



Proposal Defence FYP I

Easy Parcel: IoT-Based Parcel Storage System for University Villages

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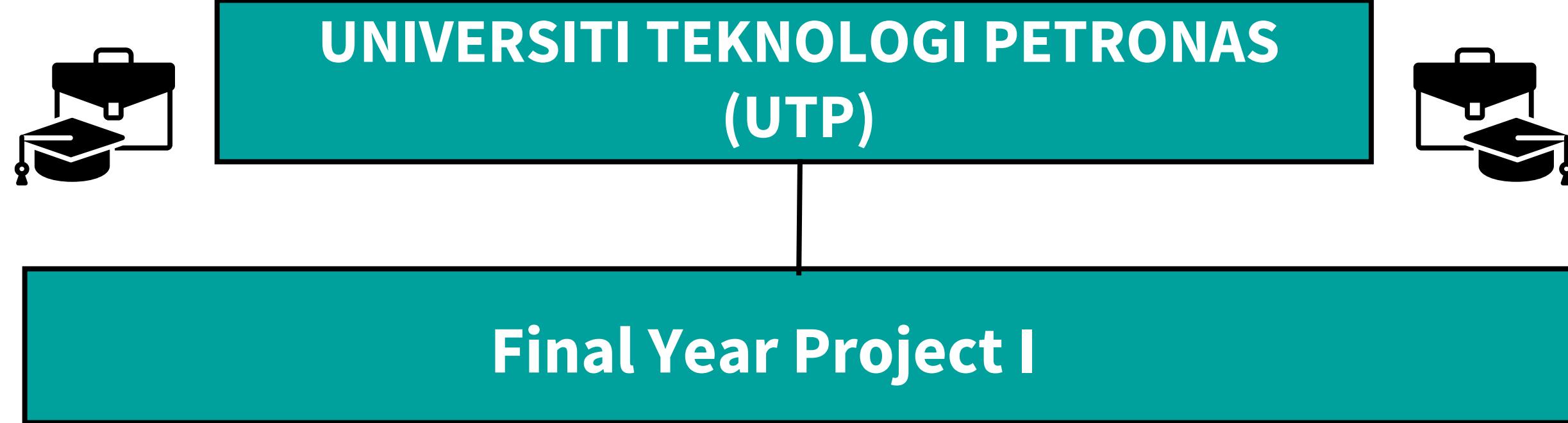
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INTRODUCTION



