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ABSTRACT

Modern high-tech machinery and equipment are necessary to complete the jobs and make life easier. The smart home is one of these systems equipped with home appliances that wish to control smartly from anywhere. The study's objectives are to design users with the convenience of controlling their home appliances, develop the sensor using Blynk apps, and evaluate the efficiency and functionality of the sensor by using the Blynk apps. This study highlights the development of the NEXHOME smart home prototype, which integrates advanced technologies like NodeMCU ESP 32, solenoid door locks, and ultrasonic sensors controlled via the Blynk app. The prototype aims to revolutionize traditional household functionalities by integrating cutting-edge technology to enhance home living experiences. A new mechanism has been introduced to leverage mobile phone services to communicate with and control home appliances and make our homes smart. Additionally, this system has an ultrasonic distance sensor installed, which detects motion if someone tries to enter the door without authorization and notifies the user using the Blynk app. The system enhances home automation by improving convenience, security, and energy efficiency. With a growing elderly population, smart home technologies are essential for improving the quality of life through better safety, comfort, and healthcare. The systematic coding approach ensures seamless device interaction, providing a truly effective and user-friendly smart home solution. The feedback from the questionnaire responses underscores the importance of addressing key areas for improvement, including user-friendliness, energy conservation, security, integration of IoT technology, sustainability promotion, and user education.

ABSTRAK

Mesin dan peralatan berteknologi tinggi diperlukan untuk menyelesaikan pekerjaan dan menjadikan kehidupan lebih mudah. Rumah pintar adalah salah satu daripada jenis sistem kawalan peralatan rumah yang boleh dikawal dari mana-mana sahaja. Objektif kajian adalah untuk mereka bentuk pengguna dengan kemudahan mengawal peralatan rumah mereka, untuk membangunkan sensor menggunakan aplikasi Blynk dan untuk menilai kecekapan dan fungsi sensor dengan menggunakan aplikasi Blynk. Kajian ini menyerlahkan pembangunan prototaip rumah pintar NEXHOME, yang menyepadukan teknologi canggih seperti NodeMCU ESP 32, kunci pintu solenoid dan penderia ultrasonik, dikawal melalui apl Blynk. Ini adalah bertujuan untuk merevolusikan fungsi isi rumah konvensional dengan menyepadukan teknologi untuk meningkatkan pengalaman hidup di rumah. Mekanisme baharu telah diperkenalkan supaya perkhidmatan telefon mudah alih boleh dimanfaatkan untuk berkomunikasi dan mengawal peralatan rumah dan menjadikan ia rumah pintar. Selain itu, sistem ini mempunyai penderia jarak ultrasonik yang dipasang yang mengesan pergerakan seseorang yang cuba memasuki pintu tanpa kebenaran dan memaklumkan pengguna menggunakan aplikasi Blynk. Sistem ini bertujuan untuk meningkatkan automasi rumah dengan meningkatkan kemudahan, keselamatan dan kecekapan tenaga. Dengan populasi warga emas yang semakin meningkat, teknologi rumah pintar adalah penting untuk meningkatkan kualiti hidup melalui keselamatan, keselesaan dan penjagaan kesihatan yang lebih baik. Pendekatan pengekodan yang sistematik memastikan interaksi lancar antara peranti, menyediakan penyelesaian rumah pintar yang efektif dan mesra pengguna. Maklum balas daripada soal selidik yang dijalankan, menekankan kepentingan dalam penambahbaikan dalam elemen kemesraan pengguna, penjimatan tenaga, keselamatan, penyepaduan teknologi IoT, promosi kemampanan dan pendidikan pengguna.

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LIST OF SYMBOLS

Symbols	
%	Percentage

LIST OF ABBREVIATIONS

IoT	Internet of things
Wi-Fi	Wireless Fidelity
ECOs	Energy Conservation Opportunity
R&D	Research and Development
PC	Personal Computer
SHT	Smart Home Technology
IOW	Inspector of Works
IR4.0	Industrial Revolution 4.0
AC	Alternating Current
BC	Back Centuries
DALI	Digital Addressable Lighting Interface
ESP	Espressif systems
SoC	System on Chip
D0WD	Dual-core, 0D (zero-die), Wi-Fi, and Dual-mode Bluetooth.
D2WD	Dual-core, 2 MB of embedded flash memory, Wi-Fi, and Dual-mode Bluetooth.
S0WD	Single-core, 0D (zero-die), Wi-Fi and Dual-mode Bluetooth
SiP	System in Package
PICO-D4	Peripheral Interface Controller with On-chip-Dual-core, 4 MB of embedded flash memory.
MHz	Megahertz
BLE	Bluetooth Low Energy
12V	12 Voltage
DC	Direct Current
IDE	Integrated Development Environment
LED	Light Emitting Diode
BLE	Bluetooth Low Energy
PhDs	Doctor of Philosophy
NodeMCU	Node Micro Controller Unit
BALUN	BALanced to UNbalanced,

CHAPTER 1

INTRODUCTON

1.1 INTRODUCTION

In this globalization era, controlling home appliances using a mobile phone is a revolutionary concept made possible through the Internet of Things (IoT) technology. With IoT, every object can be connected to the internet and communicate with each other, enabling seamless control and automation. Traditionally, controlling home appliances required physical interaction or the use of remote controls. However, with the advent of IoT, homeowners can now conveniently manage their devices from anywhere using their smartphones.

Integrating IoT into home appliances allows users to remotely switch on/off lights, adjust thermostats, control security systems, monitor energy usage, and much more. This level of control provides convenience, enhances energy efficiency, improves security, and creates a personalized user experience. By connecting appliances to a central smart hub or directly to the internet via Wi-Fi or Bluetooth connectivity, users can access and control their devices through dedicated mobile applications. These apps enable real-time monitoring and adjustment of appliance settings based on personal preferences or predefined schedules.

Furthermore, IoT-enabled home appliances often have built-in sensors that collect data about usage patterns or environmental conditions. This data can then be used for further analysis to optimize performance mance or provide intelligent energy management or maintenance recommendations.

1.2 BACKGROUND OF STUDY

The study's background is rooted in the increasing prevalence and advancements in mobile technology. With smartphones becoming an integral part of people's lives, there has been a growing interest in leveraging their capabilities to control various aspects of daily life, including home appliances.

Traditionally, home appliances such as lights, fans, security systems, and kitchen equipment have been controlled manually or through dedicated control panels within homes. However, this approach limits flexibility and convenience for users wanting to maintain these appliances remotely or automate certain functions.

Controlling home appliances using mobile phones offers numerous advantages. It allows users to remotely monitor and manage their appliances from anywhere with an internet connection. It means that even when away from home, individuals can ensure that lights are turned off, cooling systems are adjusted appropriately, and security measures are activated.

Moreover, integrating home appliances with mobile phones enables automation based on user preferences and schedules. For example, users can set timers for devices to turn on or off at specific times or create personalized settings based on occupancy patterns or energy efficiency goals. This level of customization enhances comfort and convenience while also reducing energy consumption.

Smart home technologies have facilitated the integration between mobile phones and home appliances. Internet of Things (IoT) devices allow for seamless communication between different devices in a networked environment. By connecting various appliances to a central hub or directly to mobile phone applications, users can easily interact with them through intuitive interfaces.

Additionally, advancements in wireless communication protocols such as Wi-Fi and Bluetooth have made it easier to establish reliable connections between mobile phones and home appliances without complex wiring requirements. Overall, the study's background highlights the increasing demand for convenient and flexible ways to control home appliances. Integrating mobile phones into this process offers significant benefits regarding remote access, automation capabilities, and improved energy management.

1.3 PROBLEM STATEMENT

From March to May 2017, a detailed walk-through energy audit was conducted to assess the energy consumption pattern and possible energy conservation opportunities (ECOs) in the Universiti Malaya Research and Development (R&D) building. It was discovered that the main appliances that contributed to the building's total energy usage were air conditioning (34%), lighting (18%), and PC/laptops (10%) [2].

A total of 15% of Malaysians are expected to reach 60 by 2030, and this number is expected to reach 20. 4% in 2050, meaning the country has a high proportion of older adults. Therefore, there must be a national plan to address the problems of the elderly, primarily through the provision of smart homes fully equipped with the latest technologies that facilitate convenience and comfort in the daily lives of older people [3].

Deploying smart home technology (SHT) can indisputably improve the quality of life for its residents in various ways, including safety, leisure, comfort, and healthcare [1].

1.4 OBJECTIVES

This project aims at exploring development of laser security alarm beam system prototype in complying with IR4.0:

i. to design users with the convenience of controlling their home appliances.
ii. to develop the sensor using Blynk apps.
iii. to evaluate the efficiency and functionally of the sensor by using the Blynk apps

1.5 RESEARCH QUESTION

Five research questions can be asked:

Question 1: What is IR 4.0 used in this project?

Question 2: What are the positive effects of using this project?

Question 3: How far is the sensor to be effective?

Question 4: Who are the influential users involved in this project?

Question 5: How is this project applied in daily use?

1.6 SCOPE OF PROJECT

The project's scope is to enable the comprehensive remote control of appliances through mobile phones and use home appliances which are controlled doors, controlled door locks, and intelligent lighting systems:

i. to be a smart appliance control

ii. to take care of energy and time optimization

iii. to ensure home automation, monitoring, security, and privacy measures are in good working order.

1.7 IMPORTANCE OF THIS PROJECT

Controlling home appliances remotely via mobile phones enhances convenience and efficiency. It allows users to manage devices from anywhere, saving time and energy. This technology also contributes to energy conservation by enabling users to monitor and adjust appliance settings, promoting a more sustainable lifestyle. Additionally, it enhances home security as users can simulate their presence by remotely activating lights or other devices. Overall, the importance lies in convenience, energy efficiency, and improved home management.

1.8 DEFINITION OF OPERATION

A home appliance remote control project typically involves using a mobile application to communicate with and control various household devices. Users can send commands through the mobile app, which are transmitted to the appliances via a communication protocol such as Wi-Fi or Bluetooth. The appliances with compatible interfaces respond to these commands by adjusting settings or turning on/off as instructed. This operation allows users to remotely manage and monitor their home appliances using a mobile device, providing convenience and control over their household devices.

1.9 CONCLUSION

In conclusion, Internet of Things (IoT) technology has revolutionized how people interact with and manage our home appliances. IoT's seamless connectivity and remote-control capabilities enable users to efficiently control lighting, thermostats, security systems, and more from their smartphones. It enhances convenience and contributes to energy efficiency and improved security. Incorporating sensors in IoT-enabled appliances further empowers users with valuable data, facilitating insightful analysis for optimized performance and intelligent decision-making in energy management and maintenance areas. As its's continue to embrace IoT in our homes, the personalized user experience and efficient resource utilization mark a significant step forward in the era of intelligent living.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

A literature review is a piece of academic writing that exhibits knowledge and understanding of academic literature on a given issue while placing it in perspective. It also involves a critical evaluation of the content, hence the name "literature review" rather than "literature report." A literature review is both a method of reviewing books and a type of writing.

Consider television or film review articles as examples of the distinction between reporting and reviewing. These articles offer a brief overview of the film or program's key points, as well as the critic's own assessment. Similarly, the two primary goals of a literature review are to cover existing research, hypotheses, and evidence and to critically examine and debate this content.

A literature review is typically a piece or component of a dissertation, research project, or extended essay. It can, however, be set and judged as a solo piece of work. A literature review is typically one of the first activities completed after settling on a topic for a bigger piece of writing, such as a dissertation or project. Reading and critical analysis can help to develop a topic and frame research questions. Before embarking on a new inquiry, conduct a literature review to ensure that users are familiar with and understand existing research in a specific topic. After conducting a literature review, people should understand what research has already been conducted and be able to identify what is unknown about main issue [19].

2.2 HISTORY OF THE “SMART HOME”

2.2.1 The Origin of The Smart Home

Smart home technology has long been the subject of futurists predicting robot butlers. While not have “The Jetsons” style tech, smart home technology has come a long way in recent years. Let’s examine the journey of smart home technology, uncover some of the trends in this industry’s development, and assess where just now. As known it today, smart home technology began in 1975 with the invention of X10. X10 is a communication protocol that uses a home’s AC wiring to enable communication between devices and control modules installed in the house. While advanced for earliest time, these systems tended to be expensive and often required professional installation. X10 opened the possibility of remote control for hundreds of devices. But it had many problems. It was slow, unencrypted, and unreliable due to signal loss and interference. If your neighbour had an X10 system, it is possible it could turn the lights on and off as well as their own!

As the internet gained popularity in the 90s, more devices became available, but there still part of proprietary and expensive systems. The internet enabled remote access to smart home systems, but these systems retained many properties of X10 centralized control, wired devices, and simple automation. While some of the innovations of this era, such as this microwave/banking system, were laughable, others, such as this smart home concept from Microsoft, were remarkably prescient [5]

Figure 2.1: X10 logo

2.2.2 The Origin of The Controlled Access Door

However, door access control systems have been essential throughout history, from the earliest human settlements to Ancient Egyptian tombs and modern high-rise apartments that use the latest technology. The need to protect people and the property they deem valuable has led to the development of various remarkable technologies over the years.

The earliest form of access control is often regarded as human intervention, for example, using people acting as guards to protect buildings or other areas from unauthorized access. However, the need for more sophisticated access control systems became apparent as settlements grew. The first known lock and key is believed to have been invented over 6,000 years ago, and one early example was discovered in the ruins of Nineveh, the capital of ancient Assyria, around 600 BC.

It was a simple device often termed a 'pin tumbler lock.' It consisted of a wooden post affixed to the door and a bolt that would slide into it. The person opening it would use a large wooden key with prongs (that matched the openings inside) to lift a series of movable pin tumblers into a position that allowed the wooden bolt to slide open. When the key was removed, the pins fell back into the bolt, preventing it from opening. The mechanism is very close to what some locks and keys are like today in the euro cylinder mechanism.

The Greeks and Romans advanced this technology. Some of the locks used in ancient Rome were so complex that they could only be opened by specially trained locksmiths! Interestingly, having anything so precious that it would need locking up with what would've been (for the period) extremely advanced or expensive technology was relatively rare, so locks and keys were less of a necessity than they are today - and more of a status symbol.

