machine project. Nur Syakirah Adilah conducted the interview with the laundry owner and compiled a comprehensive project report with Lim En Dhong. Besides, Lim En Dhong led the UTM student survey, contributing valuable insights to the overall report. Ain Najiha created a Google form, edited videos, and crafted a PowerPoint presentation for the prototype showcase. Fam Qai Zen summarized the interview with the laundry owner, adding valuable insights and contributing to prototype development. Tan Jian Ming and Mah Wilson collaborated on survey questions and actively participated in prototype development. Yousif Salah Yousif Almatri formulated interview questions and recorded a presentation video. Together, our diverse skills and efforts addressed problems, proposed solutions, emphasized the importance of our innovation, and showcased IoT washing machine features, resulting in a well-rounded and comprehensive project outcome.

4.0 Design thinking assessment

4.1 During the end of the project demonstration

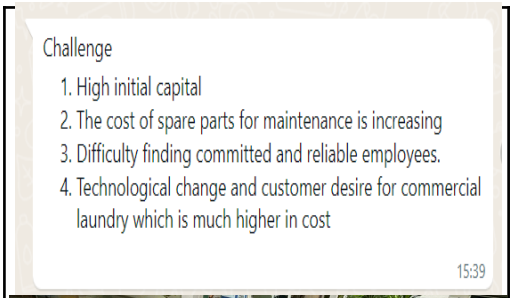
During the project's final presentation, our group showed off its skills and successfully illustrated how to use design thinking. The demonstration highlighted our understanding of user requirements, the effectiveness of our approaches to problem-solving, and the skillful incorporation of creative solutions. We successfully conveyed the key components of our IoT washing machine project through the presentation, demonstrating how they overcame the difficulties that were found. This demonstration showed how committed our organization is to the design thinking concepts and presented a thorough and user-centered solution.

4.2 During the transition between design thinking phases

The transition between design thinking phases within our group was smooth and effective. We approached each phase with a clear understanding of our goals, smoothly progressing from problem identification to solution generation with ease. Frequent team meetings promoted open discussion and ensured that ideas and feedback were shared cooperatively. We continue adding our ideas with valuable insight to our innovation based on our research and surveys. Our ability to move through these stages demonstrated fexibility, teamwork, and a strong dedication to developing a significant and approachable solution for the laundry problems that were identified.

5.0 Design Thinking Evidence

5.1 Sample work by students working



Interview using Whatsapp
Interviewer: Nur Syakirah Adilah binti Azri
Interviewee: Zuwairi Izwan Bin Taufik

About: He has encountered certain challenges while carrying out his work, and he hopes that our app can provide him with the necessary features that can simplify his tasks.

Discussion
We analyzed the problems

Building a prototype
We built the prototype to show how our app functions

Discussion to improve the prototype
When the product was done, we showed it to our lecture and made improvements before we presented it to the class

5.2 Record for each phase

5.2.1 Empathy

The table below shows the questions and answers obtained from the interview.

Question	Answer
Assalamualaikum Encik Zuwairi, can I interview you for our assignment about the Internet of Things that are related to your job scope?	Waalaikumussalam, yes you can. Feel free to ask me anything.
First of all, I want to know about what challenges you face when managing laundry.	The challenge that I faced: 1. High start-up capital 2. The cost of spare parts for growing maintenance 3. Difficulty in obtaining committed and reliable employees 4. Technologies changes and customer requirements to commercial laundry that are much higher cost 5. Customer whimps
Are you familiar with the concept of a mobile app for managing laundry?	Our laundry is not yet familiar with mobile apps, so we still wash and dry our clothes manually using machines. Therefore, I have high expectations for your apps and find them interesting.
What method did you use for maintenance?	To ensure smooth operations, it's important to schedule regular maintenance once every two weeks. This way, you can avoid potential complaints from customers or colleagues. And in case of any repairs, we guarantee a response within 48 hours. Don't let unexpected breakdowns disrupt your business - prioritize maintenance and repairs today.
Are you already using eWallet, QR, or debit card payment methods?	Not yet, payment is still in cash.
What's the critical point of managing a laundry?	1. Vandalism 2. The money fund is spun up by unscrupulous individuals during the semester break.

5.2.2 Define

The table below shows the problem faced by the respondent.

Problems	Description
The money fund is spun up by unscrupulous individuals during the semester break.	During the semester break, the machine tubes are responsible for accepting cash and turning it into tokens. This is because there is a high risk of theft during this period, and people may attempt to steal the money contained within the machines.

