**SECP1513-04 TEKNOLOGI DAN SISTEM MAKLUMAT**

**(TECHNOLOGY AND INFORMATION SYSTEM)**

Semester 2023/2024-1

**Report Design Thinking**

Project Title: UTM AR Face Attendance System

Project Field: Augmented Reality

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# Group: IT Xpert

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# 1. Introduction

Design thinking is generally defined as an analytic and creative process to solve problems which is one of the most important skills nowadays. It is a structured and cyclical approach for generating and evolving ideas. In the design process, we must believe in ourselves to create an idea that gives a positive impact to the targeted people. Thus, we get to develop an optimistic mindset when we use the design thinking approach for innovation. There are five phases in design thinking that help us navigate through the development process from identifying a design challenge to providing the solution and building it. These phases include empathizing users, defining the problem, ideating solutions to that problem, prototyping ideas and testing the model with users. A successful design process endeavor covers each of these phases thoroughly.

System analysis and design on the other hand is a structural approach used in solving a problem. This step-by-step procedure helps system analysts to configure a project systematically. The first phase in system analysis and design is preliminary investigation where the investigation is done from scratch to find out what problems the users are facing. Next phase is the system analysis where the data is collected about the current problem and analyzed for better requirements. Then, phase three which is system design which is one of the crucial stages in system analysis and design where an alternative system is designed. The following phase is system development where the new system is tested and this phase takes a long duration most of the time due to the evaluation process. Then, phase five which is system implementation where the old system is converted to a new system and there are few methods in converting the old system to a new system. Most of the time, the method depends on the economic feasibility of the system analyst. Last phase is system maintenance where it is to prevent errors while using the system and also to compare the original design with the new design specification. So, all these phases should be implemented in system analysis and design to prevent big mistakes from happening and also to save time.

To conclude this, there are five phases in design thinking:

● Empathize

● Define

● Ideate

● Prototype

● Test

## 2. Detail step and descriptions in design thinking and evidence for each phase

● Empathize

Empathy is the stage where we should understand the problems faced by our respondent. Our target was lecturers who might face problems with its diverse user base including faculty, students, staff as our respondent for the interview. At the beginning of the interview, we asked our respondent about personal information as this might be useful for us in identifying problems and later asked about experience and the problems faced when UTM Students who did not actually attend the class physically but still managed to get attendance QR code screenshots from his or her friends. Eventually, he or her is able to scan the QR code without attending class

● Define

Define is the stage for us to identify the problems faced by the respondent. After we had an interview with the stakeholder, we identified problems by understanding and analyzing that answer in the interview session.

● Ideate

Ideate is the stage for brainstorming where we can generate all possible solutions for the problem statement. In this stage, we suggested different solutions for the problems based on the 3 different categories which are rational, intermediate and radical.

● Prototype

Prototype is the stage for us to select the most suitable idea from the possible ideas and turn the idea into products. After we had decided the solution, we started to prototype. The prototype implemented a design with an intuitive and user-friendly interface to facilitate easy registration and attendance tracking for both students and lecturer. The prototype was an attendance system integrated with facial recognition.

● Test

Test is a stage where our product should be tested by our user and the feedback from the user is important as it can help us to identify the limitations of our product and further improve the product. After we completed the prototype, we demonstrated it and explained about the features of the augmented reality face recognition attendance system to the respondent. Besides that, we also asked for her feedback for the product.

## 3. Detailed descriptions include problem, solution and team working
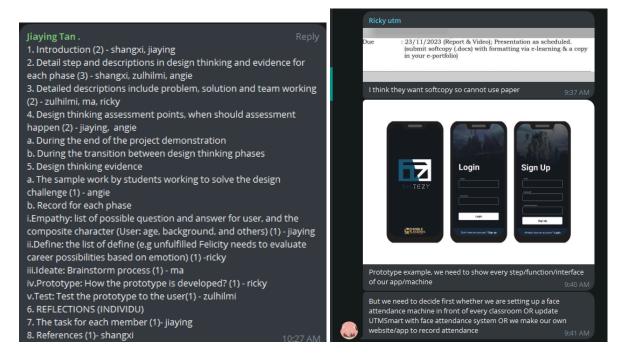
**<u>Problem</u>**