Unlike the ancient Egyptians, Greeks and Romans crafted their mechanisms from metal and other more durable materials. In ancient Greece, locks and keys were made of bronze or iron and often decorated with intricate patterns. The locks were typically cylindrical in shape and—like the pin tumbler lock—had a series of pins that had to be aligned by the proper key to unlock the device. The keys themselves were often long and thin, with teeth corresponding to the lock's pins.

In ancient Rome, locks and keys were also made of bronze or iron and resembled Greek designs. However, the Romans also developed a type of lock called a "warded lock," which consisted of a series of obstructions (wards) that prevented the key from turning unless it was the correct shape. Warded locks were popular for many centuries and are still used in some modern padlocks [18].


NEW ELECTRONIC LOCK

Warns Against Intruders . . .

Best Universal Lock Co. Inc. announces easy-to-install lock-alarm system ready for market soon.

Figure 2.2: The old door access systems

Figure 2.3: The door access systems

2.2.3 The Origin of Smart Lighting Control

Digital technology has transformed the way human live, and wireless lighting control is no exception. In today's age of smartphones, wireless communication, and high-speed connectivity, how household control lights is undergoing a revolution. Here, is the plot of critical milestones in developing intelligent lighting controls, from the first light switch to the age of the Internet of Things (IoT).

Lighting controls have advanced significantly in the past few decades, yet most of today's systems are based on old standards. The DALI standard was conceived more than twenty years ago in a world when computing power was limited, the internet knew it barely existed, and smartphones were still a decade away. DALI has served well, but a new approach is needed to realize today's technology's potential fully.

Bluetooth Low Energy (which began life in 2006 as Wibree) was originally developed by Nokia and later integrated with the existing Bluetooth standard. Today, Bluetooth Low Energy is built into every smartphone, tablet, laptop, and smartwatch, making it the obvious choice for applications such as Casambi. In fact, Casambi's founders, who used to work at Nokia, saw the potential of Bluetooth Low Energy from the start and have been working with it since before there were any compatible devices on the market.

Casambi was founded in 2011 by Timo Pakkala and Elena Lehtimäki, formerly of Nokia Research Center. Timo and Elena believed that smartphones and wireless technology could transform how people interact with the surrounded objects. It was thought Bluetooth Low Energy – a new technology that began life at Nokia – was the key to making connected devices truly smart. Now, the Casambi app is helping to put genuinely "smart" control in the hands of lighting users [17].

2.3 REVIEW FROM PREVIOUS RESEARCH

This paper proposes a practical smart home system intended for general residential usage, with the goal of using technology to improve daily life. It monitors the environment via networked low-power sensors, and users can change settings and issue commands. The system's processes include direct environment sensing, data collection and analysis, and user customisation. The design includes a number of sensors, a Raspberry Pi server, and Bluetooth connection, all of which are managed by an easy-to-use Android interface. The main advantages of this system are its practicality, security, and ease of configuration, making it an efficient home automation solution for end customers [6].

The design of a Smart Home Control System (SHCS) that integrates with existing home equipment to reduce human intervention while increasing security and energy efficiency. Despite its potential, issues such as network distance, signal interference, usability, cost, and battery consumption persist. The article examines many areas of smart home technology, such as control systems, networks, appliances, and sensors. It introduces a home automation prototype that uses the Internet of Things (IoT) and solar charging, as well as four types of sensors (PIR, temperature, ultrasonic, and smoke gas) to regulate the environment and detect intrusions. The report also describes how the proposed system's hardware, software, and test field were designed [7].

This article examines the impact of Smart Home Technology on home dynamics, drawing on qualitative research of seven in-depth interviews done in 2018. It demonstrates how the presence of remotely monitored and controlled sensors alters the home environment. The study finds that the administrative functions of smart home systems are often administered by one household member with the most technical skills, known as a "super-empowered user." This person can control many features of the home (such as temperature and lighting) and watch other household members in real time, even from a distance. This skill modifies power and control relations within the family by essentially extending the supervising user's senses via technology [8].

This article describes a low-cost intelligent home automation system based on the Internet of Things (IoT), a concept that connects ordinary devices over the internet.

The Internet of Things (IoT) enables the interconnection and control of countless devices throughout the world via various sensors. The system uses a computer to process sensor inputs and initiate actions that benefit users. For example, a security camera system can detect and respond to motion in a home, creating alarms and recording evidence of intruders. The camera's zoom capability improves the sharpness of identified subjects, and particular zones for motion detection can be set. IoT technology collects and uses real-time data to increase efficiency in everyday tasks. The article describes an experimental configuration that uses an Arduino Mega 2560 board, sensors, and modules to demonstrate device control through a mobile application, explaining the system components and control mechanisms [9].

This paper offers a smartphone-based system for managing and monitoring home devices utilizing IoT technology, including Raspberry Pi and NodeMCU, built on the Blynk framework. The research entails developing a prototype that incorporates sensors, actuators, a Raspberry Pi, NodeMCU, and cellphones. Actuators control the devices, and sensors detect conditions. The Raspberry Pi serves as both a server and an internet bridge, while the NodeMCU connects home equipment and sensors to the Raspberry Pi, reading and transferring sensor data to the server. The server processes queries from cellphones that use the Blynk framework. The system also has an automated mode for offline use and records all system activity [11].

This paper presents a system that uses home monitoring and automation to ensure acceptable living conditions. Thermal (temperature and humidity), visual (colors and lighting), and sanitary (air quality) are all important factors of comfort. The system monitors these characteristics to ensure they remain within acceptable limits, and it employs the Internet of Things (IoT) for data-driven, intelligent automation. The EmonCMS platform is used in the design to collect data, visualize it, and control household appliances remotely. The NodeMCU-ESP8266 microcontroller board is designed for real-time data sensing, processing, and connection with the EmonCMS cloud server. The chosen platform is known for its adaptability and user-friendliness [12].

The article examines the rapid advancement of technology via the Internet of Things (IoT), which seeks to improve communication and data sharing among interconnected things. IoT technologies can simplify and even replace human tasks.

One example is using NodeMCU for Smart Home applications, such as controlling room lighting over the internet. NodeMCU, like the Arduino ESP8266, is a microcontroller with WiFi capabilities and a USB data extension chip, making it suitable for such applications. The research compares the Web, Thingspeak, and Blynk platforms for controlling Smart Home devices. The results show that Blynk is the superior platform due to its ease of use and efficiency [13].

The article examines the growing popularity of home automation systems for improving comfort and quality of life. It focuses on an intelligent home automation system (iHAS), which enables users to remotely monitor and operate household electrical appliances using computers, Android smartphones, or tablets with internet connectivity. The technology can be installed into existing residences without requiring infrastructure upgrades. The paper describes the design and execution of a home automation system based on a Wi-Fi-enabled microcontroller unit, which allows users to operate appliances from anywhere using an Android app and an internet connection [14].

The article explores how the Internet of Things (IoT) is transforming traditional homes into smart homes in which digital equipment communicate over the internet. According to one study, 59% of Malaysians are either unaware of or unfamiliar with the Internet of Things concept. To solve this, the project created a smart home system managed by mobile apps and used IoT to educate Malaysians. It detects movements using wireless technologies and infrared sensors, and a microprocessor controls home appliance. The Blynk mobile app was used to operate and monitor various devices such as LEDs, fans, and cameras, with outputs shown as icons and video streams. The technology works successfully within a Wi-Fi range of around 50 meters and intends to educate university students and staff on current technologies [15].

The article covers a Smart Home prototype built with Internet of Things (IoT) technology to improve home control and monitoring remotely via electrical gadgets, the internet, and smartphones. The system comprises a proximity sensor (HC-SRF04) for automatic door operation, a temperature sensor (LM35) that regulates fan operation based on room temperature, and remote control of lights and fans via the Blynk app [16].

Smart homes are increasingly becoming a significant aspect of modern life in Malaysia, providing residents with advanced, connected living experiences. As technology advances, these homes are expected to become more accessible and user-friendly, enhancing homeowners' lives and supporting Malaysia's goal of a digitally advanced future. This trend represents a shift towards more efficient, secure, and sustainable living [20].

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

Methodologies are defined as a set of instructions for solving problems using specific components such as phase, task, methods, and technique. This chapter will go through the specific items that were needed to make this project complete and functional. The method is to meet the project's goal, which will result in a perfect result. Researchers will describe the work progress, technique, and procedure for making the Smart Home in this chapter. In this chapter, the researcher will conduct a survey to obtain expert validation to determine the usefulness of the device that had been created. All data collected were recorded and analyzed [4].

In this chapter, there will be a lot of information about the process and journey throughout the making of the final project. This chapter will also provide a detailed explanation of the materials used to complete and successfully complete this project. There will be a flowchart depicting the entire project's process. This flowchart will explain the steps that were taken. Next is the Gantt Chart, which will show the actual work and planning throughout all the 13 weeks.

3.2 RESEARCH DESIGN

The methodology flowchart in Figure 3.1 shows the planning of the project. This flowchart helps in understanding the research goals and as the guidance in choosing the right questions, selecting samples, collecting data, and analyzing it.

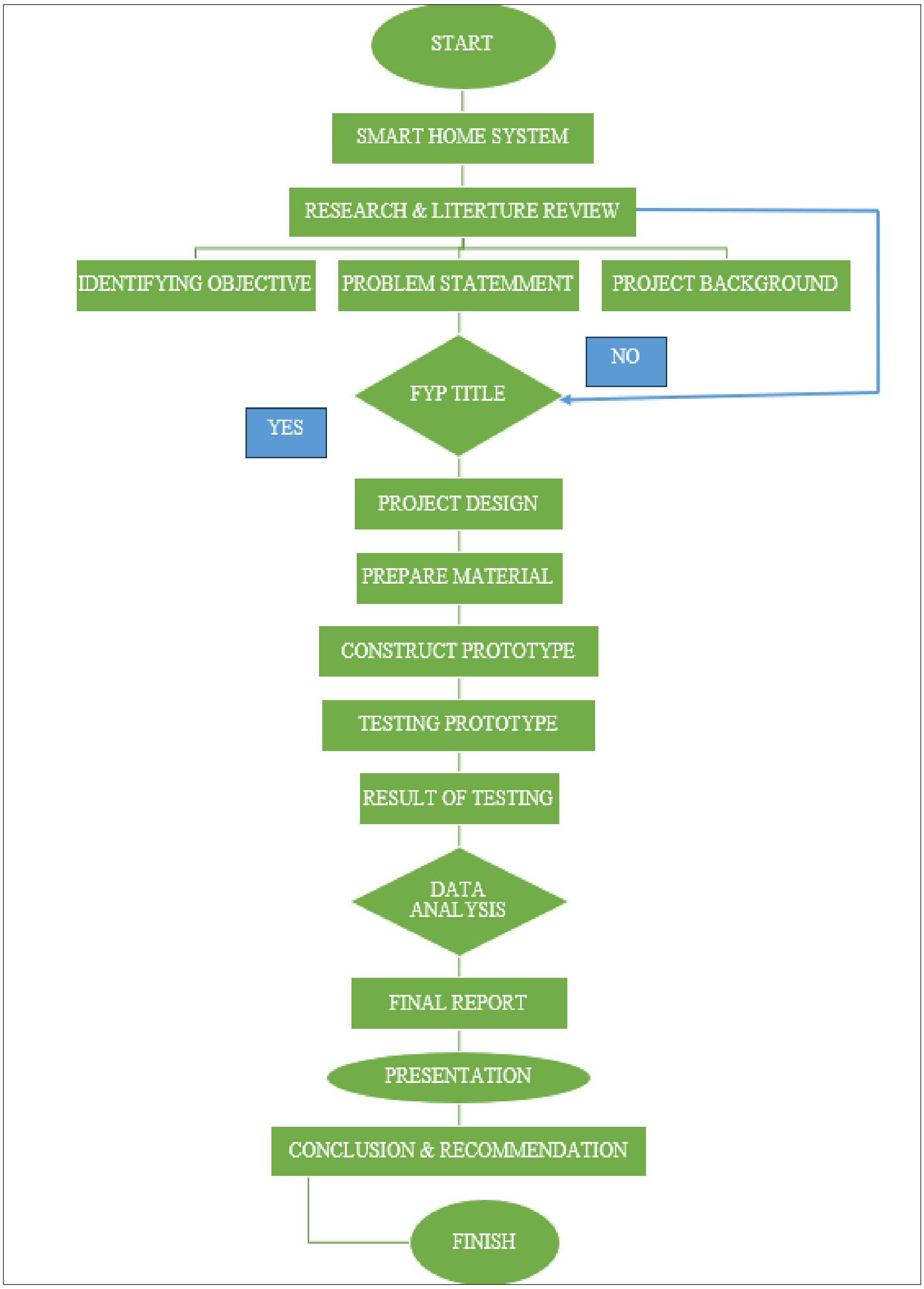


Figure 3.1: Methodology flowchart

3.3 DESIGN PROJECT

In a project, the term "method" or "methodology" refers to the most efficient means of obtaining relevant data at the lowest possible cost to accomplish a research objective. Figure 3.2 shows the example of designing in project. To ensure that the project is completed effectively, the researcher should perform a study using the proper methodology. Effective project production is possible when the researcher employs an efficient methodology. As mentioned before, the goal of this project is to solve the issues encountered and accomplish the goals by its conclusion. A smart home project's evaluation is a crucial first step in determining the project's functioning, effectiveness, and the impact.

Figure 3.2: Example of Designing project in Revit

3.3 MATERIAL AND EQUIPMENT

Several materials and equipment required in developing the prototype of NEXHOME. There are NodeMCU ESP 32, Solenoid Door Lock, Modulo Expansion ESP32 Shield 36 Pines WROOM, LED, Servo Motor, Blynk IoT, Ultrasonic Sensor and 12v DC Power Supply.