5.2.3 Ideate

The table shows the possible solutions that can be used to solve respondent problems.

Traditional	Application
Utilize CCTV to effectively monitor the laundry area and prevent any potential theft.	With the advent of online payment systems, physical money is becoming less relevant. Due to this, machines that dispense cash are no longer necessary.

5.2.4 Prototype

After discussion with our team members, we decided to make an application so users and owners can get a better experience while doing laundry compared to the traditional way.

Ways	Reason
Traditional	For the owner: ● CCTV usage incurs high costs. ● There is no assurance that theft will not occur. ● In the event of theft, it becomes challenging to identify and trace the culprit. The process involves reviewing CCTV footage multiple times and reporting it to the police, which can be time-consuming. For the users: ● Need to queue for washing and drying clothes ● Late maintenance ● Need to call to report if the machine is broken ● Unscented clothes/ dirty clothes due

	to dirty filler. ● Wasting time

Table 5.2.4 Reasons for not choosing traditional ways

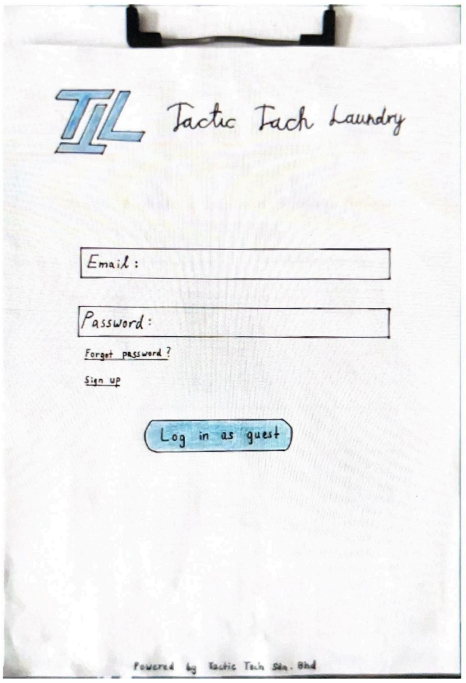
Therefore, our team decided to develop a new technology to help UTM students or UTM staff do their laundry effectively without wasting any time. Users can search for the nearest laundry, see the availability of machines, and book machines in their free time so users do not need to rush or waste their time in queue, can choose the function or mode of machines using the app, and also all the payments will be online.

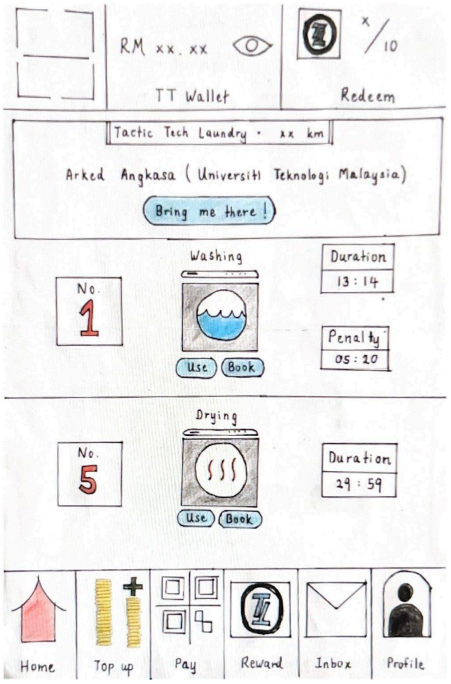
The table below shows the characteristics of the Tactic Tech Laundry application and device.

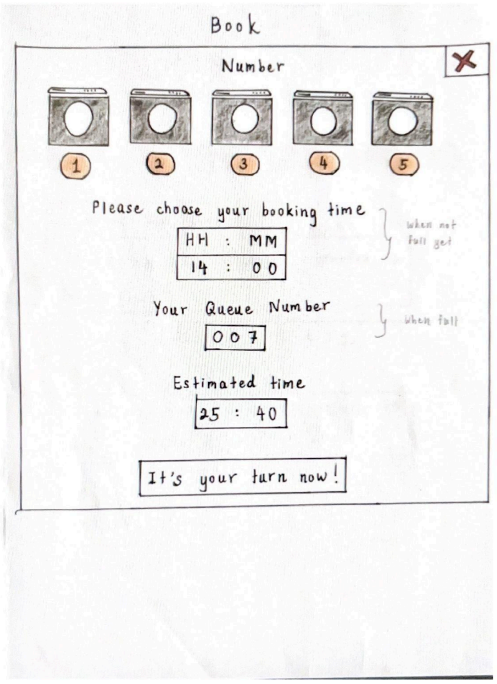
TacTic Tech Laundry	**Characteristics**	**Description**
Application	Booking	User can book laundry machine when its available through the app anytime
	Queue System	User can look at estimated time before they can use the machine from the app when the machine is used and notify them when it's their turn
	GPS	User can locate the nearest laundry or washing machine from their location
	Report	User can direct report about broken machine directly to the maintenance team
Application and Device	Washing and Drying	User can choose mode, temperature and water level through the app or manually on the machine
	Payment	User can choose the payment method and pay for the service through the app or pay traditionally to the machine using tokens or cash