The project is done to overcome some problems and security weaknesses that UTMSmart consists of such as UTM Students who did not actually attend the class physically but still managed to get attendance QR code screenshots from his or her friends. Eventually, he or she is able to scan the QR code without attending class. It can be inconvenient. QR codes require a smartphone with the ability to scan the code. Some users may also rely on non-smartphones, or simply don't have their phone on them. This requires an internet connection. QR codes also require an internet connection in order to function. People with otherwise-compatible smartphones may have low signal or no access to Wi-Fi, preventing them from scanning the QR code.

**Solution**

In order to overcome the problems, UTM Face AR attendance system is being introduced to replace the current QR code attendance system. The system is installed in all the lecturer's computers in every classroom. A "super camera" is being installed at the corner of every classroom. Whenever a student enters the classroom, the student's face will be detected and quickly identified by the "super camera". If it is true that the student belongs to this class, then the attendance will be recorded and a confirmation message will be shown on the lecturer's computer. The "super camera" then constantly monitors the presence of the students, preventing them from leaving the classroom earlier than the expected class end time. A successful attendance will be recorded into the database if the student managed to arrive class on time and leave class when class ends.

**Team Working**

We discuss all the problems and solutions through telegram group and gladly all members participating in giving ideas and opinions.

## 4. Design thinking assessment points

### a. During the start of the design thinking phase

To collect the idea of designing the features on the application, we did a survey about the UTM attendance system to gain some basic ideas and suggestions. This survey served as a foundation for understanding user needs and preferences.

### b. During the transition between design thinking phases

We have encountered a problem while discussing the idea of designing the feature, that is the idea provided was not aligned with the objective. Luckily, we discovered the problem while checking back on the idea. So, it reminded us to make sure that the design ideas always align with the overall goals and objectives of the application. We should also check if the features being designed address the identified user needs.

### c. During the end of the project demonstration

As we finish thinking about our design, it's important to look back at what we've learned, the problems we faced, and how our ideas have changed. Even though we didn't receive feedback from users, we gained useful insights from the process. We remember our mistakes as a lesson for us.

## 5. Design thinking evidence

    a.  **The sample work by students working to solve the design challenge**





    b.  **Record for each phase**

## i.Empathy: list of possible question and answer for user, and the composite character (User: age, background, and others)

Possible Question for user:
1. Currently, how do you handle student attendance in your classes?
2. Would you mind discussing any issues you are having with the current attendance system?
3. How have you found using screenshots of QR codes to track attendance with students?

4. What level of comfort do you have with the procedures used now to track attendance?
5. In which particular situations does keeping track of attendance become difficult for you?
6. What is your opinion of the security of the in place attendance system?

Possible Answer from user:
1. As of right now, I track attendance using QR codes, however students have shared screenshots with trouble.
2. Handling attendance by hand can take a lot of time.
3. Security is an issue, particularly when students take advantage of QR code vulnerabilities.
4. It can be difficult to precisely monitor the participation of some pupils who participate electronically.
5. No real-time monitoring function from the current system.

## ii.Define: the list of define (e.g unfulfilled Felicity needs to evaluate career possibilities based on emotion)

1. QR Codes for Attendance: A digital method for tracking attendance where students scan a Quick Response (QR) code using their smartphones or other devices. This process is intended to automate attendance recording, reducing manual effort and increasing accuracy.

2. Security Concerns with QR Codes: Refers to vulnerabilities associated with using QR codes for attendance, such as the potential for students to share screenshots of a QR code, allowing absent students to appear as if they were present.

3. Hand Tracking of Attendance: The traditional method of taking attendance, where the teacher manually records students' presence, usually by calling names or checking them off a list. This method is time-consuming and prone to errors.

4. Electronic Participation Monitoring: Involves tracking students' engagement and attendance in online or hybrid learning environments. Challenges include accurately identifying and recording active participation, especially in large or digitally mediated classes.