3.3.1 NodeMCU ESP 32

Created by Espressif Systems, ESP32 is a low-cost, low-power system on a chip (SoC) series with Wi-Fi & dual-mode Bluetooth capabilities! The ESP32 family includes the chips ESP32-D0WDQ6 (and ESP32-D0WD), ESP32-D2WD, ESP32-S0WD, and the system in package (SiP) ESP32-PICO-D4. At its heart, there's a dual-core or single-core Tensilica Xtensa LX6 microprocessor with a clock rate of up to 240 MHz. ESP32 is highly integrated with built-in antenna switches, RF balun, power amplifier, low noise receives amplifier, filters, and power management modules. Engineered for mobile devices, wearable electronics, and IoT applications, ESP32 achieves ultra-low power consumption through power-saving features, including fine-resolution clock gating, multiple power modes, and dynamic power scaling as in Figure 3.3 [21].

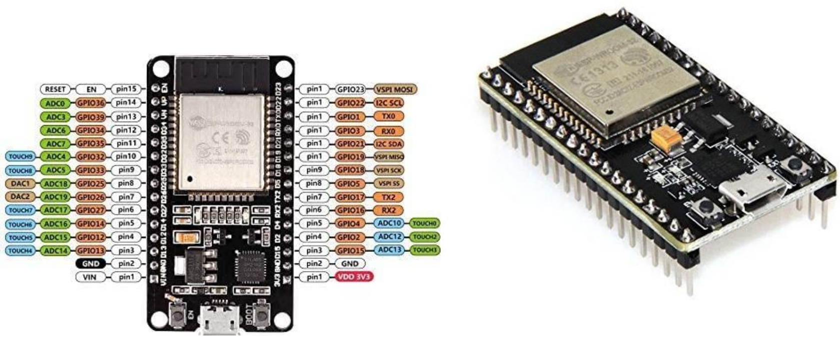


Figure 3.3: NodeMCU ESP 32 Pinout

The ESP32 is an updated version of the ESP8266 in Figure 3.4, a chip that took experimenters in the Western world by “surprise” in 2014. The original ESP8266 was introduced on a module called the ESP-01, which had very little English documentation, so its capabilities were largely unknown at the time. Once the documentation was translated into English, many experimenters became aware of the power of the ESP8266, and it quickly became trendy.

The ESP32 improved upon the ESP32 design in several ways. It offers both Bluetooth and BLE (Bluetooth Low Energy), whereas the ESP8266 only has WiFi. It is faster and is available in a dual-core design. It can also operate in an ultra-low-power mode, which is ideal for battery-powered applications.

Figure 3.4: NodeMCU ESP8266

3.3.2 Solenoid Door Lock

Solenoids in Figure 3.5 are electromagnets that are big coils of copper wire with an armature (a slug of metal) in the middle. When the coil is energized, the slug is pulled into the center of the coil, allowing the solenoid to pull from one end.

This solenoid is nice and strong. It has a slug with a slanted cut and a good mounting bracket. It's basically an electronic lock designed for a basic cabinet, safe, or door. Normally, the lock is active, so you can't open the door because the solenoid slug is in the way. It does not use any power in this state. When 9-12VDC is applied, the slug pulls in so it doesn't stick out anymore, and the door can be opened. The solenoids come with the slanted slug as shown above, but you can open it with the two Phillips-head screws and turn it around, so it's rotated 90, 180, or 270 degrees so that it matches the door you want to use it with.

Figure 3.5: Solenoid Door Lock

3.3.3 Modulo Expansion ESP32 Shield 36 Pines WROOM

The "Modulo Expansion ESP32 Shield" with 36 pins in Figure 3.6 is likely expands the GPIO capabilities of the ESP32 microcontroller, enabling you to connect more sensors and devices to your projects for increased versatility.

Figure 3.6: Modulo Expansion ESP32 Shield 36 Pines WROOM

3.3.4 LED

Figure 3.7 shows LED stands for light emitting diode. LED lighting products produce light up to 90% more efficiently than incandescent light bulbs. How do they work? An electrical current pass through a microchip, which illuminates the tiny light sources that are called LEDs, and the result is visible light [23].

Figure 3.7: LED

3.3.5 Servo Motor

The function of the servo motor is to convert the control signal of the controller into the rotational angular displacement or angular velocity of the motor output shaft. Servo motor is used to drive the joints as in Figure 3.8 [22].

Figure 3.8: Servo Motor

3.3.6 Blynk IoT

This program is a creative platform for developing graphical user interfaces for tasks that will only be carried out through widget drag and drop. Everything can be ready in less than five minutes because it is simple. Blynk has no ties to anything. It is a Module or board that can remotely operate anything through this application platform from any location. Because it has a steady internet connection, this system is called the Internet of Things (loT). Through WiFi and the internet, Blynk can be used to command an Arduino, NodeMCU, or another microcontroller.

Referring to Figure 3.9 and 3.10, this platform has several simple features that do not require the user to navigate through challenging applications, making it incredibly user-friendly. The initiative provided an online Cloud-Server, allowing the mobile app to control or monitor Arduino projects from any location worldwide that has internet to create a mobile app that is the simplest to configure and use.

Figure 3.9: Blynk IoT icon

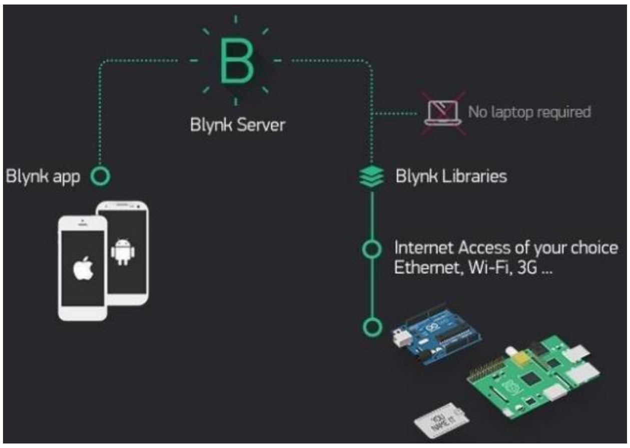


Figure 3.10: Connection using Blynk IoT

3.3.7 Ultrasonic Sensor

Ultrasonic sensors in Figure 3.11 emit sound waves, measure their reflection time, and calculate distances based on the speed of sound. They enable functions like proximity sensing, object detection, liquid level measurement, and gesture recognition in diverse applications such as robotics, automation, IoT devices, and security systems

Figure 3.11: Ultrasonic Sensor

3.3.8 12v DC Power Supply

12V DC power supply serves as a reliable and stable source of electrical power for various IoT devices and components as shown in Figure 3.12. These power supplies typically incorporate features such as compact size, high efficiency, and compatibility with IoT devices that operate on a 12V DC input. They function by converting AC power from a standard wall outlet into DC power with a constant voltage output of 12 volts, ensuring consistent and reliable operation of IoT sensors, actuators, microcontrollers, and other connected devices.

Figure 3.12: 12v DC Power Supply

3.4 PROTOTYPE DEVELOPMENT

The procedure to make coding for the prototype is as follows:

a) Coding for the LED

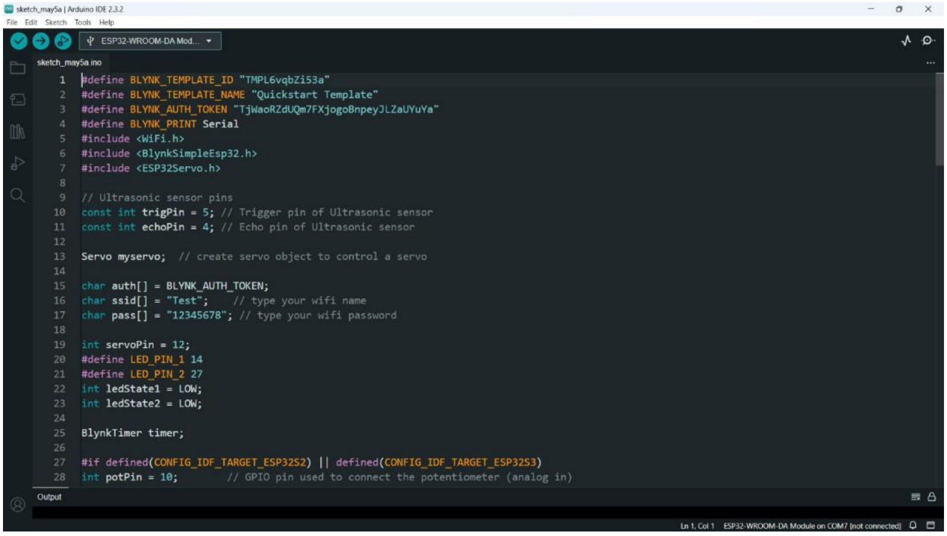


Figure 3.13: LED Coding

This code defines and initializes several components for use with an ESP32 microcontroller. It sets **servoPin** to 12, indicating the pin connected to a servo motor. It defines two LED pins, **LED_PIN_1** as 14 and **LED_PIN_2** as 27, which will control two separate LEDs. Additionally, it initializes **ledState1** and **ledState2** to **LOW**, representing the initial off states for the two LEDs. These definitions and initializations set up the hardware components for subsequent control in the program.

b) Coding for Servo Motor

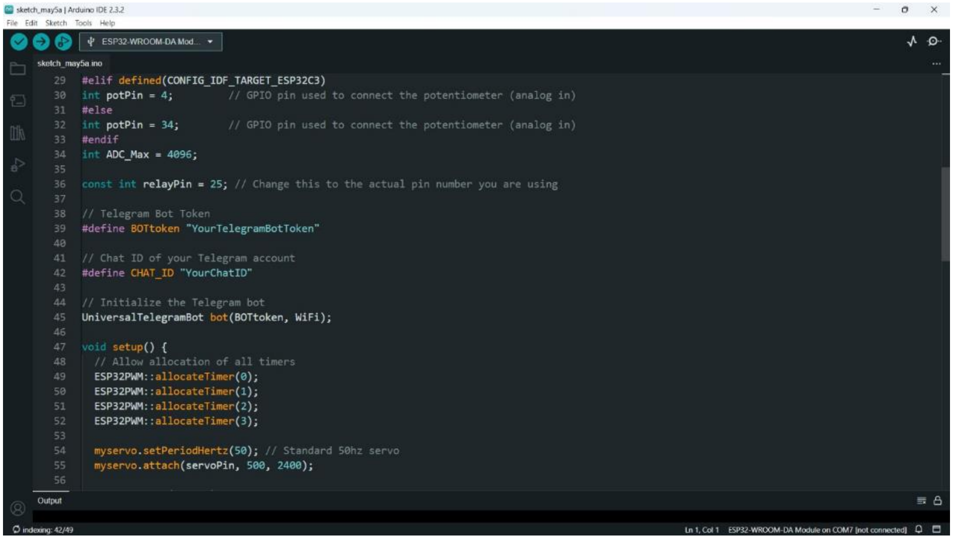


Figure 3.14: Servo Coding

This code sets up different GPIO pins for connecting a potentiometer based on the specific ESP32 microcontroller model in use. If the target is ESP32S2 or ESP32S3, potPin is set to 10; if it's ESP32C3, potPin is set to 4; otherwise, potPin is set to 34. It also defines ADC_Max as 4096, which is the maximum value for analog-to-digital conversion. The relayPin is assigned to pin 25 for controlling a relay. Additionally, it configures a servo motor by setting its frequency to 50 Hz and attaching it to servoPin with a pulse width range between 500 and 2400 microseconds, ensuring proper servo control.

c) Coding for Solenoid

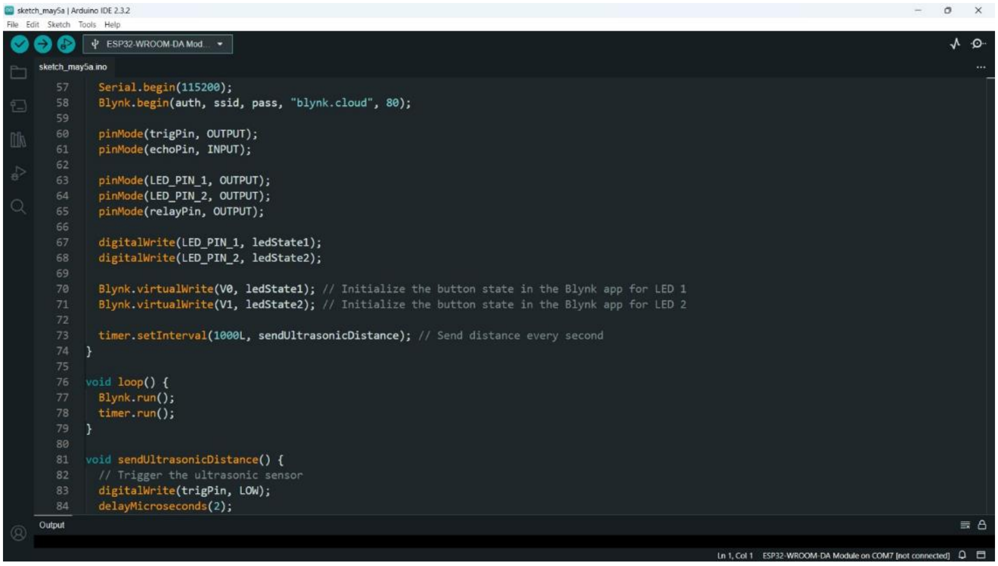


Figure 3.15: Solenoid Coding

This code snippet integrates the Blynk IoT platform to control a relay connected to pin 25 of an ESP32 microcontroller. It defines relayPin as 25 and sets up a Blynk virtual pin V4 callback function (BLYNK_WRITE(V4)). When the state of the virtual pin V4 changes, the function retrieves the new state (either 0 or 1) from the Blynk app using param.asInt(). It then writes this state to relayPin using digitalWrite(relayPin, relayState), thereby toggling the relay on or off based on the input received from the Blynk app.

d) Coding for Ultrasonic Sensor

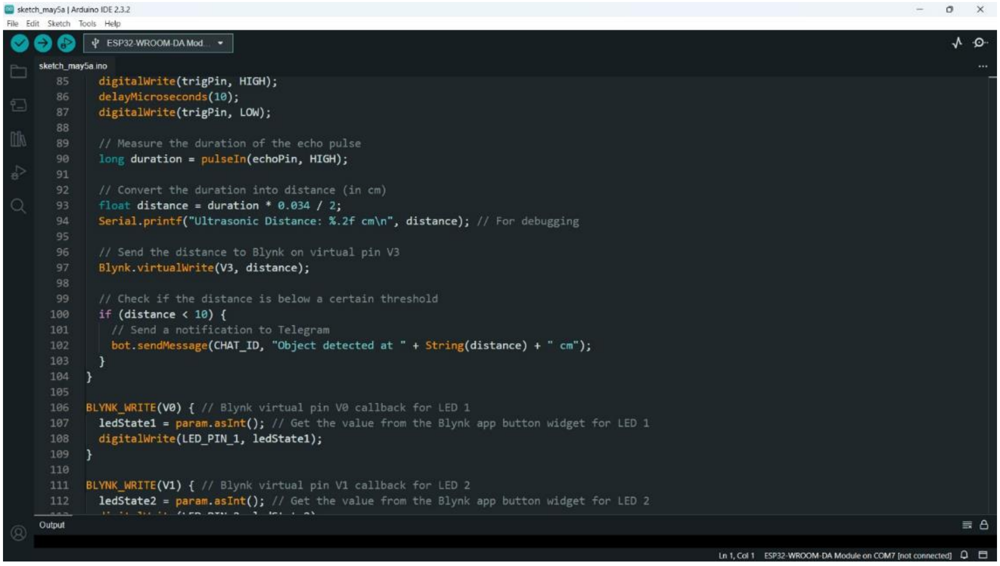


Figure 3.16: Ultrasonic Sensor Coding

The **sendUltrasonicDistance()** function triggers an ultrasonic sensor to measure distance. It sets the **trigPin** (connected to the ultrasonic sensor's trigger pin) low for 2 microseconds to ensure a clean signal start, then high for 10 microseconds to send a pulse. Finally, it sets the **trigPin** low again. This sequence initiates a sound wave from the sensor, which will be used to calculate the distance based on the time it takes for the echo to return to the sensor.

e) Coding for command using Blynk apps.