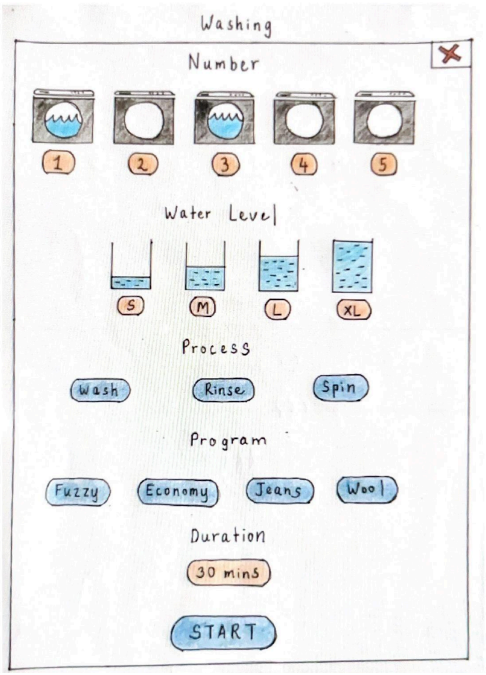
Table 5.2.5 Features for ‘TacTic Tech Laundry’ application and device

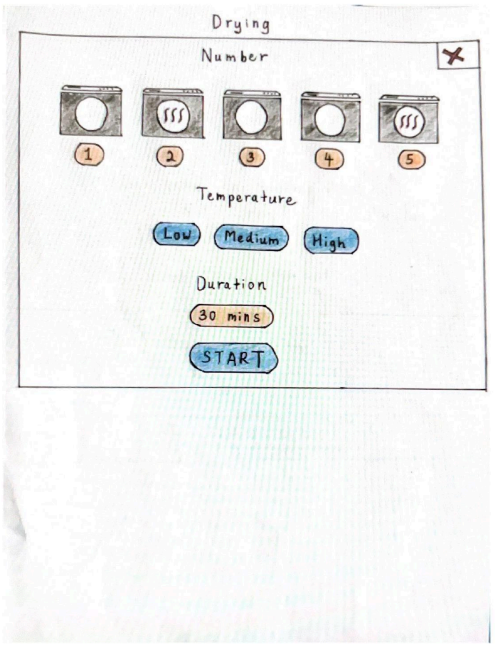
The figures below show the prototype of our application’s interfaces.

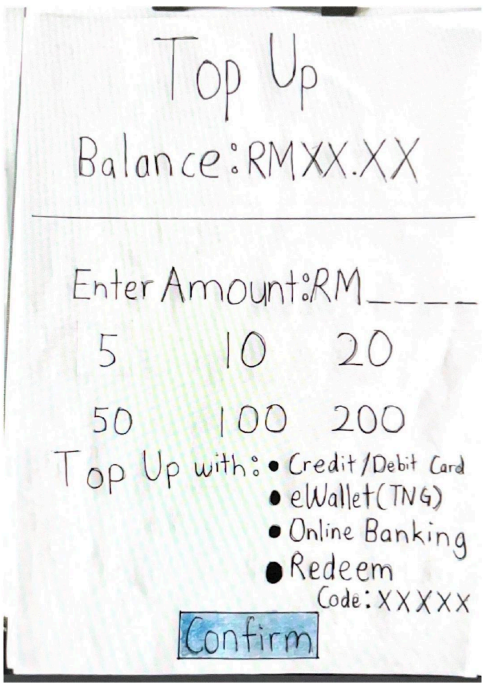

Tactic Tech Laundry
Email :
Password :
Forget password ?
Sign up
Log in as guest
Powered by Tactic Tech Sdn. Bhd