INTRODUCTION



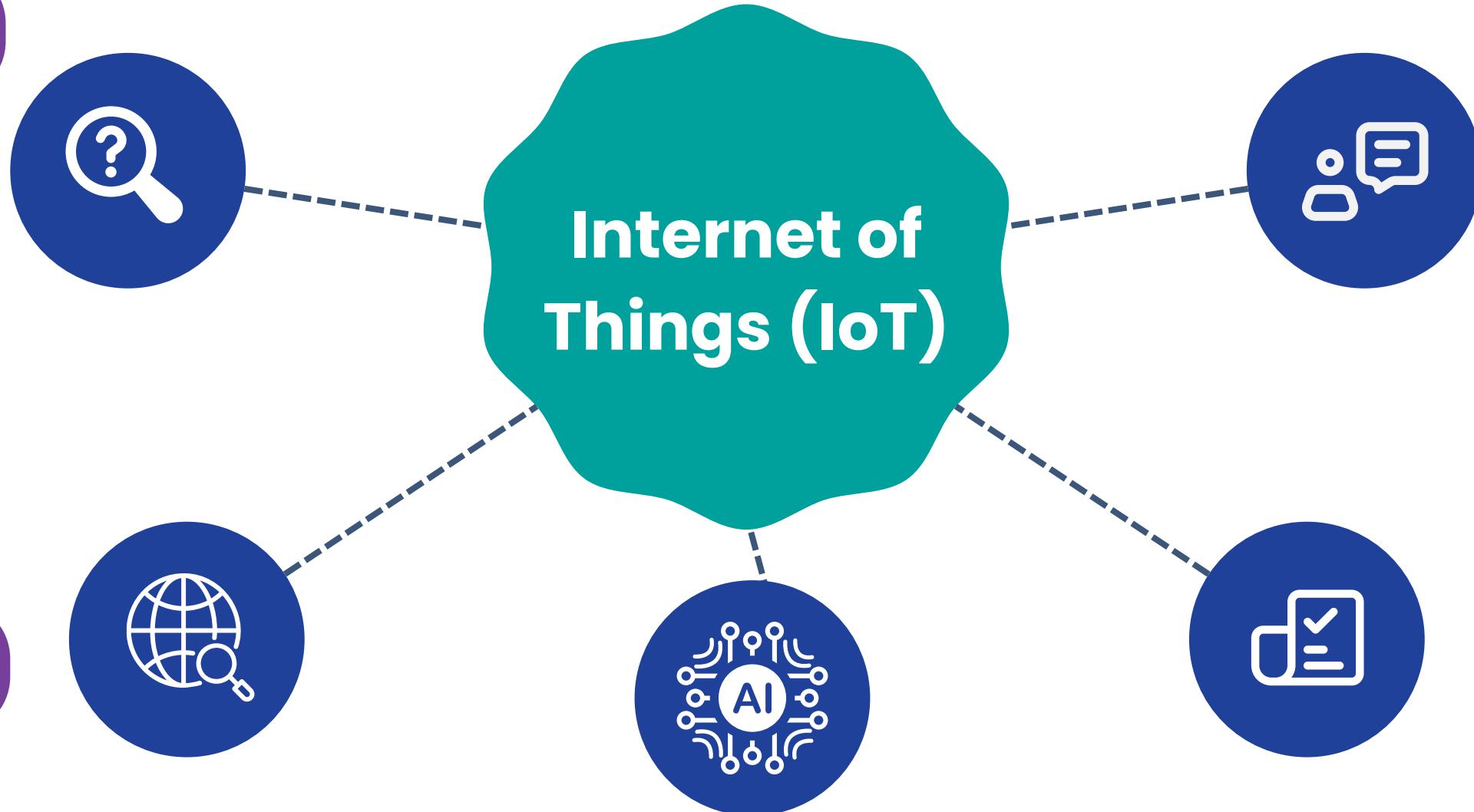
OBJECTIVES

The purpose of the project is to develop a framework, which will enhance students' skills in the process of applying knowledge, expanding thoughts, solving problems independently and presenting findings through minimum guidance and supervision.

INTRODUCTION

WHAT?

Network of interconnected devices that collect, send, and receive data through the internet to automate and improve processes.



APPLICATION

- Smart Homes
- Healthcare
- Transportation
- Agriculture
- Logistics and Delivery

TECHNOLOGIES USED

- Sensors & Actuators
- Microcontrollers (e.g., ESP32, Raspberry Pi)
- Cloud Platforms & Mobile Apps

IMPORTANCE

- Enables automation and real-time monitoring
- Increases efficiency and reduces manual work

FEATURES

- Remote access & control
- Data collection & analytics
- Integration with mobile apps

BACKGROUND OF STUDY

1

Malaysia E-commerce Growth

- E-commerce in Malaysia has seen remarkable growth in recent years
- Malaysia is now one of Southeast Asia's leading digital markets
- E-commerce users projected to increase by over 75% reaching expected 18.81 million users by 2029

2

University Students Role in E-commerce

- University students make up a large and growing portion of online shoppers
- Known for high digital literacy and frequent internet and mobile usage
- Prefer e-commerce for its convenience, affordability, and variety

SUMMARY

- ParcelHub was introduced to manage the increasing volume of parcels received by university students.
- The system supports the growing trend of online shopping among students.
- ParcelHub ensures students receive their parcels safely and at a time that suits their schedule.
- It aims to streamline the delivery process and reduce issues like lost or mishandled parcels.