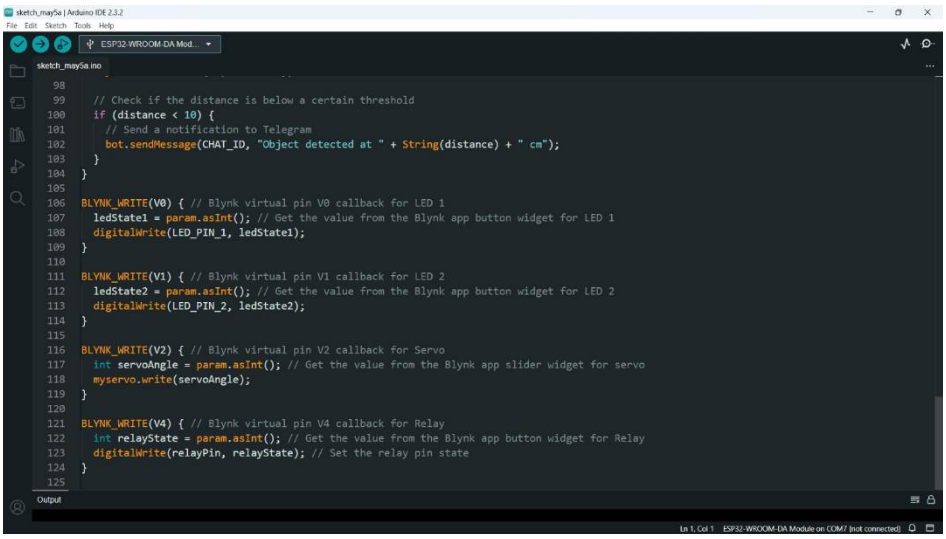
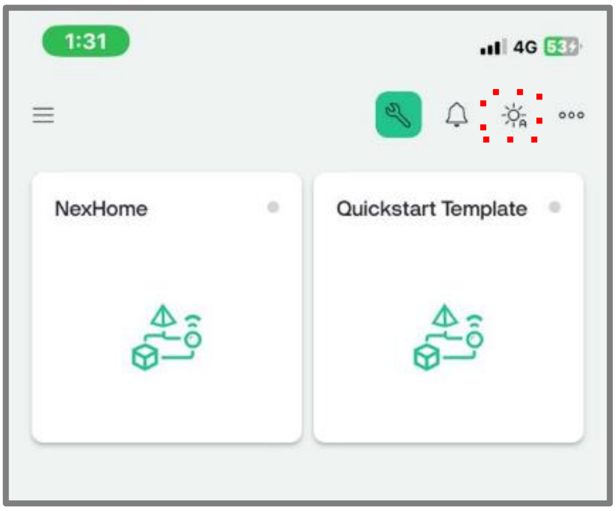


Figure 3.17: Coding for command using Blynk apps

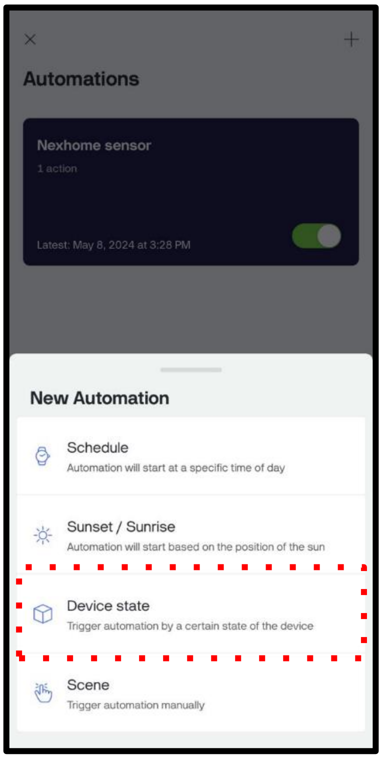
This code configures Blynk virtual pin callbacks to control various hardware components connected to an ESP32 microcontroller. Specifically, `BLYNK_WRITE(V0)` and `BLYNK_WRITE(V1)` handle the state changes for two LEDs connected to `LED_PIN_1` (pin 14) and `LED_PIN_2` (pin 27), respectively, toggling them on or off based on input from the Blynk app. `BLYNK_WRITE(V2)` adjusts the angle of a servo motor based on the value received from a Blynk slider widget, using `myservo.write (servoAngle)`. Finally, `BLYNK_WRITE(V4)` controls a relay connected to `relayPin` (pin 25), setting its state based on the input from a Blynk button widget. Each callback function retrieves the respective value from the Blynk app and updates the hardware accordingly.

f) Blynk apps setting for the notification:



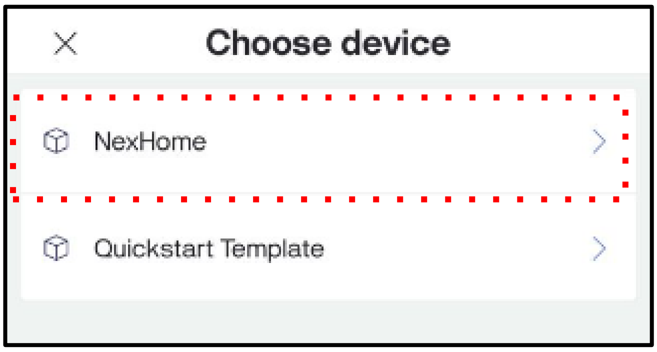
Figures 3.18: Blynk Template

i) The first step is open the Blynk app, click the Automations button.



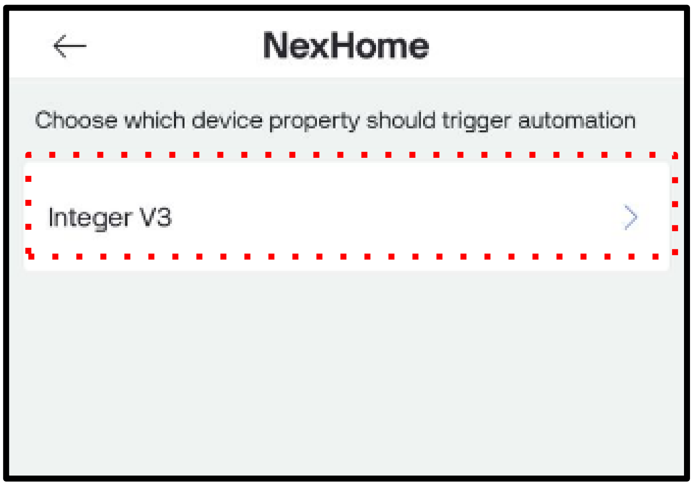
Figures 3.19: Blynk Template

ii) Second step is choosing the device state



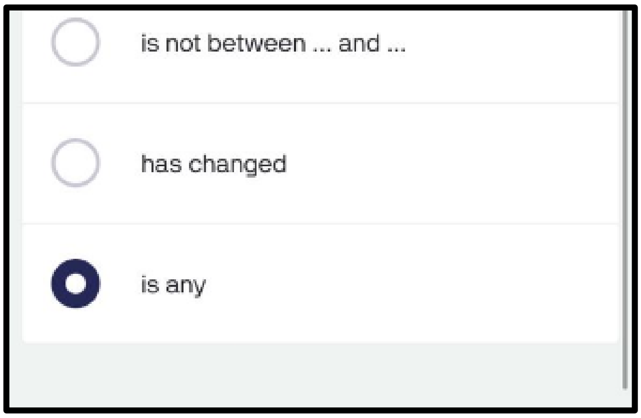
Figures 3.20: Blynk Template

iii) Third step is choosing device based on our project which is NexHome



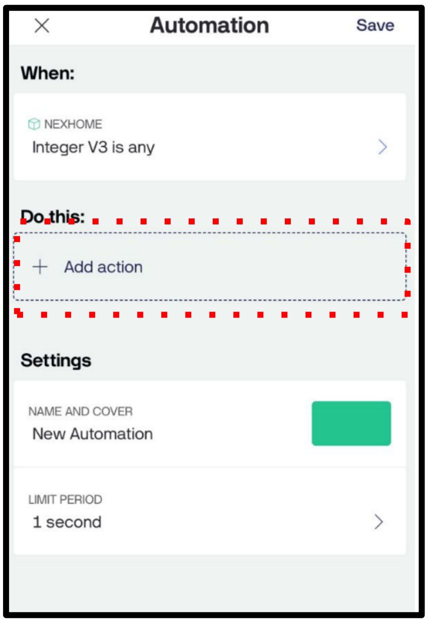
Figures 3.21: Blynk Template

iv) Then choose which device property should trigger the automation for example our project set up use the integer V3.



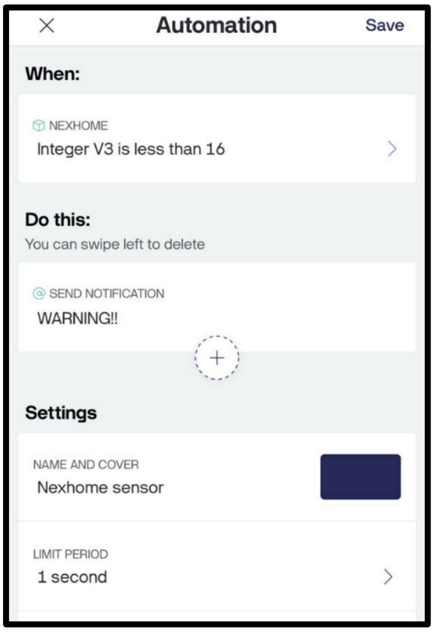
Figures 3.22: Blynk Template

v) After that, select any command you like.



Figures 3.23: Blynk Template

vi) After that fill the action with any action such as giving warning sign to your project.



Figures 3.24: Blynk Template

vii) Lastly save the setting for notification set up.

g) The procedure to build the house model is as follows:

1. Start by sketching your house design on paper, including dimensions and features such as doors, windows, and roof shape.

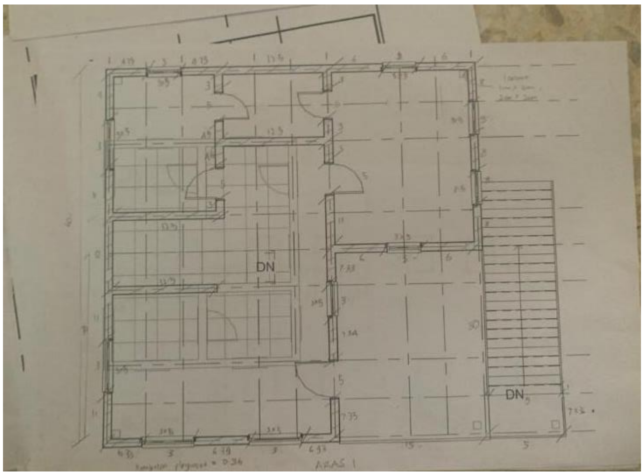


Figure 3.25: Sketching drawing

2. Decide on the scale of your model. For example, 1 inch on your model could represent 1 foot in real life.

Figure 3.26: Scaling the drawing

3. Use a craft knife or saw to cut wooden boards into the desired lengths for the walls, roof, and other structural elements.

Figure 3.27: Cutting the wooden board

4. Cut excess wood for a model house beam and columb with a wood cutting machine in the workshop.

Figure 3.28: Sample after cutting the excess wood

5. Carefully cut out openings for doors and windows if necessary.
6. Sand down any rough edges to create a smooth finish.

Figure 3.29: Sanding the wood

7. Begin by assembling the beam and columb of the house. Using screw to the edges of the wooden pieces and carefully attach them together to form the frame according to your design.