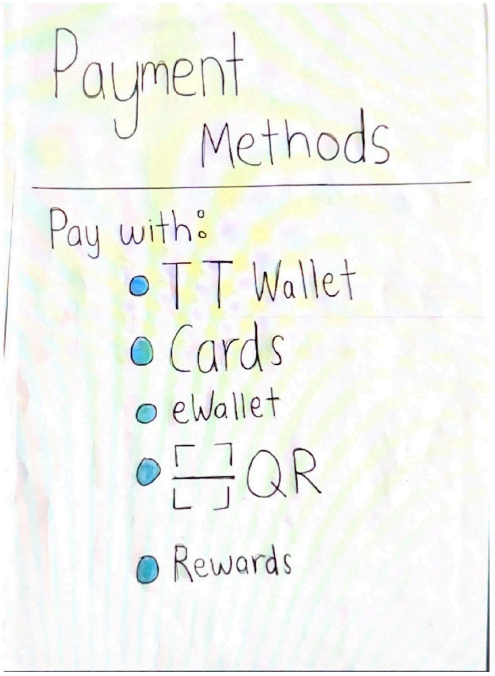

RM xx.xx
TT Wallet
x/10
Redeem
Tactic Tech Laundry · xx km
Arked Angkasa (Universiti Teknologi Malaysia)
Bring me there !
Washing
No. 1
Use
Book
Duration
13 : 14
Penalty
05 : 20
Drying
No. 5
Use
Book
Duration
29 : 59
Home
Top up
Pay
Reward
Inbox
Profile

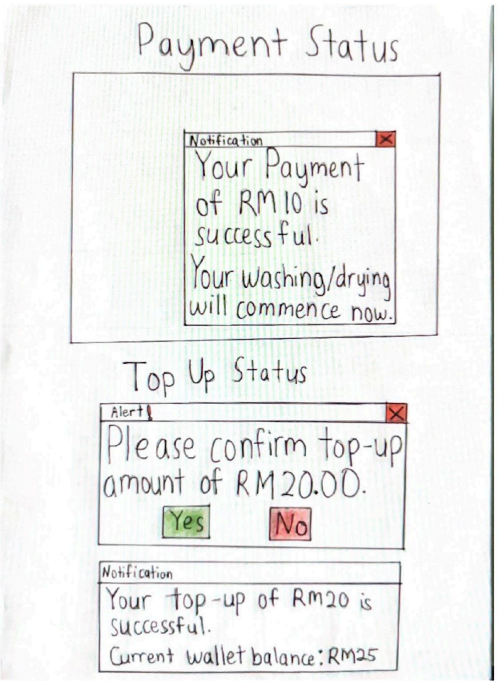

Book
Number
1
2
3
4
5
Please choose your booking time
HH : MM
14 : 00
when not full yet
Your Queue Number
007
when full
Estimated time
25 : 40
It's your turn now!

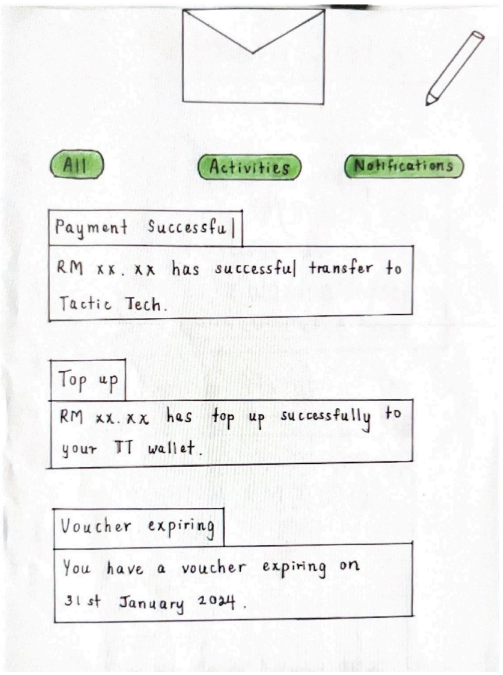

Washing
Number
1
2
3
4
5
Water Level
S
M
L
XL
Process
Wash
Rinse
Spin
Program
Fuzzy
Economy
Jeans
Wool
Duration
30 mins
START