PROBLEM STATEMENT



While the ParcelHub aims to simplify parcel collection, it still has notable flaws that impact student convenience.

One centralized location (ParcelHub), far from most student residences

Long queues during peak hours

Inconvenient for students without transport

Creates parking problems for those who drive

Students must pay additional charges to collect parcels

OBJECTIVES



To design and develop an IoT-based smart locker system for student villages to store small parcels securely



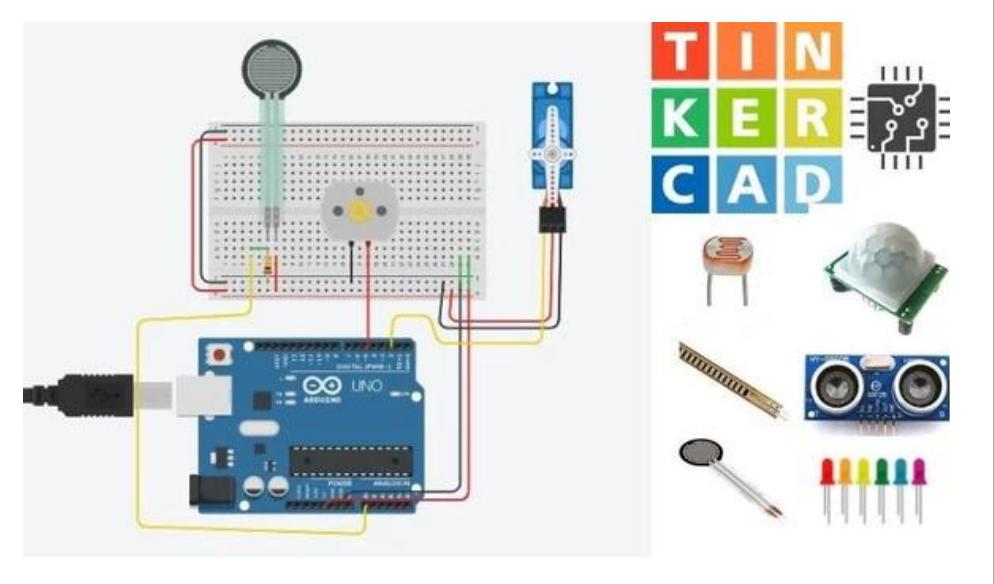
To build a mobile application for both students and couriers to manage locker access, track deliveries, and receive parcel notifications.



To implement a random password lock system and barcode scanning for secure identification of parcel senders (couriers) and receivers (students).

SCOPE OF STUDY

- Build a smart locker prototype using **Arduino, sensors, and locks.**
- Simulate circuit design using **Tinkercad**.
- Connect hardware to **Firebase** for real-time status and access logging.



- Develop a mobile app using **Flutter** for students and couriers to access lockers, track parcels, and receive notifications.
- Data will be managed using **Firebase Firestore**.



- Implement OTP-based access using **Firebase Authentication**.
- Integrate **barcode scanning** to log parcel sender and receiver details, with records stored in the cloud.



LITERATURE REVIEW



LITERATURE REVIEW

LITERATURE REVIEW – RESEARCH STUDY

Study	Technology / Focus	Strengths	Weaknesses	Limitations
Refaningati et al. (2020)	City-level smart locker logistics (Indonesia)	<ul style="list-style-type: none"> Improved delivery efficiency (30%) Traffic reduction 	<ul style="list-style-type: none"> No user-facing tech No tracking system 	Not designed for campus use or user notification features
Wang et al. (2024)	E-commerce adoption in Malaysia	<ul style="list-style-type: none"> Insight into student demand and mobile behavior 	<ul style="list-style-type: none"> No proposed system Theoretical only 	No technological implementation or real-world delivery model
Naik et al. (2020)	Secure smart locker with face recognition	<ul style="list-style-type: none"> High security (ECC, camera alerts) IoT-based access 	<ul style="list-style-type: none"> Over-secured for public/shared use No mobile or student interaction 	Not scalable or practical for student village environments
Poliku Parcel System (2024)	Web-based parcel management for academia	<ul style="list-style-type: none"> Academic-focused design Staff/Admin dashboards Iterative Agile UX 	<ul style="list-style-type: none"> Web-only (no mobile app) No smart locker hardware 	Does not support physical locker integration or secure parcel retrieval
UUM UPC (Zainuddin et al., 2021)	Service quality evaluation at UUM's UPC	<ul style="list-style-type: none"> SERVQUAL-based improvements Trusted, accessible hub 	<ul style="list-style-type: none"> Long queues Poor pickup system Charges & inconsistent SOP 	Manual collection, no automation or mobile-based access



