**CHAPTER I**

**DESIGN PROJECT STUDY**

* 1. INTRODUCTION

In today’s world, technology had continued to emerge which have changed and improved the way people live in different ways. People continued to embrace the use of smart technologies to easily accomplished specific task in their lives that makes their work more productive and have access to communication easily. People are expecting more from these technologies that can add value in their lives such as looking for a more convenient and instant way of accommodating their basic needs. One of these is a vending machine, also known for its automatic retailing of goods which have evolved and is a good option for retailing products.

A vending machine is a machine that dispenses beverages, snacks newspapers, cigarettes, personal care items and many more automatically, through inserting a coin on a coin slot validator.

Philippines, based on its location is a tropical country and because of that Filipinos have to adapt themselves physically with climate and environmental changes that may cause health problems to people. For this situation, people are advised to take medication to fight illnesses and to be at their best condition as possible. In such case, it is easier to buy over-the-counter drugs via operated machines like vending machines where less time is consumed.

One way to deliver OTC drugs on demand is through vending machines. OTC or Over-the-counter drugs are medicines that do not require prescription to purchase, available for purchase on store shelves in a pharmacy and in stores such as supermarkets or small convenience stores, relies on self-diagnosis; product is chosen based on self-care decision and used to treat minor ailments. (ConsumerMedSafety, 2014)

The researchers proposed a design project entitled “**Development of Over the Counter Medicine Vending Machine Using Microcontroller”.** A development that would give a convenient and innovative service of retailing over the counter medicines.

* 1. BACKGROUND OF THE STUDY

Presently, there has been a world-wide spread use of vending machines in Japan. Most of the things you want to buy are sold through vending machines. Some vending machines in Dubai dispensed jewelry and gold bars. In the Philippines, Filipinos are well-known for retailing products. A vending machine is usually seen in the community that offers beverage, chips, prepaid load. Now, there is also a chicken broth, Wi-Fi, charging kiosk at malls and convenient stores plus piso-internet machines for a cheap PC rental at cheaper price. (GMA NEWS, 2014) These machines offered convenience and retail product that are highly suitable in the Philippine setting.

The first vending machines were all mechanical. Venders designed them and evolved from electromechanical control and dispensing to electronic control. Conventional machines, which basically rely on hard pressed buttons, have limitations in the number of products that can be offered to customers. (Crosby, 2013) Now, the researchers used a more advanced units high-resolution touch screen color displays that permits users to browse through a range of product options together with detailed information about the product. Display touch screen interfaces the present marketers with the ability to broadcast eye-catching, dynamic advertising when the vending machine is not being used, so as to attract business from passersby.

The present vending machine does not prompt or notify the service maintenance provider if there are still stocks. This can affect the effectiveness of the said convenience of the vending machine if the medicines that are needed are out of stock. That is why the researchers thought of a way to prevent this from happening by adding a GSM module on the vending machine that sends a text to the maintenance provider when the stocks are about to run out.

* 1. STATEMENT OF THE PROBLEM

1.3.1 General Problem

The general problem of the design project is: “How to design and develop an **Over-the-Counter Medicine Vending Machine Using Microcontroller”**.

1.3.2 Specific Problems

The problems are further classified into:

1. How to validate coins using the coin slot validator?
2. How to design a dispensing mechanism for the medicine?
3. How will the system maintain the temperature in the vending machine?
4. How will the system notify the critical level of the stocks?
5. How will the system play an advertisement/tutorial about usage of medicine?
6. How to interface a thermal printer to the system?
   1. ENGINEERING HYPOTHESIS AND TECHNICAL JUDGEMENTS

The project entitled “**The Development of Over the Counter Medicine Vending Machine Using Microcontroller**” will provide convenient and innovative service of vending medicine.

1. The coins will be validated using coin slot.
2. The system will dispense medicine using servo motors.
3. The system will maintain the temperature using cooling fans.
4. The system will send a SMS notification.
5. The system will play a video when the system is idle.
6. The system will print a receipt after a transaction.
   1. OBJECTIVES OF THE STUDY

1.5.1 General Objectives

The general objective of the design project is: “To design and develop an **Over-the-Counter Medicine Vending Machine**”.