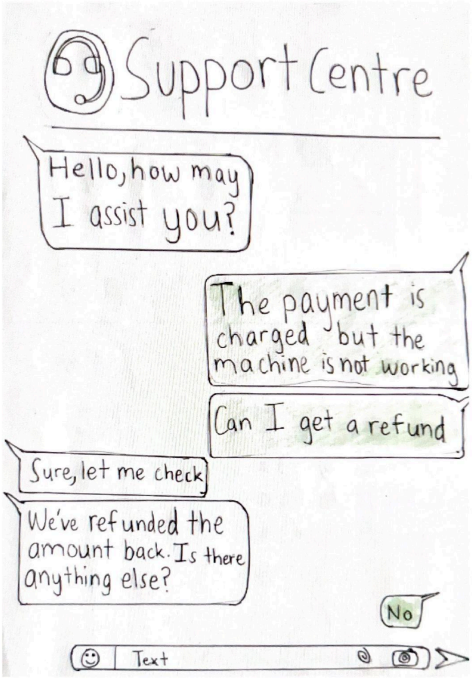

Drying
Number
1
2
3
4
5
Temperature
Low
Medium
High
Duration
30 mins
START

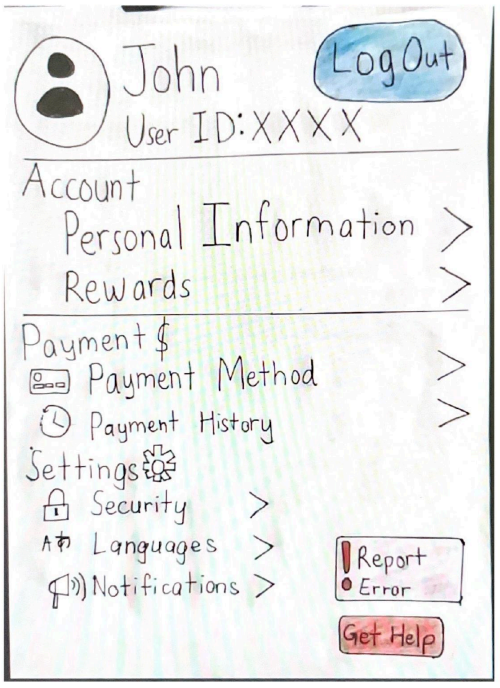

Top Up
Balance: RMXX.XX
Enter Amount: RM____
5
10
20
50
100
200
Top Up with:
• Credit/Debit Card
• eWallet(TNG)
• Online Banking
• Redeem
Code: XXXXX
Confirm


Payment Methods
Pay with:
TT Wallet
Cards
eWallet
QR
Rewards


Payment Status
Notification
Your Payment of RM10 is successful.
Your washing/drying will commence now.
Top Up Status
Alert
Please confirm top-up amount of RM20.00.
Yes
No
Notification
Your top-up of RM20 is successful.
Current wallet balance: RM25







5.2.5 Test

After our prototype was done, we started to present it to our lecturer. We explained how our app works and what relationship between software and physical devices. He gave us positive feedback and ideas to improve our project before we finalized it and presented it to our class.

6.0 Reflection

Question:

a. What is your goal/dream with regard to your course/program?
b. How does this design thinking impact your goal/dream with regard to your program?
c. What is the action/improvement/plan necessary for you to improve your potential in the industry?

Answers of each member:

1. **Nur Syakirah Adilah binti Azri**
    - **a.** By mastering the art of protecting digital information from various threats, I'm striving to make a valuable contribution to the industry. My ultimate goal is to apply my knowledge to real-world projects, making a positive impact and paving the way for a safer digital world.
    - **b.** Design thinking can be applied in various areas, including setting and achieving personal and professional goals. This is also the process of improving my critical thinking skills that has a significant impact on my daily life by allowing me to upgrade my style of thinking. This, in turn, enables me to tackle more complex problems effectively and efficiently, thereby enhancing the quality of my life.
    - **c.** In the field of computing, the half-life is short, which means that continuous improvement is crucial. This is because the industry is dynamic, with new technologies and threats emerging regularly. To stay relevant and competitive, it is important to keep updated about the latest trends, tools, and best practices. Therefore, it is essential to focus on continuous learning and development to thrive in this ever-changing field.

2. **Lim En Dhong**
    - **a.** My ultimate goal in pursuing this course/program is to not only gain a broad understanding of networking and network security but also to excel and make a meaningful impact in these fields. Beyond academic success, I aspire to secure a rewarding job that allows me to apply my acquired knowledge and skills, contributing to the ever-evolving landscape of technology and cybersecurity.
    - **b.** The integration of design thinking principles significantly influences the achievement of my goals in this program. Design thinking fosters a mindset that values creativity, encourages innovative problem-solving, and emphasizes user-centric solutions. In the context of networking and network security, these qualities are paramount. Design thinking trains me with the ability to approach challenges with a fresh perspective, considering not only the technical aspects but also the end-users and their experiences. This comprehensive approach supports my goal of successfully addressing challenging problems in this industry.
    - **c.** To enhance my potential in the industry, I recognize the importance of taking proactive actions and implementing strategic improvements. Actively engaging in real-world projects will provide me with practical experience and a deeper understanding of the industry's dynamics. Additionally, continuous self-learning and keeping up with industry developments will be instrumental in adapting to emerging trends and technologies. Seeking opportunities to

apply my knowledge in real-world scenarios will not only enhance my skills but also expose me to the challenges of the field, preparing me for a successful career in networking and network security.