LITERATURE REVIEW

RESEARCH GAPS

1 Student-specific design

Most systems aren't tailored for students in residential campus settings with limited mobility.

2 Lack of integrated mobile control

Systems like Poliku and UPC use web-based tools but don't integrate with mobile apps or IoT hardware.

3 Access & security balance

Most systems fail to balance security with usability, making them either too complex for shared campus environments or too basic to ensure parcel safety.

4 Courier-side support

Existing solutions rarely include features that support courier-side access, such as barcode scanning or OTP verification for secure parcel drop-offs.

5 Affordability & Scalability

Commercial systems may be costly and hard to scale or adapt in smaller campus communities.

LITERATURE REVIEW

Solution of The Research Gaps – Easy Parcel

Student-specific design 1

Easy Parcel is designed specifically for student residential villages, where students often lack personal transport and need accessible, on-campus parcel services

Lack of integrated mobile control 2

The system includes a dedicated mobile app, allowing students to receive real-time notifications, track parcels, and open lockers using OTPs

Access & security balance 3

Instead of complex biometric systems, **Easy Parcel** uses practical OTP, offering secure access without overcomplicating the user experience

Courier-side support 4

Couriers can deliver parcels into specific lockers, reducing delivery errors and enabling secure, contactless drop-offs

Affordability & Scalability 5

The system is prototyped using Arduino for proof of concept, but designed to scale using affordable, off-the-shelf IoT components for real-world deployment in campus

METHODOLOGY



METHODOLOGY

SMART LOCKER – HARDWARE

Design & Simulation Phase

- Use Arduino Uno R3 as the main microcontroller.
- Design and simulate the electronic circuit using Tinkercad.
- Simulate component connections, logic flow, and system behavior in a cost-effective and safe environment.