Figure 3.30: Assembling the frame

8. Paint the frame of the house model using wood shell paint.

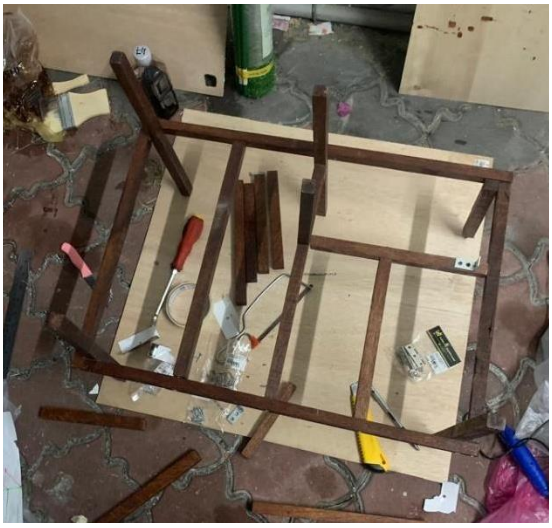


Figure 3.31: Paint the frame

9. After that assembling the wall and floor into the frame house model.

Figure 3.32: Assembling the floor and the walls

10. Cut out roof pieces according to your design, ensuring they are appropriately sized to fit the top of your house walls.
11. Attach the roof pieces together and then to the top of the walls, forming the roof structure.

Figure 3.33: Attach the roof

12. Use additional wooden pieces to create doors, windows, and stairs. Attach them to the walls using glue.

Figure 3.34: Creating stair

13. Add some decoration to the model, then the house model is done.

Figure 3.35: Model of the Complete prototype

3.5 GANTT CHART

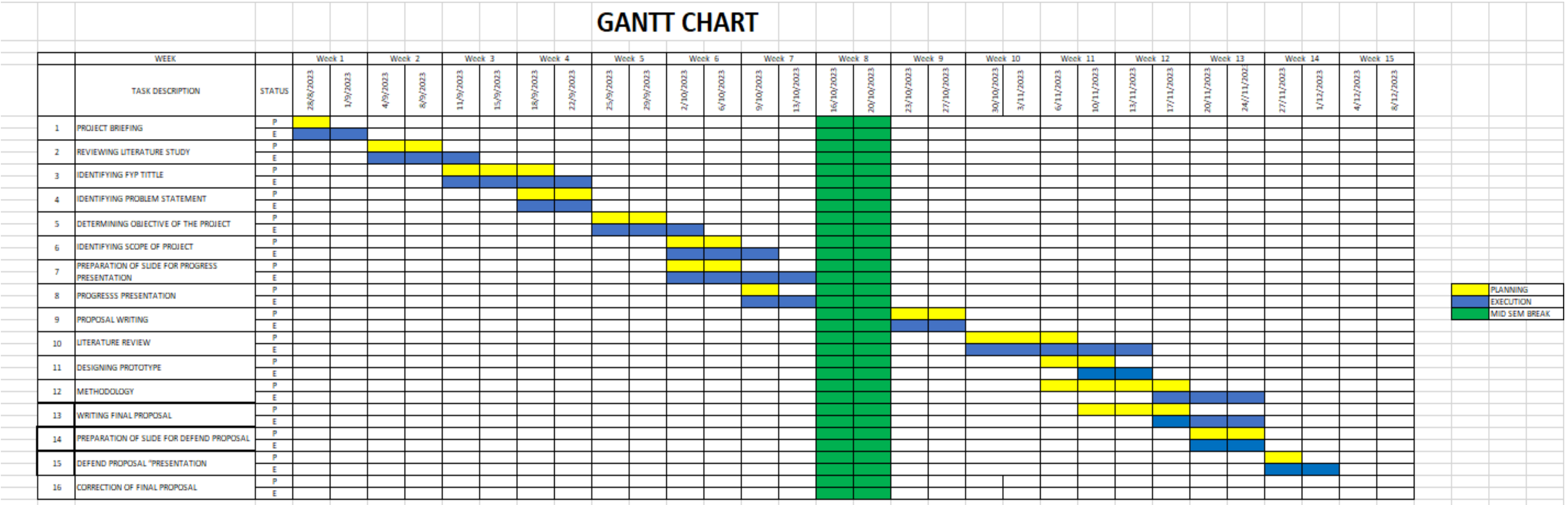


Figure 3.36: Gantt Chart for FYP 1

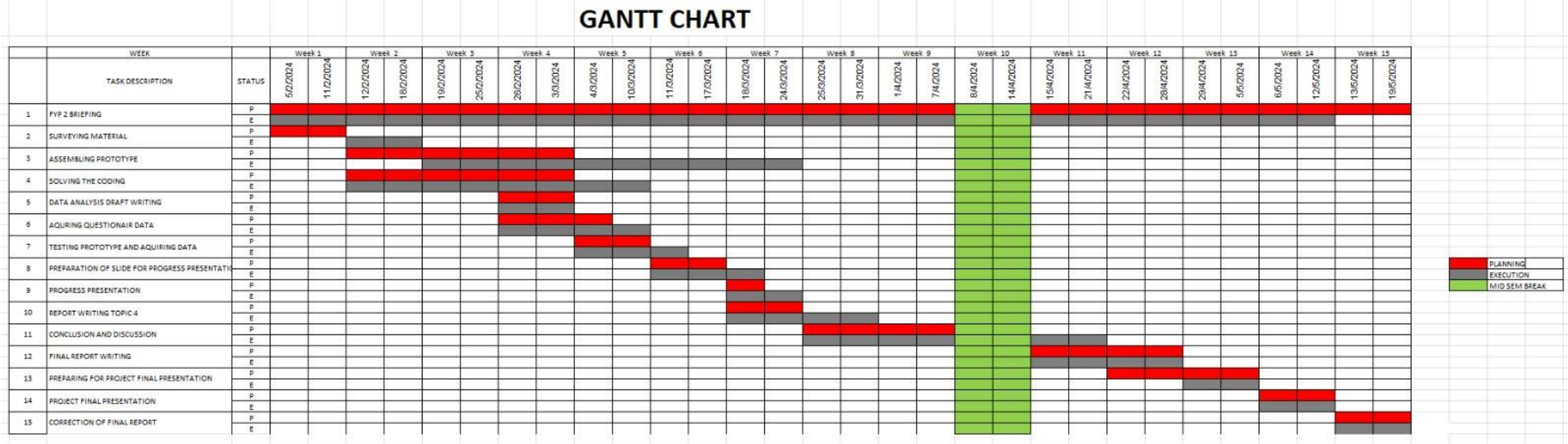


Figure 3.37: Gantt Chart for FYP 2

3.6 SUMMARY

The research study's design and execution, including information on sampling, data gathering techniques, analysis protocols, and research design, are briefly described in the methodology section. This section provides readers with a road map for understanding the study's methodical approach. Whether the study is experimental, observational, qualitative, or quantitative helps to describe the research design. The goals and research questions guide this decision. Information regarding the changed variables and the control strategies is crucial for experimental research. One of the most important factors is the sampling procedure, which chooses the subjects or participants for the study. It includes defining the target population, explaining why a random sampling technique was selected for every given facility, and providing details on the sampling technique.

Furthermore, the intended level of precision and statistical considerations supports the sample size. Instruments, tools, and information-gathering strategies are examples of data collection methods. Surveys, interviews, experiments, observations, or a combination of these may be used in this process. To guarantee accuracy in data selection, these tools' validity and reliability are frequently examined. To illustrate how the gathered data would be handled and evaluated, data analysis processes are described. Descriptive coding, statistical testing, and other analytical techniques can be employed to get this data. The tools and software used to analyze the data are also included in this section.

CHAPTER 4

RESULT ANALYSIS

4.1 INTRODUCTION

In our increasingly complex age, using technology in everyday life has become necessary. An increasingly attractive feature is the simplicity of home appliances that can be intelligently and efficiently controlled. This study aims to provide such a feature to users by developing a sensor on the 'Blynk' platform. The main purpose of this research is to design users who can easily control their home appliances, develop sensors, and evaluate the efficiency and functionality of the sensors using the 'Blynk' platform.

Users can enjoy greater comfort while reducing unnecessary energy consumption through these measures. This study also emphasizes the importance of adapting technology in everyday life to improve the quality of life. Thus, this research not only provides a new alternative to managing home appliances but also brings its users positive long-term benefits.

4.2 Data Analysis

4.2.1 Demographic Information

The questionnaire began with demographic information questions. Demographics are statistics that describe populations and their characteristics. Demographic analysis is a population study based on factors such as age, race, and sex

Demographic data refers to statistical socioeconomic information, including employment, education, income, marriage, etc.

Based on the questionnaire, the gender distribution among the respondents shows a slight majority of females at 55.6%, compared to males at 44.4% as in Figure 4.1. This distribution suggests a relatively balanced representation, which could provide valuable insights into perspectives on smart home technology from both genders. Understanding how different genders perceive and interact with smart home systems can be crucial for designing inclusive and user-friendly solutions. By analyzing the responses based on gender, you may uncover nuanced preferences, concerns, and priorities that can inform the development and implementation of smart home technologies tailored to diverse user needs.

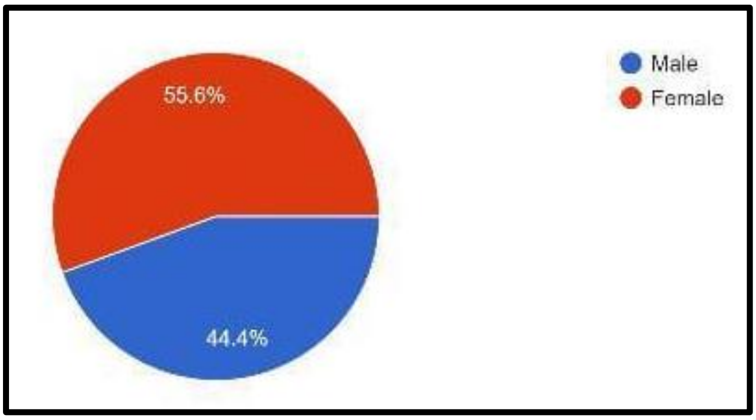


Figure 4.1: Gender

The distribution of education qualifications among the respondents highlights a significant majority, with 69.4% holding diplomas, 19.4% with bachelor's degrees, 8.3% with PhDs or higher qualifications, and the remaining respondents holding master's degrees as in Figure 4.2. This distribution suggests that a considerable portion of the respondents have attained qualifications at the diploma level, indicating a diverse range of backgrounds and experiences.

Understanding participants' educational backgrounds is essential for contextualizing their perspectives on smart home technology. It can provide valuable insights into technical understanding, familiarity with advanced concepts, and potential preferences for user interfaces and features. Analyzing responses based on education qualifications can help tailor smart home solutions to meet the needs and expectations of users with varying levels of educational attainment.

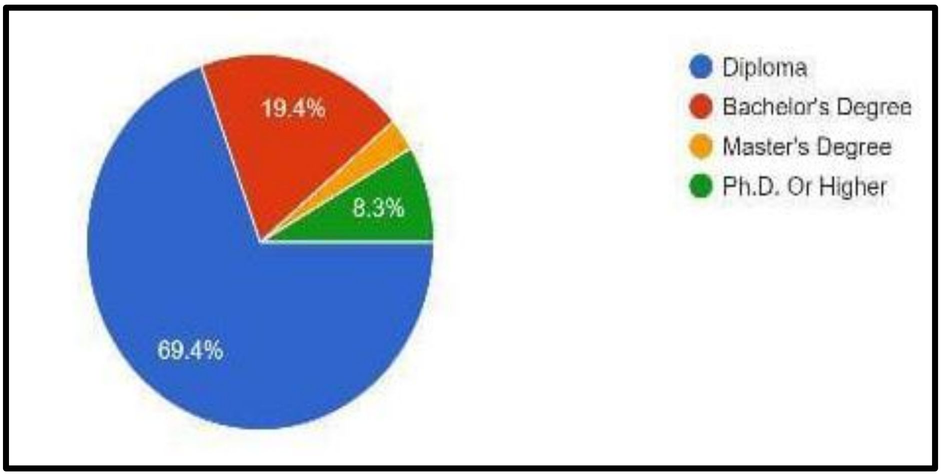


Figure 4.2: Education qualification

4.2.2 Smart Home system

Figure 4.3 shows the response to the question regarding prior awareness of smart home or smart building technology reveals a high level of familiarity among the respondents, with 80.6% indicating that they have heard of it. This finding suggests that the concept of smart homes or smart buildings is relatively well-known among the surveyed population. Most respondents who know this technology indicate a potential readiness and openness to engage with smart home prototypes and related discussions.

However, the 19.4% who responded negatively could represent an opportunity to further educate individuals about the benefits and functionalities of smart home systems. Understanding respondents' awareness level is crucial for assessing the effectiveness of educational efforts and tailoring future outreach strategies to ensure widespread understanding and adoption of smart home technologies.

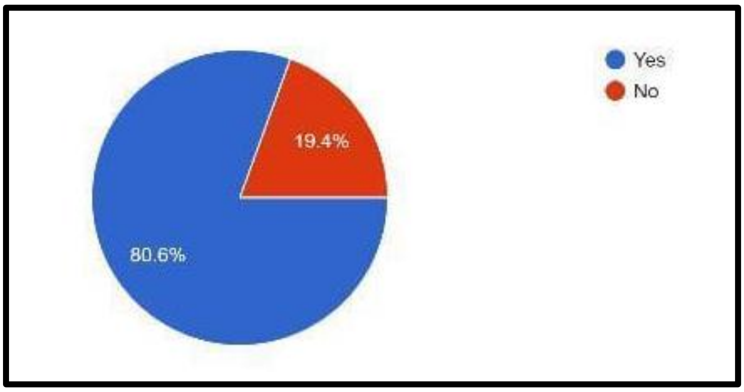


Figure 4.3: Awareness of smart home technologies

The overwhelmingly positive response rate of 97.2% from respondents indicating a preference for a smart home system in their houses suggests a strong inclination towards adopting this technology as in Figure 4.4. This high level of agreement underscores participants' significant interest and willingness to integrate smart home solutions into their living spaces. The enthusiasm expressed by most respondents signals a growing recognition of the potential benefits of smart home systems, such as enhanced convenience, energy efficiency, and security.

However, it's noteworthy that a small percentage of respondents disagreed with the idea of having a smart home system. Understanding their reluctance can provide valuable insights into potential barriers or concerns that must be addressed to promote broader acceptance and adoption of smart home technology. Overall, most respondents' overwhelmingly positive sentiment towards smart home systems indicates a promising market for such innovations.