5. Real-Time Monitoring Function: A feature in attendance systems that allows for the immediate tracking and visualization of students' attendance status. The lack of real-time monitoring means teachers cannot instantaneously see who is present or absent, limiting the ability to make timely interventions.

6. Security of Attendance Systems: Concerns the measures in place to protect against unauthorized access and manipulation of attendance data. This includes preventing fraudulent attendance records and ensuring that only authorized individuals can modify or view attendance information.

7 Facial Recognition Attendance System for Educational Institutions：FRAS operates through a network of strategically placed cameras at classroom entrances or other key locations within the educational facility. As students pass by, the system captures their facial data in real-time and compares it with the stored profiles to verify their identity and attendance. The system then automatically updates the attendance records in the institution's database, providing accurate and real-time attendance data. This data can be integrated with the institution's Learning Management System (LMS) for comprehensive academic management.

## iii.Ideate: Brainstorm process

1.Enhanced QR Code Security: Develop a system where QR codes dynamically change for each class session, making screenshots ineffective for attendance fraud. Incorporate facial recognition or biometric verification as an additional layer of security to authenticate the student's presence at the time of scanning.

2.Infrastructure Planning: Identify the optimal camera placement and hardware requirements needed for effective facial recognition. Consider factors such as lighting, classroom layout, and entry/exit points to ensure comprehensive coverage and accurate identification.

3.Real-time Attendance Dashboard: Create a dashboard that provides teachers with real-time information on who is currently present, late, or absent. This dashboard could also offer analytics on attendance patterns over time, helping to identify students who may need additional support or intervention.

4.Participation-Based Attendance: Develop algorithms that monitor and record attendance based on student participation in class activities, discussions, and online forums. This method would help in accurately tracking engagement for remote learners.

5.Geofencing for On-campus Classes: Implement a geofencing system that automatically marks students as present when they enter the classroom or specific location with their mobile devices. This method would reduce the need for manual check-ins or QR code scans while ensuring physical presence.

6.Blockchain for Attendance Data Security: Explore the use of blockchain technology to securely record and store attendance data. This could provide an immutable record of student attendance, reducing the potential for tampering and enhancing overall data security.

7.Privacy and Ethics Review: Conduct a thorough review of privacy laws and ethical considerations related to biometric data collection, particularly for minors. Develop a framework for obtaining consent from students and/or parents and establish strict data protection measures to ensure the security and confidentiality of personal information.

8..AI-Powered Anomaly Detection: Implement AI algorithms to detect unusual attendance patterns or potential fraud. For instance, if a student is marked present in two places at the same time, the system could flag this for review. This approach could help maintain the integrity of the attendance system..

## iv.Prototype: How is the prototype developed?

In the case of our project, the prototype is manually crafted, emphasizing a hands-on approach to model development. This tactile method involves the skillful assembly and construction of the model, paying meticulous attention to detail to ensure accuracy and functionality. The artisanal nature of the prototype creation allows for a personalized and customized touch, reflecting the commitment to precision and craftsmanship.

As we navigate through the iterative testing phase, where the prototype is presented to users, the manual craftsmanship ensures a tangible and interactive experience. Clear explanations are provided to users during the presentation, and their feedback becomes integral to refining and perfecting the handmade prototype. This artisanal approach not only adds a unique dimension to the project but also underscores our dedication to creating a model that aligns seamlessly with the needs and expectations of our users.

## v.Test: Test the prototype to the user

In the last phase of design thinking is the test phase where the prototype is presented to the user. The prototype was explained to the users and all the doubts were cleared. The negative and positive feedback are gained from the users to make some improvement on our project. This phase is also very important because in this phase, improvement is made until the users are satisfied and it is user-friendly. We keep on innovating our prototype until it fulfills perfectly the expectations of the users. After several improvements, the interviewees give us positive feedback and think this system will benefit the students,lecturers of UTM.