Verification & Confirmation

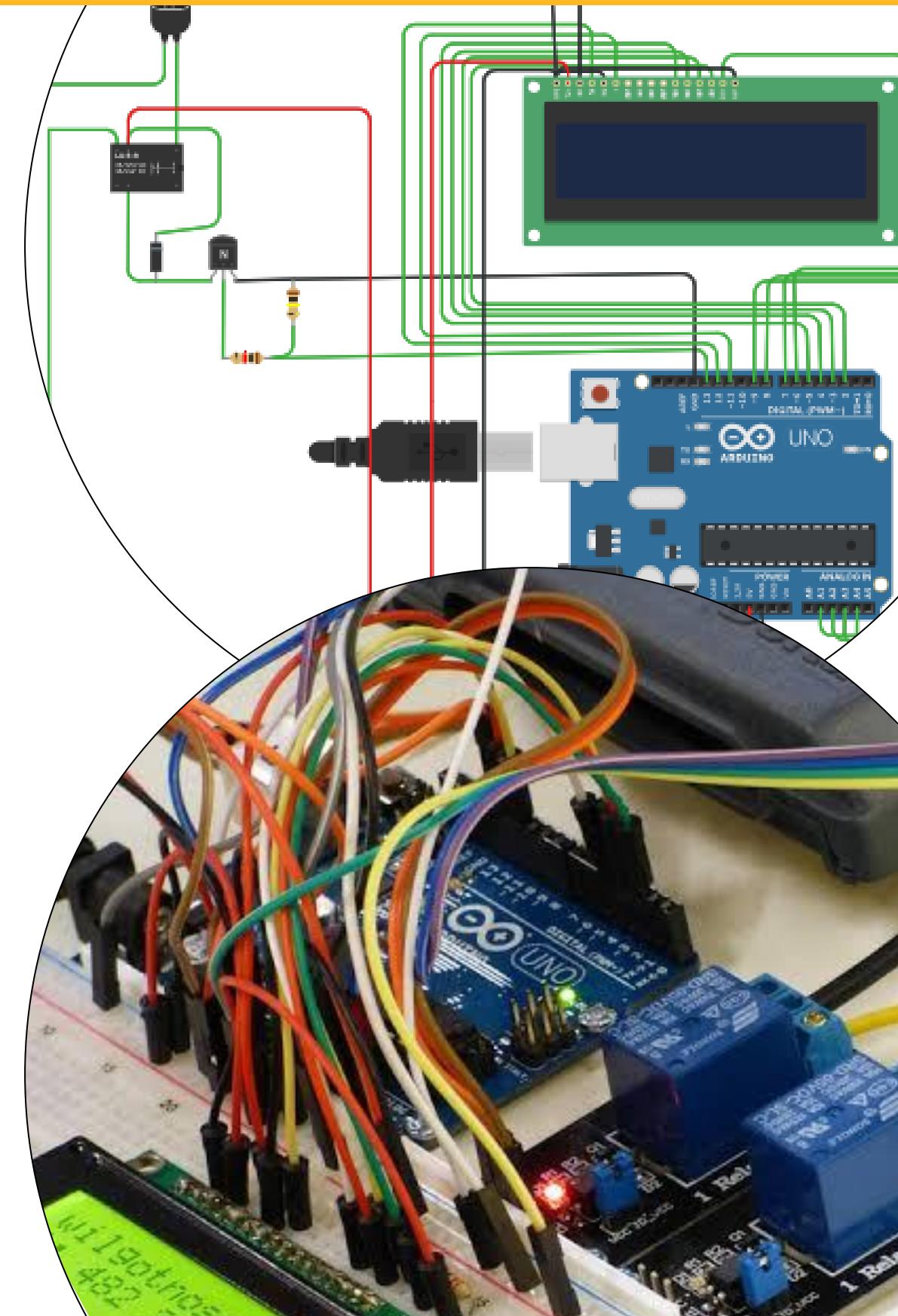
- Confirm the design through Tinkercad simulation to ensure it works as intended.

Physical Assembly Phase

- Assemble the hardware using real components based on the validated simulation design.

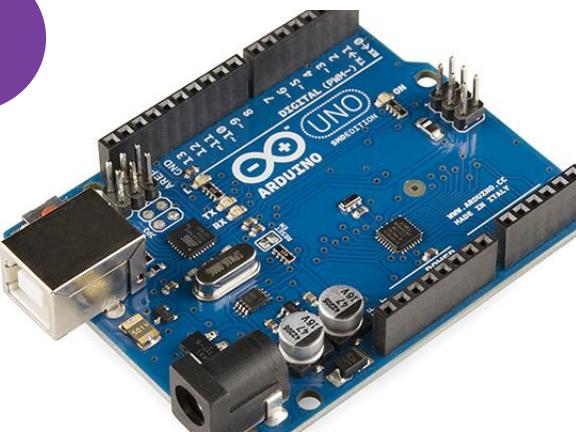
Implementation & Testing

- Implement the system step-by-step to ensure a smooth transition from design to prototype. Aim to minimize errors and rework during development.