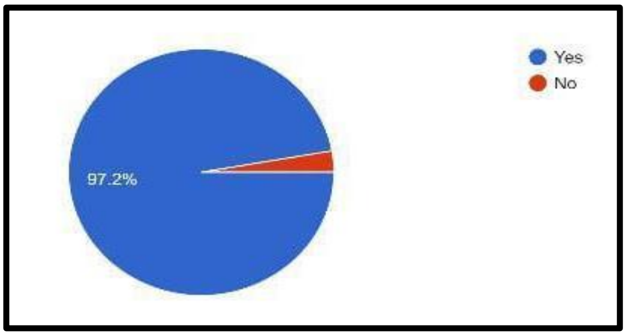


Figure 4.4: Preference for a smart home system

Figure 4.5 shows the unanimous agreement of 100% among respondents regarding the helpfulness of smart sensors in daily life highlights a widespread recognition of the value that these technologies bring to everyday routines. This collective acknowledgment suggests that individuals perceive smart sensors as essential tools for enhancing various aspects of daily life, such as convenience, efficiency, and safety.

It shared understanding of the benefits offered by smart sensors, which may include automating tasks, monitoring environmental conditions, and improving overall comfort and security within homes or workplaces. Such widespread agreement indicates a strong consensus among respondents regarding the positive impact of smart sensors, reaffirming their relevance and importance in modern living environments.

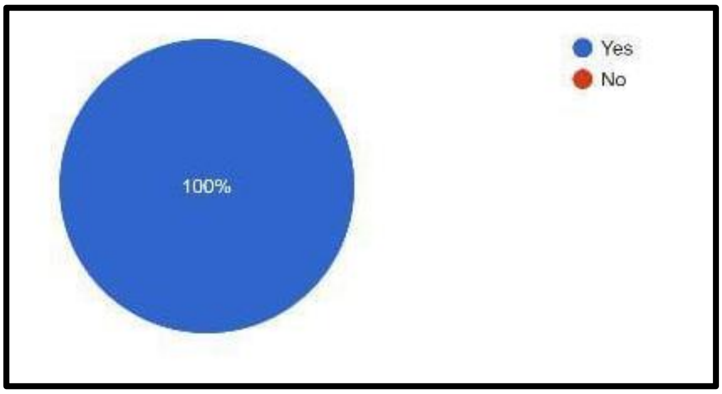


Figure 4.5: Helpfulness of smart sensor in daily life

Figure 4.6 shows the unanimous agreement of 100% among respondents regarding the notion that smart sensors or smart home technology make their lives easier signifies a widespread recognition of the transformative impact these innovations have on daily routines. This overwhelming consensus suggests that individuals perceive smart sensors and smart home systems as invaluable tools for streamlining tasks, increasing efficiency, and enhancing overall quality of life.

It also reflects a shared understanding of the practical benefits offered by these technologies, such as automating repetitive chores, optimizing energy consumption, and providing remote access and control over home devices. Furthermore, the unanimous agreement underscores a collective appreciation for the convenience, comfort, and peace of mind that smart home technology affords, reaffirming its status as an indispensable aspect of modern living.

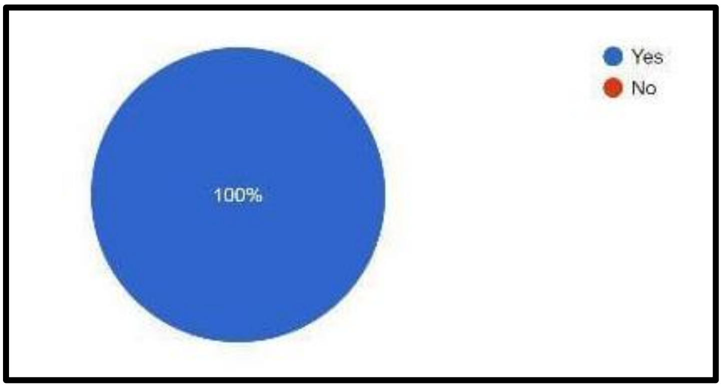


Figure 4.6: Smart sensor in making life easier

The unanimous agreement of 100% among respondents regarding the potential of smart home systems to upgrade home management reflects a widespread anticipation of the transformative benefits these technologies can bring to household operations. This unanimous consensus suggests that individuals perceive smart home systems as powerful tools for modernizing and optimizing various aspects of home management. By integrating advanced features such as remote monitoring, automated controls, and intelligent analytics, smart home systems offer the promise of enhancing efficiency, convenience, and overall functionality within the home environment.

It also shared belief in the capacity of smart home technology to streamline tasks, improve organization, and ultimately elevate the quality of life for homeowners. This collective optimism signals a strong endorsement of smart home systems as essential components of contemporary home management practices, highlighting their potential to revolutionize the way households operate and function in the future.

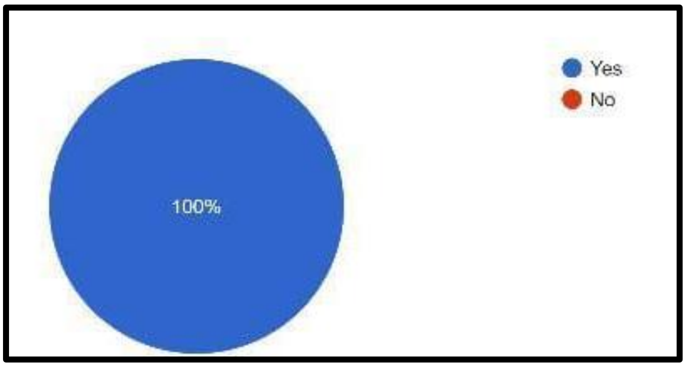


Figure 4.7: Smart home system upgrade home management

The distribution of responses regarding the user-friendliness of the smart home prototype suggests a generally positive perception among most respondents. With 41.7% strongly agreeing and 55.6% simply agreeing, there is a significant consensus that the prototype is user-friendly. This collective sentiment highlights a promising indication that the smart home prototype has been designed with the end user in mind, prioritizing ease of use and accessibility. The substantial proportion of respondents expressing strong agreement suggests that many find the prototype exceptionally intuitive and straightforward to interact with.

However, it's worth noting that some respondents needed clarification about the user-friendliness of the prototype. Their uncertainty may stem from unfamiliarity with smart home technology or specific design elements that could be further refined for improved usability. Addressing any areas of uncertainty through user feedback and iterative design improvements can help ensure that the smart home prototype meets its intended users' diverse needs and preferences, ultimately enhancing its overall usability and effectiveness.

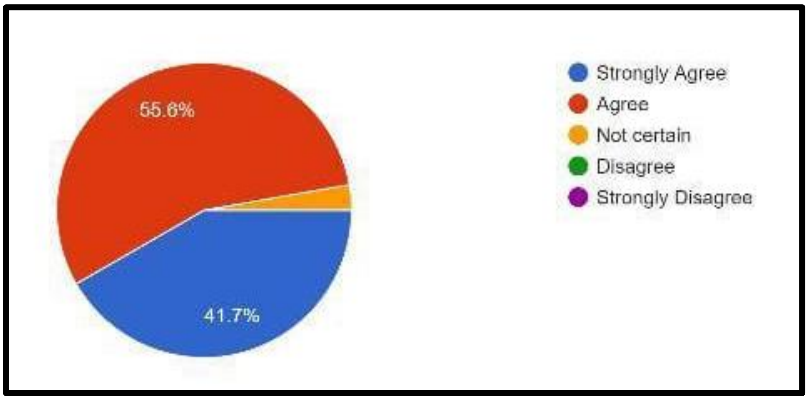


Figure 4.8: User friendliness

Figure 4.9 represent the responses to the statement regarding whether the smart home prototype enhances convenience for users and efficiency of smart living demonstrate a range of opinions among respondents. While a notable 41.7% agree and 13.9% strongly agree with the statement, indicating a substantial proportion acknowledging the prototype's positive impact, there are also contrasting viewpoints. A significant portion, 25%, strongly disagree, suggesting a notable scepticism or dissatisfaction with the prototype's ability to enhance convenience and efficiency.

Additionally, 16.7% express uncertainty, indicating a need for further clarification or potential improvements in communication regarding the prototype's benefits. The presence of respondents who disagree further highlights areas for potential refinement or enhancement in the prototype's functionality or user experience. Gathering feedback from both satisfied and dissatisfied users can provide valuable insights for optimizing the smart home prototype to better meet the diverse needs and expectations of its user base, ultimately striving towards a solution that maximizes convenience and efficiency for all users.

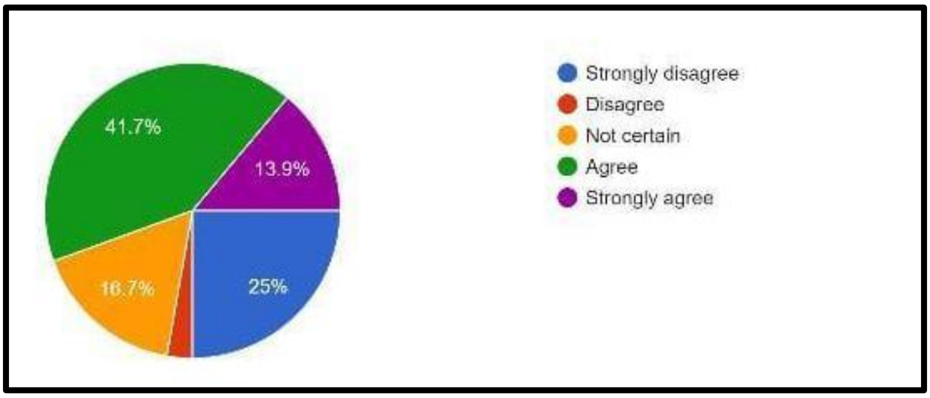


Figure 4.9: Convenience and efficiency

Figure 4.10 shows most respondents expressing agreement (63.9%) and strong agreement (30.6%) with the statement regarding the prototype's contribution to energy conservation by enabling users to monitor appliance settings suggests a widespread recognition of its positive impact in this regard. This collective acknowledgment underscores the importance of empowering users with the tools and insights needed to manage energy consumption effectively within their homes. By providing the capability to monitor and adjust appliance settings, the smart home prototype offers users greater control over their energy usage, facilitating more informed decisions and promoting responsible energy conservation practices.

However, it's worth noting that a portion of respondents disagreed with the statement, indicating potential areas for improvement or refinement in the prototype's energy monitoring and management features. Addressing any concerns or limitations identified by these respondents can help enhance the effectiveness and user satisfaction of the smart home prototype in promoting energy conservation efforts.

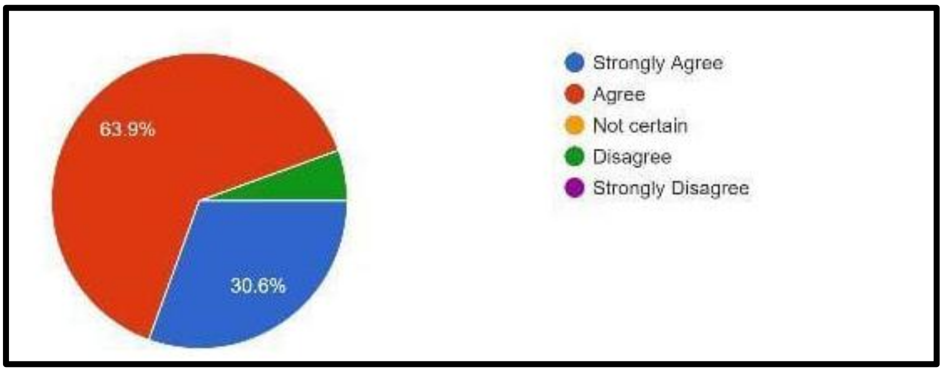


Figure 4.10: Energy conservation

Figure 4.11 presented the significant agreement strong agreement rates of 55.6% and 33.3%, respectively, regarding the smart home prototype's promotion of a sustainable lifestyle indicate a strong endorsement of its potential to encourage environmentally conscious behaviours among users. This collective sentiment suggests that respondents perceive the prototype as an effective tool for fostering sustainable living practices within the home environment. By incorporating features such as energy conservation, resource optimization, and environmental monitoring, the smart home prototype enables users to reduce their ecological footprint and contribute to a more sustainable future.

The substantial proportion of respondents expressing agreement and strong agreement underscores the prototype's ability to inspire positive changes in lifestyle and consumption patterns, aligning with broader societal goals of environmental responsibility and conservation. This collective endorsement highlights the importance of integrating sustainability considerations into the design and development of smart home technologies, leveraging their potential to drive meaningful impact and promote a greener way of life.

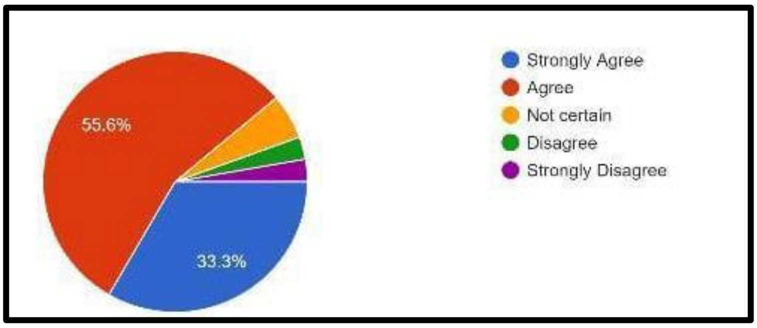


Figure 4.11: Promoting sustainable lifestyle

The combined percentage of 44.4% strongly agreeing and 47.2% agreeing with the statement regarding the enhancement of home security by the smart home prototype indicates a widespread recognition of its effectiveness in this regard as in Figure 4.12. This substantial agreement suggests that respondents perceive the ability to remotely activate lights or other devices to simulate presence as a valuable feature for bolstering home security. By leveraging smart technology to create the illusion of occupancy even when residents are away, the prototype provides users with a proactive means of deterring potential intruders and enhancing overall safety.

The high proportion of respondents expressing strong agreement further underscores the perceived importance and effectiveness of this security-enhancing functionality. However, it's essential to address any concerns or reservations expressed by the remaining respondents, as their perspectives may highlight areas for improvement or optimization in the prototype's security features. Overall, the widespread agreement among respondents suggests that the smart home prototype offers a compelling solution for enhancing home security through innovative and convenient means.

