CHAPTER ONE

INTRODUCTION

1.1 Background of Study

The internet of things, or IoT, is a network of physical objects: “things” that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. These devices range from ordinary household objects like temperature sensors to sophisticated industrial tools like military radar (“Gillis”, 2022). By means of low-cost computing, the cloud, data analytics, and mobile technologies, physical things can share and collect data with minimal human intervention. In this hyper connected world, digital systems can record, monitor, and adjust each interaction between connected things. The physical world meets the digital world and they cooperate.

In a world of growing complexity, new methods and strategies have to be developed to make the life of everyone easier, faster and more efficient. Technological advancements play a large part in making this possible. In the past all paper work had to be written by hand, signed and transported by train before it could get to its destination; today that is no longer the case. Phones and the internet have totally changed the way we transmit information.

Radio-frequency identification (RFID) IoT devices and sensors use electromagnetic fields to automatically identify and track tags attached to objects. (“RFID”, 2022) Meaning they don’t need physical touch to be detected. They only need to be close enough.

A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory and input/output (I/O) peripherals on a single chip.

Sometimes referred to as an embedded controller or microcontroller unit (MCU), microcontrollers are found in vehicles, robots, office machines, medical devices, mobile radio transceivers, vending machines and home appliances, among other devices. They are essentially simple miniature personal computers (PCs) designed to control small features of a larger component, without a complex front-end operating system (OS).

1.2 Problem Statement

Current administrative tasks and activities in Nigerian schools and corporate offices can be made faster and much more efficient.

According to Princewill Ene (2022) There are many factors that affect development of science and technological advancement, including but not limited to:

- Lack of funds
- Lack of expertise
- Low level of education
- Lack of appropriate market
- Inadequate infrastructure
- Poverty
- Economic fluctuation
- Political instability
- Ethnicity
- Social vices

With these problems in mind, for technology to be feasible in Nigeria, it has to be: cheap, easy to operate, secure, durable, solve an important problem, small, consume low power and be cheap to maintain. As impossible as all this sounds, with the right tools, technology and mindset it can be done. A simple device that scans student's ID cards, confirms their info from an online database, and returns a simple yes or no response. This will help boost administrative efficiency and reduce paperwork.

1.3 Aim and Objectives

- Design and build a small hardware device that connects to the internet through Wi-Fi.
- Design and build a small hardware device that can read RFID tags.
- Design and build a small hardware device that runs on minimal electricity and uses batteries.
- Design and build a small hardware device that is easy to use and understand.
- Design and build a website hosted online that communicates efficiently with the small hardware device.
- Design and build a website hosted online that stores the data gotten from the small hardware device.
- Design and build a website hosted online that lets its users download summarized data in any of these formats: Excel and CSV.
- Build a fully functional Iot device that can scan student's RFID enabled ID cards and confirm/store any data needed.

1.4 Significance of the Study

- Make administrative tasks like checking for fee payment, leasing library books, taking attendance faster and more efficient
- Make the life of students and staff easier
- Reduce the use of hardcopy
- Boost data analysis through direct electronic data availability
- Higher security through advanced monitoring of students from their entries and direct confirmation from an online database
- Reduce our carbon footprints through burning of paper containing information that is readily available online

1.5 Scope of the Study

The scope of this study covers the hardware device and online website that holds all the needed data and functionality. It also covers the students and staff of ESUT.

1.6 Limitation of the Study

- Purchase of the RFID enabled cards and assigning them to each student
- Cannot work without an internet active Wi-Fi hotspot device
- Each Wi-Fi hotspot device has to be set to a particular Wi-Fi name and password for the device to find.

1.7 Organization of the Report

This project report is organized into five chapters:

Chapter One: The whole idea behind the work. Includes objective of the study, statement of the research, area of coverage limitation and definition of terms.

Chapter Two: This section deals with the review of study, review of concept theories upon which this work is built on and the potential issues

Chapter Three: This section talks about the software and hardware tools used in the project. The methodology at which this research work will be implemented.