METHODOLOGY

HARDWARE COMPONENTS

- 1**  **Arduino Uno R3**

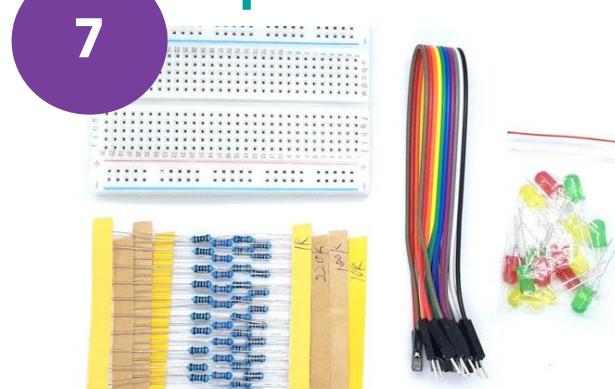
Main microcontroller for controlling inputs and outputs.
- 2**  **Servo Motor**

To open and close the locker door electronically.
- 3**  **Keypad**

To allow manual entry of OTP or password.
- 4**  **LCD**

To display status messages or OTP confirmations.
- 5**  **Locker**

To house the electronics and simulate the parcel storage compartment.
- 6**  **Barcode Scanner**

To scan courier and parcel information.
- 7**  **Breadboard, Wires, Capacitor and LED**

For circuit connections and prototyping.
- 8**  **Buzzer**

To provide audible feedback (e.g., when access is granted or denied).
- 9**  **OV7670**

(optional) For capturing images/videos during locker access.
- 10**  **ESP32**

(optional) To enable wireless communication with Firebase if direct integration is needed.

METHODOLOGY

MOBILE APPLICATION – SOFTWARE

The mobile application will be developed using Flutter, a cross-platform framework by Google that allows building Android and iOS apps from a single codebase. Flutter is chosen for its fast development, beautiful UI capabilities, and seamless integration with Firebase.



Development Process

UI Design

- Create wireframes and user flow diagrams to outline the structure and navigation of the app.

App Development

- Build the app using Dart and Flutter's widget system for smooth, responsive interfaces.

Firebase Integration

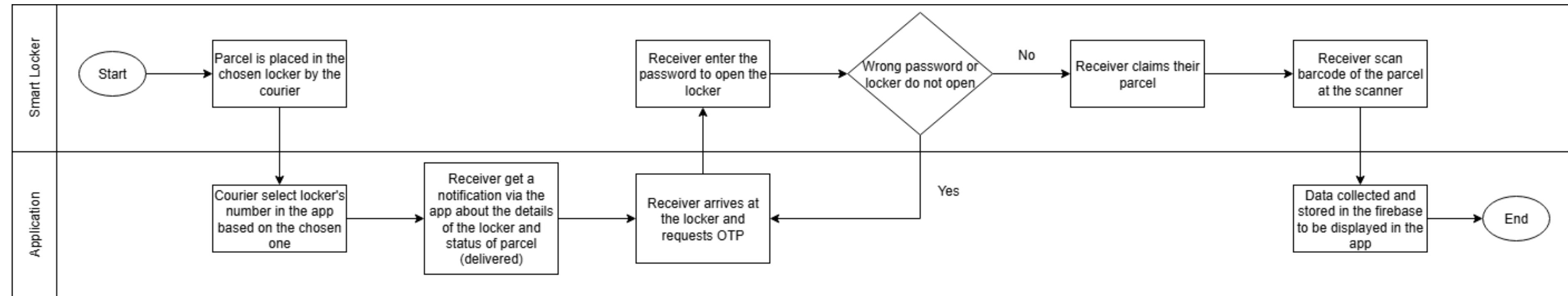
- Use Firebase Authentication for OTP-based login.
- Use Firestore to manage parcel and locker data.
- Enable Firebase Cloud Messaging (FCM) for push notifications.

Testing

- Perform functional and usability testing to ensure smooth performance across platforms.

METHODOLOGY

SYSTEM ARCHITECTURE



METHODOLOGY

GANNT CHART & MILESTONES - FYP I

METHODOLOGY

GANNT CHART & MILESTONES - FYP II

METHODOLOGY

EXPECTED OUTCOME

Functional Smart Locker Prototype

A working locker system using Arduino with servo lock, keypad, and barcode scanner to simulate secure parcel storage and retrieval.