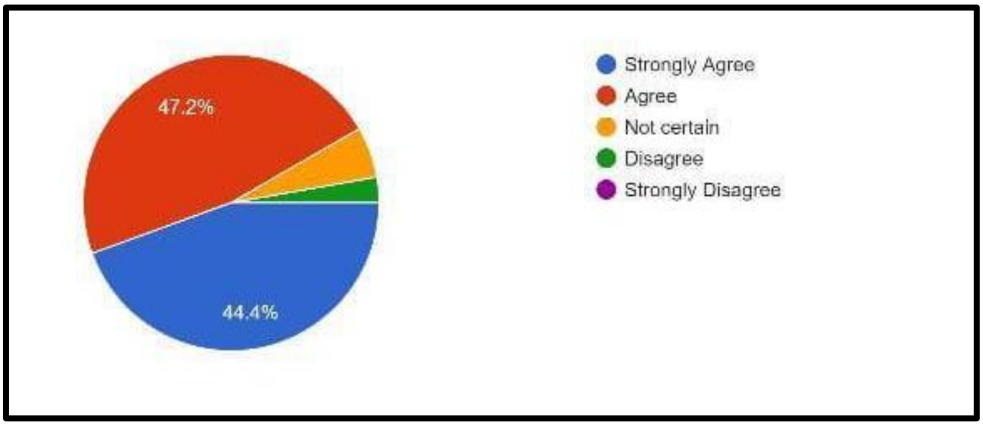


Figure 4.12: Enhancement of home security

The responses to the statement regarding the impact of Internet of Things (IoT) technology on the interaction and management of home appliances demonstrate a range of perspectives among respondents. While 44.4% agree with the statement, indicating a recognition of the transformative effects of IoT on home appliance interaction and management, there is also a notable proportion expressing scepticism or disagreement. The 27.8% who strongly disagree and the 19.4% who are not certain suggest differing opinions regarding the extent of IoT's revolutionizing influence in this context.

It is possible that those who strongly disagree may have reservations about the reliability, security, or practicality of IoT-enabled home appliances, while those who are uncertain may require further clarification or evidence to form a conclusive opinion. Addressing concerns and providing additional information about the benefits and capabilities of IoT technology in the context of home appliance management can help alleviate doubts and foster a better understanding among respondents. Overall, the varied responses highlight the complex and evolving nature of attitudes towards IoT and its role in reshaping household dynamics and routines.

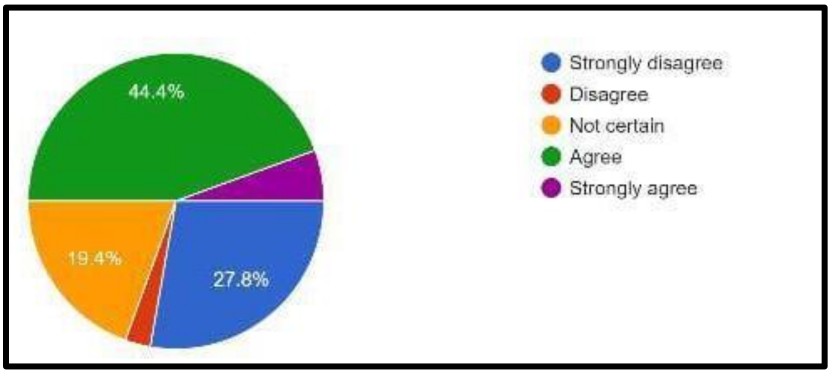


Figure 4.13: Revolution of IoT in smart home system

The responses to the statement regarding the integration of IoT technology in managing home appliances within the smart home prototype demonstrate a diverse range of opinions among respondents. While a notable proportion, 41.7%, agree with the statement, suggesting a recognition of the potential for IoT to optimize appliance performance, there are also contrasting viewpoints. A significant portion, 25%, strongly disagree, indicating scepticism or reservations about the effectiveness or practicality of IoT-enabled management in this context. Additionally, 22.2% express uncertainty, suggesting a need for further clarification or evidence to form a definitive opinion.

The 11.1% who strongly agree highlight a smaller but still notable subset of respondents who strongly endorse the integration of IoT technology for managing home appliances within the smart home prototype. Addressing concerns, providing additional information, and potentially showcasing real-world examples of IoT-enabled appliance management can help alleviate doubts and foster a better understanding among respondents. Overall, the varied responses underscore the complexity of perceptions surrounding the integration of IoT technology in optimizing appliance performance within smart home environments.

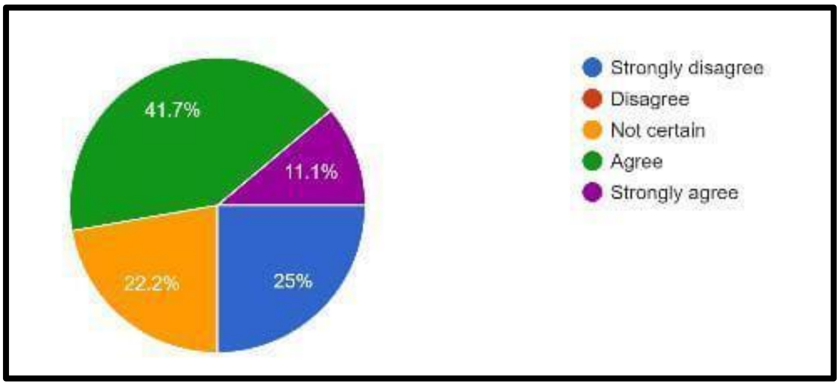


Figure 4.14: IoT technology optimized performance

4.3 DISCUSSION

In response to the feedback from our questionnaire regarding our smart home prototype, several key areas for improvement and enhancement have been identified. These areas include user-friendliness, energy conservation features, security features, integration of IoT technology, sustainability promotion, and user education and training. Each of these areas is crucial for the successful implementation and adoption of our smart home prototype, and addressing the concerns raised by our respondents will be instrumental in achieving our goals.

i. User-Friendliness

The first area of focus is the user-friendliness of our prototype. It is essential that our system is intuitive and easy to use for a wide range of users, including those with varying levels of technical expertise. To address the concerns raised by respondents, we will simplify the interfaces, improve the intuitiveness of the system, and provide clearer instructions or guidance for users. This will involve conducting user testing sessions with a diverse group of participants to identify any potential usability issues and make the necessary adjustments.

ii. Energy Conservation Features

The second area of focus is the energy conservation features of our prototype. Respondents have expressed concerns about the effectiveness of our system in promoting energy conservation. To address these concerns, we will enhance the energy monitoring and management capabilities of our system. This may involve optimizing the algorithms used for energy consumption analysis and implementing additional features that allow users to easily identify and reduce their energy usage. We will also provide additional educational resources on energy-saving practices to help users understand how they can contribute to energy conservation efforts.

iii. Security Features

The third area of focus is the security features of our prototype. Respondents have expressed reservations about the security of our system, particularly in terms of data privacy and integrity. To address these concerns, we will enhance the encryption protocols used by our system and improve the authentication mechanisms to safeguard user privacy and data integrity. This will involve working closely with cybersecurity experts to ensure that our system is secure against potential threats and vulnerabilities.

iv. Integration of IoT Technology

The fourth area of focus is the integration of IoT technology in managing home appliances. Respondents have expressed uncertainties and scepticism about the benefits and effectiveness of IoT-enabled appliance management within smart home environments. To address these concerns, we will provide additional information and evidence showcasing real-world examples and case studies demonstrating the benefits and effectiveness of IoT-enabled appliance management. This will involve conducting a comprehensive review of existing literature and case studies on the subject and presenting this information in a clear and accessible format to our respondents.

v. Sustainability Promotion

The fifth area of focus is the promotion of sustainability within our prototype. Respondents have expressed a desire for our system to encourage environmentally conscious behaviors. To address this, we will explore ways to further promote sustainability within our prototype, such as incorporating additional features or functionalities that support sustainable living practices. This may involve working with environmental experts to identify and implement features that have a positive impact on the environment, such as energy-efficient appliance management and water conservation features.

vi. User Education and Training

The final area of focus is user education and training. Respondents have expressed a desire for educational resources and training opportunities to help them maximize the benefits of our smart home prototype. To address this, we will offer tutorials, workshops, and online resources to enhance users' understanding of the system's capabilities and empower them to utilize its features more effectively. This will involve developing a comprehensive training program that covers all aspects of the system, from basic operation to advanced features.

4.4 CONCLUSION

In conclusion, the development and implementation of smart home technology, particularly using sensors on the Blynk platform, present a promising avenue for enhancing the quality of life by offering greater convenience, energy efficiency, and security. The feedback from our questionnaire responses underscores the importance of addressing key areas for improvement, including user-friendliness, energy conservation, security, integration of IoT technology, sustainability promotion, and user education. By focusing on these areas, the project aims to refine the smart home prototype to better meet the needs and expectations of users, thereby ensuring its successful adoption and widespread impact. This approach aligns with the broader goal of leveraging technology to improve everyday life, as highlighted in the research on smart home services and the development of context-based solutions for scenarios. By continuously adapting and refining our smart home prototype based on user feedback and technological advancements, we can contribute to the ongoing evolution of smart home technology, ultimately benefiting users and society at large.

4.5 SUMMARY

This study aims to enhance home appliance control through sensors on the 'Blynk' platform, focusing on user comfort, energy efficiency, and technological integration into daily life. Questionnaire data show balanced gender representation and diverse educational backgrounds, with strong awareness and preference for smart home systems. Key improvement areas include user-friendliness, energy conservation, security, IoT integration, sustainability, and user education. Addressing these areas will refine the smart home prototype, better meet user needs, ensure successful adoption, and contribute to the advancement of smart home technology.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

To enhance home living experiences, the 'NEXHOME-Smart Home' prototype aims to revolutionize traditional household functionalities by integrating cutting-edge technology. As part of our development process, a comprehensive questionnaire was conducted to gather valuable insights from potential users. This feedback not only validates our design choices but also provides a foundation for refining and optimizing the prototype to better meet the needs and preferences of our target audience. In this section, we present a summary of the feedback received, along with recommendations for further improvement, ensuring the Smart Home prototype aligns seamlessly with the expectations and desires of modern homeowners.

5.2 RECOMMENDATIONS

Several crucial areas require attention to resolve the issues brought up by respondents and enhance the smart home prototype's overall efficacy as follows:

i. Make the system user-friendly is essential to ensuring users are at ease and confident while engaging. It entails making interfaces more user-friendly, improving intuitiveness, and offering precise directions or support for navigating different functions.

ii. Improve its energy-saving features to ease worries about how well the prototype encourages energy-saving behaviours.

iii. Provide the users with real-time insights into their energy consumption patterns might entail optimizing energy monitoring and management capabilities and

iv. providing extra instructional resources on energy-saving advice and best practices.

v. Improving security measures to resolve respondents' concerns about data integrity and privacy is also essential. It may entail strengthening authentication procedures, introducing more security measures, and optimizing encryption algorithms to protect user information.

vi. Customers' doubts and anxieties can be reduced by offering more proof and information about the advantages of integrating IoT technology with home appliance management. It also could be accomplished by presenting case studies and real-world examples highlighting the benefits of IoT-enabled appliance control in smart home settings.

vii. Promote the environmentally sensitive habits, the prototype must continue promoting sustainability. It could entail adding extra features or functionalities—like water-saving or energy-efficient appliance settings—that promote sustainable living practices.

viii. Educate the public about the environmental advantages of utilizing smart home technology through community outreach programs or educational campaigns.

ix. Provide the users with extensive tutorials, workshops, and online resources for user education and training can enable them to get the most out of the smart home prototype and improve their experience.

5.3 CONCLUSION

In conclusion, the feedback obtained from our questionnaire has been instrumental in shaping the direction of our Smart Home prototype. By carefully analyzing the responses provided by participants, we have gained valuable insights into the features and functionalities that resonate most with potential users. Moving forward, this project is committed to incorporating these insights into the further development and refinement of the NEXHOME prototype, ensuring that it meets and exceeds modern homeowners' expectations. With a continued focus on user-centric design and continuous improvement, the NEXHOME-Smart Home prototype will pave the way for a more convenient, efficient, and enjoyable living experience for users around the globe.

5.4 SUMMARY

The final year project constitutes a comprehensive exploration into the concept, coding in SHT and the use of Blynk apps, known as the remote controller of the NEXHOME project. The main objective of this project to design the NEXHOME using espressif system 32 (ESP32), to design users with the convenience of controlling their home appliances,to develop the sensor using Blynk apps and to evaluate the efficiency and functionally of the sensor by using the Blynk apps. The 'NEXHOME-Smart Home' prototype aims to revolutionize household functionalities through advanced technology, guided by comprehensive user feedback. Key recommendations include enhancing user-friendliness, improving energy-saving features with real-time consumption insights, and providing educational resources on energy conservation. Strengthening security measures and offering evidence of IoT benefits through case studies are also essential. Additionally, promoting sustainable living practices and educating the public on the environmental advantages of smart home technology are crucial. Extensive tutorials, workshops, and online resources will further enhance user experience. Incorporating these insights ensures the NEXHOME prototype meets modern homeowners' expectations for a convenient, efficient, and enjoyable living experience.