Chapter Four: The system is implemented and presented with its analysis. Functions are in depth explained for reader understating and comprehension. The system requirements are also detailed.

Chapter Five: Summarizes the whole work done and makes possible recommendation and suggest other points to be included into the work for future propose

1.8 Definition of Terms

1. IoT: The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided

with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction(“Gillis”, 2022).

2. Sensors: A sensor is a device that produces an output signal for the purpose of sensing a physical phenomenon.

3. RFID: Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects (“RFID”, 2022).

4. RFID Tags: A radio-frequency identification system uses tags, or labels attached to the objects to be identified. Two-way radio transmitter-receivers called interrogators or readers send a signal to the tag and read its response (“RFID”, 2022).

5. Microcontroller: A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general-purpose applications consisting of various discrete chips.

6. Input/Output(I/O): In computing, input/output (I/O, i/o, or informally io or IO) is the communication between an information processing system, such as a computer, and the outside world, possibly a human or another information processing system. Inputs are the signals or data received by the system and outputs are the signals or data sent from it (“General Purpose Input/Output”, 2022).

7. Wi-Fi: A family of wireless network protocols, based on the IEEE 802.11 family of standards, which are commonly used for local area networking of devices and Internet access, allowing nearby digital devices to exchange data by radio waves. These are the most widely used computer networks in the world, used globally in home and small office networks to link desktop and laptop computers, tablet computers, smartphones, smart TVs, printers, and smart speakers together and to a wireless router to connect them to the Internet, and in wireless access points in public places like coffee shops, hotels, libraries and airports to provide visitors with Internet connectivity for their mobile devices.

8. Wi-Fi Hotspot: A hotspot is a physical location where people can obtain Internet access, typically using Wi-Fi technology, via a wireless local-area network (WLAN) using a router connected to an Internet service provider.

9. Website: is a collection of web pages and related content that is identified by a common domain name and published on at least one web server.

10. Online Hosting/Cloud Hosting: is the on-demand availability of computer system resources, especially data storage (cloud storage) and computing power, without direct active management by the user.

11. NodeMCU: is an open source firmware for which open source prototyping board designs are available (“NodeMCU”, 2022).

12. MRC522 RFID Sensor: The RC522 RFID Reader/Writer Module (Transceiver) is based on a highly integrated reader/writer IC MFRC522 from NXP Company. It is used for contactless Multi-communication at 13.56 MHz (“RFID”, 2022).

13. Arduino IDE: The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them (“Arduino”, 2022).

14. VS Code: Visual Studio Code, also commonly referred to as VS Code, is a source-code editor made by Microsoft with the Electron Framework, for Windows, Linux and macOS. Features include support for debugging, syntax highlighting, intelligent code completion, snippets, code refactoring, and embedded Git (“Visual Studio Code”, 2022).

15. PHP: is a general-purpose scripting language geared toward web development (“PHP”, 2022).

16. JavaScript: JS, is a programming language that is one of the core technologies of the World Wide Web, alongside HTML and CSS (“JavaScript”, 2022).

17. MySQL: is an open-source relational database management system (RDBMS). Its name is a combination of "My", the name of co-founder Michael Widenius's daughter My, and "SQL", the acronym for Structured Query Language.

18. Git: is a distributed version control system: tracking changes in any set of files, usually used for coordinating work among programmers collaboratively developing source code during software development.

19. GitHub: GitHub, Inc is an Internet hosting service for software development and version control using Git. It provides the distributed version control of Git plus access control, bug tracking, software feature requests, task management, continuous integration, and wikis for every project.

20. Debug: In computer programming and software development, debugging is the process of finding and resolving bugs (defects or problems that prevent correct operation) within computer programs, software, or systems.

21. LEDs: A light-emitting diode (LED) is a semiconductor device that emits light when current flows through it. Electrons in the semiconductor recombines with electron holes, releasing energy in the form of photons.

22. Buzzers: A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, train and confirmation of user input such as a mouse click or keystroke.