## 6. REFLECTIONS (INDIVIDUAL)

- Ricky Tang Siet Hong

The experience of solving a problem as a team is truly exciting and wonderful in my opinion. Not only have we learnt new knowledge about the course, we also know better in handling issues and facing challenges in life. In terms of teamwork, collaboration was generally smooth. It was clear that everyone had a shared commitment to the project's success. One of the most significant challenges we faced was managing our time effectively. Despite setting deadlines, unexpected obstacles caused delays. However, there's always room for improvement. Next time, we'll ensure to have a designated communication plan to minimize any potential misunderstandings.

- Ma Liwei

I not only deepened my understanding of the value of these two steps in problem-solving and innovation, but I also learned how to thoroughly analyze issues and encourage creative exchanges within the team. This process strengthened my communication skills in group collaboration, helping me realize how to effectively overcome fixed mindsets during collective creativity, and promoted understanding and cooperation among team members. I learned how to break down complex problems and find solutions through collective intelligence, which has had a significant impact on my personal growth and ability to collaborate with others.

- Muhamad Zulhilmi Bin Jamari

We have divided our group with a specific task at first but then we have changed our mind to do it together as this is a group work assignment and not an individual task. Besides, we can help each other in completing our assignments. We thought that we can get better results by being cooperative in this assignment and helping each other .From the prototype we created, we found that it is hard to build up a new system as there are a lot of existing systems in the world that are performing well. We must also help in modifying the existing system to reduce the resources used and be able to help the community to solve their problem efficiently.

- Tan Jia Ying

This project taught me the importance of teamwork. Only by working in a team, was I able to complete this assignment. From having initial group discussions to writing a report to creating a prototype, all of these tasks were not possible individually and required me to work as a team with my teammates. Other than that, behind every decision made, I applied a lot of logical thinking to figure things out. From this, I was able to grasp the steps in design thinking, such as how to make a prototype, how to design a system or application, or improve the performance of an existing system or application.

- Angie Wong Siaw Thing

I have gained basic knowledge of the design thinking process. There are five stages in design thinking: empathize, define, ideate, prototype, and test. From this project, I also learned how to improve my communication and teamwork skills. For instance, I had to understand how to divide tasks among team members and collaborate effectively to complete our project. One of the most impactful aspects for me was the process of creating a prototype. It made me realize that there were many details to consider, and we had to think about the logic behind our decisions. This experience provided us with the opportunity to design a system or app that is useful for our progress in the IT field.

- Jiang Shang Xi

Through this semester of study, I have come to realize that the success of a project relies not only on individual ideas and efforts but also on collaborative teamwork. Initially, we began the project with our own separate research ideas, but as time passed, we encountered numerous difficulties and challenges that compelled us to reassess and adjust our direction. It

was only when we align our thoughts that teamwork became more seamless, and project progress accelerated.

During a company visit, witnessing the effective collaboration within a successful team left a lasting impression on me. Each subgroup focused on their specific tasks, contributing to the completion of a comprehensive project. This served as a profound revelation, highlighting the pivotal role of teamwork in achieving outstanding projects.

Through the experiences of this semester, I deeply appreciate the power of teamwork. Everyone had the opportunity to leverage their strengths within the team, compensating for weaknesses, thereby enhancing the quality of the project and making the entire process more enriching and enjoyable. Engaging in discussions, providing assistance, and mutually correcting one another, we gradually steered towards success

## 7. **The task for each member**

| Group Members | Task |
|---|---|
| Ricky Tang Siet Hong | ● Detailed descriptions include problem, solution and team working |
| Ma Liwei | ● Detailed descriptions define and Brainstorm process |

| | |
|---|---|
| Muhamad Zulhilmi Bin Jamari | ● Detailed descriptions include problem, solution and team working<br>● Detail step and descriptions in design thinking and evidence for each phase<br>● Test: Test the prototype to the user |
| Tan Jia Ying | ● Introduction<br>● Design thinking assessment points<br>● Empathy: The possible question and answer for user |
| Angie Wong Siaw Thing | ● Detailed descriptions include problem, solution and team working<br>● Design thinking assessment points<br>● Design thinking evidence |
| Jiang Shang Xi | ● Prototype: How is the prototype developed<br>● Test the prototype to the user |

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UTMSmart | UTMDigital

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