3. **Ain Najiha binti Junaidi**
    a. My goal through this program is to gain more knowledge and be able to meet and exceed the requirements from the course description. Aside from that, I hope to master and strengthen the fundamentals and be able to implement networking and security computers in everyday life.
    b. Throughout design thinking, I believe the process helps me to enhance my creativity and critical thinking skills by challenging my understanding about network, security and information systems. It also highlights the importance of tolerance and empathy in collaborating with the teams.
    c. Other than actively participating in constant education, I intend to explore and remain updated about new tools and technologies as they also keep evolving by the time. In addition, I have to foster my sense of teamwork and collaborative problem-solving to optimize my potential within the industry.

4. **Fam Qai Zen**
    a. My goal for this course is to master the intricacies of networking and security. I aspire to use this knowledge to create a robust and resilient system and integrity of digital information in this interconnected world.
    b. By doing this design thinking, it enhances my program goal by fostering a problem-solving mindset. It encourages me to approach network and security challenges creatively and emphasizes user-centric solutions.
    c. To enhance my potential in the industry, I plan to engage in continuous learning, stay updated on emerging technologies and seek practical experience through internships.

5. **Tan Jian Ming**
    a. My course goal is to learn networking concepts and cybersecurity principles while pursuing my degree. Then, I hope to use my knowledge to protect the network's reliability and safety and also get well employed after my university life.
    b. Throughout the five design thinking processes of empathizing, defining, ideating, prototyping, and testing, I am able to broaden my horizons and think freely, which will shape my future endeavors when confronted with networking and cybersecurity challenges.
    c. In order to improve my potential in the industry, it is necessary for me to continue to learn about networking and cybersecurity as the world evolves due to technological advancement. In addition, I plan to do as many coding projects as possible to gain hands-on experience, which will help me succeed in the networking and cybersecurity fields.

6. **Yousif Salah Yousif Almatri**
    a. My heart is set on mastering the ins and outs of networking and network security, both in this course and beyond. I'm determined to excel, not just for the sake of academic achievement, but ultimately to leverage my skills for a truly fulfilling career in cybersecurity after graduation.

b. Design Thinking is more than just a process; it's a superpower that fuels my creative problem-solving and user-centric approach. By fostering my ability to empathize, brainstorm, and iterate, it equips me with the critical tools to tackle any networking or cybersecurity challenge the future throws my way.

c. I'm not about to settle for being a passive observer in this field. Actively participating in real-world projects, independently researching cutting-edge advancements, and seizing every opportunity to apply my skills in practical scenarios are the cornerstones of my plan to unleash my full potential and become a leading force in the world of cybersecurity.

7. Mah Wilson

a. My hope for this program is to further expand my base of fundamental knowledge about all things related to computer science for the sake of preparing myself for the inevitable future of an age that is heavily dependent on computer infrastructures.

b. This design thinking process has made me realise that what I've learnt through the degree program can be used in a very practical way to produce creations that are of beneficial values to our global and immediate local communities in the form of creating an application interface based on the Internet of Things concept for the sake of the users of laundromats around the world.

c. I believe in order to improve my potential in the industry, I have to focus on upskilling myself constantly, create more projects to reinforce the knowledge I've learnt, interact and learn from my peers and elders, be aware and up to date with the recent trends and developments in computer science,and also learn and understand the history of computer science to understand the roots of the field, and diversifying my knowledge by exposing myself towards various spectrums of the computer science field and not restricting myself to only a few areas.

7.0 Gantt Chart

Date	28/12	29/12	30/12	31/12	1/1	2/1	3/1	4/1	5/1	6/1	7/1	8/1	9/1	10/1	11/1	12/1	13/1	14/1	15/1
Interview																			
Prototype and test																			
Discussion																			
Presentation																			
Video																			
Report																			

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9.0 Link For Video

TacTic Tech Laundry Presentation (1).mp4