Mobile Application for Students and Couriers

Flutter-based app allowing users to receive parcel notifications, track deliveries, and access lockers via OTP or barcode.

Secure Parcel Access System

Implementation of OTP and barcode scanning for authenticated courier drop-off and student pick-up.

Improved Parcel Handling Experience for Students

Faster, more convenient, and more secure alternative to centralized collection points like ParcelHub.

CONCLUSION & FUTURE WORKS

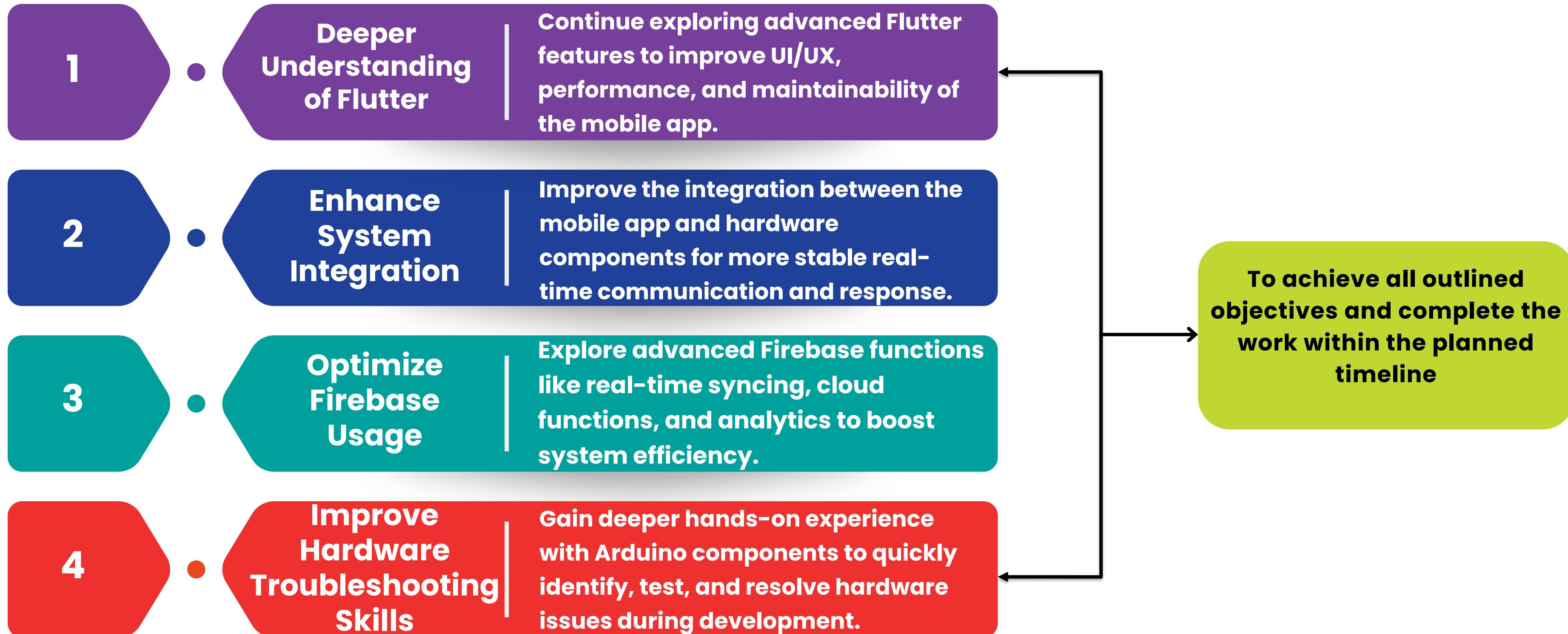


CONCLUSION



This project aims to improve the parcel collection experience for students by introducing a smart, secure, and accessible locker system within residential villages. By integrating IoT hardware with a mobile app, it offers a more convenient and efficient solution compared to the current centralized ParcelHub system.

FUTURE WORK



THANK YOU

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