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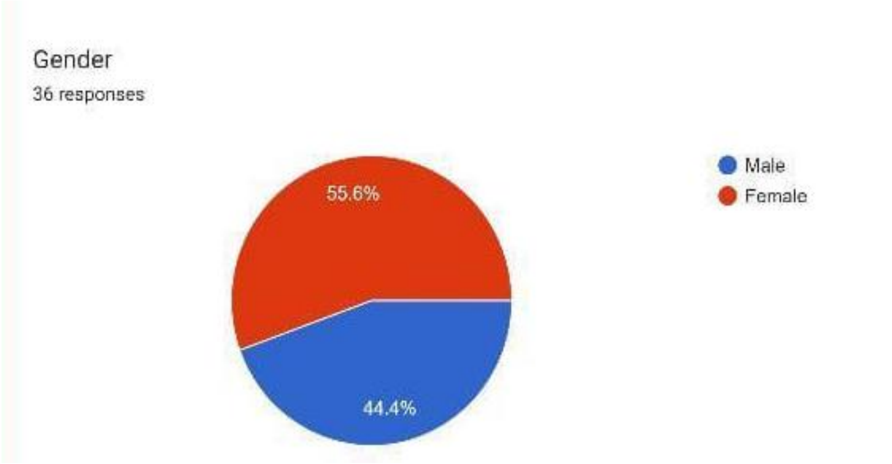
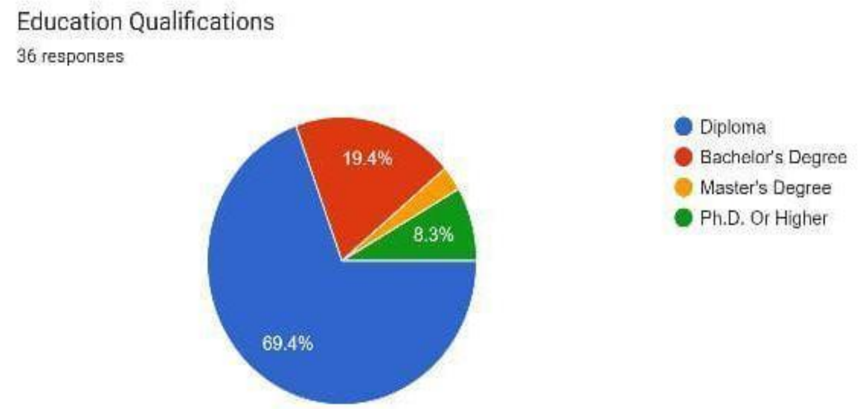
APPENDIX

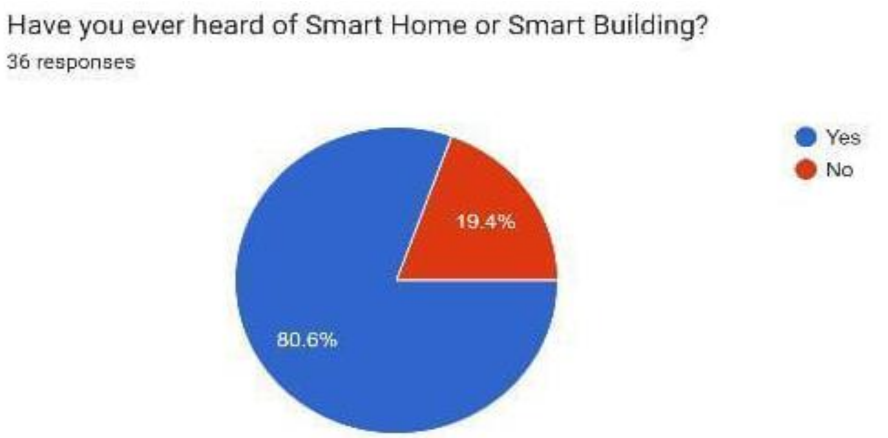
APPENDIX A	Questionnaire
APPENDIX B	Confirmation Letter for using Laboratory

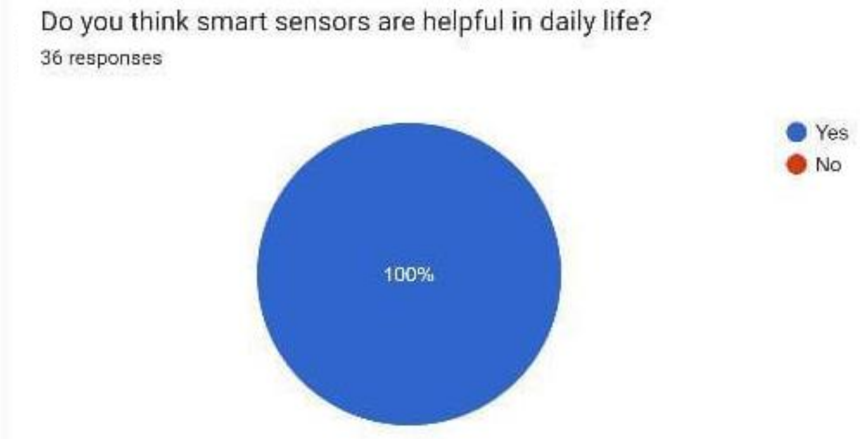
APPENDIX A

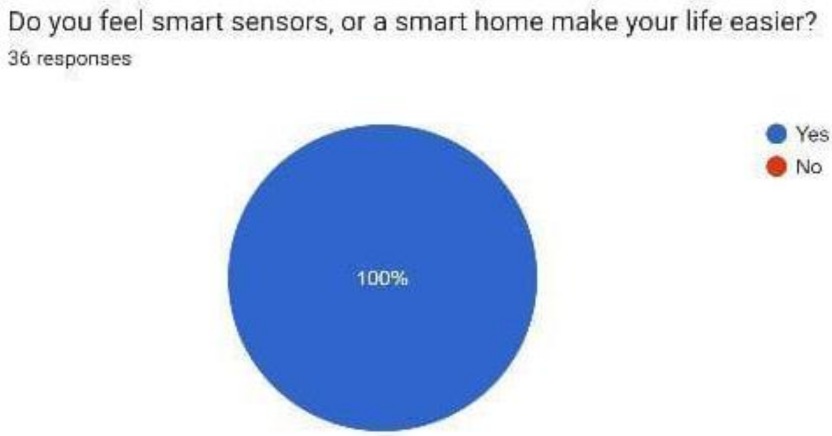
QUESTIONNAIRE








Do you think smart sensors are helpful in daily life?
36 responses
Yes
No
100%

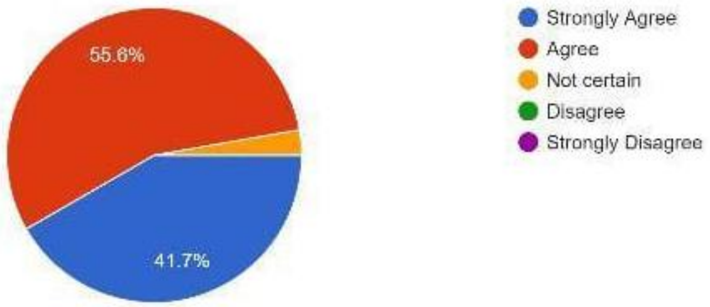

Do you feel smart sensors, or a smart home make your life easier?
36 responses
Yes
No
100%

Do you think the smart home system will help to upgrade your home management?

36 responses

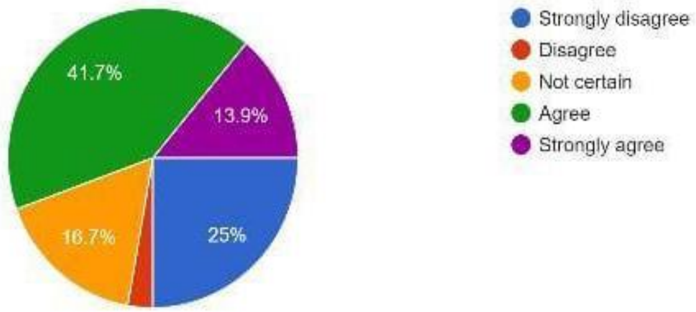
The prototype of NexHome is user friendly

36 responses

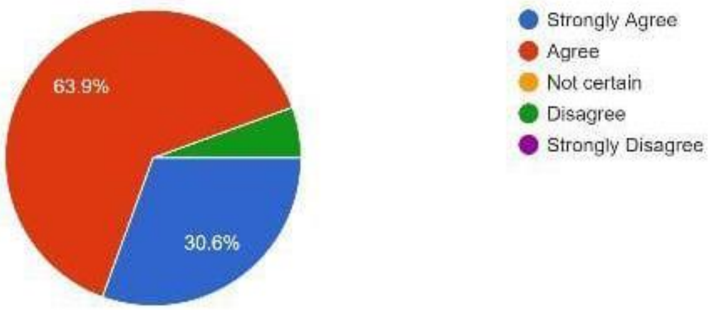


The prototype of NexHome enhances convenience for users and efficiency of smart living.

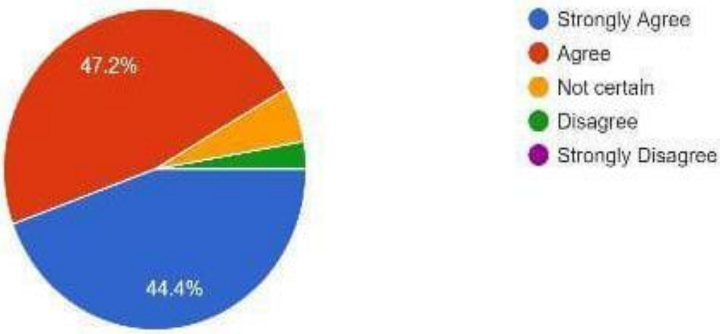
36 responses



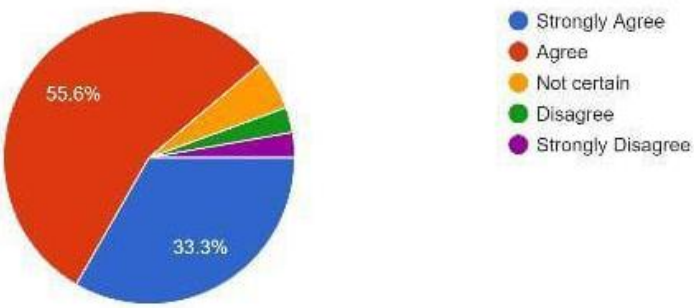
The prototype of NexHome contributes to energy conservation by enabling users to monitor appliance settings.
36 responses



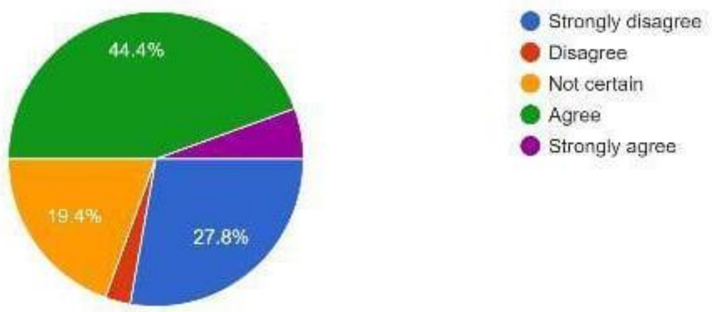
The prototype of Nexhome enhances the home security as users can stimulate presence by remotely activating lights or other devices.
36 responses



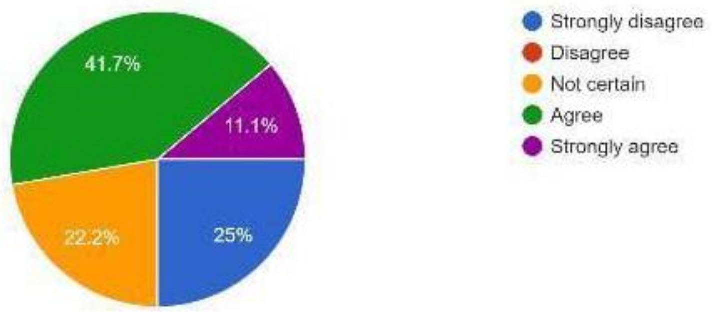
The prototype of Nexhome promoting sustainable lifestyle.
36 responses



The advent of Internet of Things (IoT) technology has revolutionized interaction ang management of home appliances.
36 responses



The prototype of Nexhome embraced IoT technology in managing home appliances in leading to optimized performance.
36 responses



APPENDIX B

CONFIRMATION LETTER FOR USING LABORATORY

Politeknik Ungku Omar,
Jalan Raja Musa Mahadi,
31400 Ipoh,
Perak Darul Ridzuan.

Penyelia Bengkel Kayu,
Jabatan Kejuruteraan Awam,
Politeknik Ungku Omar,
31400 Ipoh,
Perak Darul Ridzuan.

29 Februari, 2024

Melalui & salinan:
Aneziatun Aqmal Binti Puteh Ahmad,
Penyelia Projek Pelajar,
Jabatan Kejuteraan Awam,
Politeknik Ungku Omar, Ipoh.

Tuan,

MOHON KEBENARAN MENGGUNAKAN BENGKEL KAYU, JABATAN KEJUTERAAN AWAM

Berhubung dengan perkara di atas, kami pelajar-pelajar projek semester akhir semester 5 kelas DKA 5B (Sila rujuk **Lampiran A**), ingin memohon kebenaran untuk menggunakan Bengkel Kayu, Jabatan Kejuruteraan Awam, Politeknik Ungku Omar.

2. Kami ingin memohon kebenaran untuk menggunakan Bengkel Kayu untuk menjalankan projek semester akhir kami yang bertajuk "NexHome". Untuk makluman tuan/puan, kami ingin menggunakan bengkel tersebut pada ketetapan seperti berikut:

Tarikh: 1 Mac, 2024 (Jumaat),
Masa : 2.30 petang hingga 5.00 petang.

4. Diharapkan permohonan kami ini mendapat pertimbangan sewajarnya daripada pihak tuan/puan. Segala pertimbangan daripada pihak tuan/puan adalah amat dihargai.

Sekian, terima kasih.

Yang benar,

____

Farhad Haikal Bin Muhajim,
Pelajar Diploma Kujuruteraan Awam (DKA 5B),
Politeknik Ungku Omar, Ipoh,
(011-2025 3624)

LAMPIRAN A

SENARAI NAMA KUMPULAN PELJAR PROJEK SEKSYEN DKA 5B YANG MEMOHON PENGGUNAAN BENGKEL KAYU:

NAMA PELAJAR	NOMBOR MATRIK	NAMA PENYELIA PROJEK	TAJUK PROJEK
MUHAMMAD NAZMI BIN MASLIZAM	01DKA21F2038	ANEZIATUN AQMAL BINTI PUTEH AHMAD	NexHome
FARHAD HAIKAL BIN MUHAJIM	01DKA21F2043		
MUHAMMAD IHSAN SYABIL BIN MUHD SANI	01DKA21F2044		
MAHALETCHUMI A/P SELVARAJ	01DKA21F2060		