1.5.2 Specific Objectives

Specifically, this design project has the following objectives to answer problems in dealing with this design project:

1. To validate coins using the coin slot validator.
2. To design a dispensing mechanism for the medicines.
3. To maintain the temperature appropriate in the vending machine.
4. To notify the critical level of the stocks.
5. To play an advertisement/tutorial about usage of medicine.
6. To interface a thermal printer to the system.
   1. SCOPE AND DELIMITATION

The **“The Development of Over the Counter Medicine Vending Machine Using Microcontroller”** will dispense a medicine once the consumer inserts coin in the coin slot.

The vending machine operates on 220VAC. An ATX power supply will provide 12VDC and 5VDC to the machine and a LM7809 to supply 9VDC. The user interface of the vending machine is a touch screen display using 10.1 inches tablet. It will display the name and price of the products that are available and it will also display the credit. The vending machine will play an advertisement when it becomes idle. It will also play a video about the medicines. The coins slot will be programmed to generate pulses corresponding to the value of the coin inserted. It will accept one peso, five peso and ten peso coins. Twenty five centavo coins, tokens and other coins will not be accepted including paper bills. It will only accept coins and has the feature to refund the coins inserted. It will send a SMS notification if the stocks are running out.

* 1. SIGNIFICANCE OF THE STUDY

Technological Significance

With the current trend of “Internet of Things” also known as ”IoT,” a network of physical objects, devices, vehicles, buildings and other items which are embedded with electronics, software, sensors, and network connectivity, the design project will have technological impact in interconnected devices by collecting and exchanging data.

Economic Significance

The designed project desires to be fully efficient economically in terms of providing customers a more sustainable workplace that reduces the amount of energy business uses that can both help people to live better lives. Energy saving

Educational Significance

Future researches of the same field will benefit to the designed project that will provide them ideas and knowledge that every designed project done and proved effective to the community will bear educational significance that would influence them to develop more than what is in present through years. It will also serve as reference and guide for their research.

* 1. TECHNICAL AND ENGINEERING MERITS

Japan is an innovation country. Everyone knew that Japan has an enormous variety of vending machines. In fact, 1 vending machine is allotted for every 23 people in Japan. Vending machine dues 7 trillion yen in business per year. There are over 5,000,000 million vending machines nationwide, that means each vending machine earns 1,400,000 million yen ($15,000). Japan’s vending machines sell item for your convenience like beverages, fresh fruits, noodles, ice cream, rice balls, books, umbrella, cakes, cigarettes, and many more. (WAORYU, 2013)

Numerous companies are developing vending machines as part of their marketing strategies. Vending machines enable us to retail more products at lower cost than in traditional retail shop. Other than restocking the machines, labor costs are non-existent. There’s also strong advertising value because vending machines can be uniquely branded. (Greenwald, 2015)

Effective rapidly development of technology has changed the way the world operates. People are continuously using a variety of automatic appliance or technologies to easily accessibility the way lives. As people continue to seek for convenience, more and more technologies are invented. One of these technologies is vending machine. The Vending machines come in different types as they are made for different purposes. (Sabek, 2012) The vending sector has seen significant growth over past through years and will continue to do so in the year to come.

Vending machines are perfect way to merchandise drugs refer product in day to day usage or OTC drugs. (Beta Automation, 2013) A drug is a substance intended for use in diagnosis, cure and prevention in disease. Over-the-counter (OTC) also called non-prescription drugs are sold without a prescription. Difference between prescription drugs and non-prescription drugs, the prescription drugs are prescribed by a doctor, they are bought at a pharmacy, prescribed for intended to be used one person, and usually more powerful than OTC drugs. However the non-prescription drugs or OTC are drugs that do not require a doctor’s prescription, and they bought off the shelf in stores. (FDA, 2015)

* 1. THEORETICAL AND CONCEPTUAL FRAMEWORK

Hardware Requirements

* Single Board Computer
* Microcontroller
* Servo Motors
* Coin Slot
* Thermal Printer
* Router

Software Requirements

* GNU/Linux
* LAMP
* Arduino IDE

Hardware Development

* Designing
* Prototyping
* Testing
* Maintenance

Software Development

* Requirements
* Designing
* Prototyping
* Testing

**The Development of Over the Counter Vending Machine**

**INPUT PROCESS OUTPUT**

Figure 1.9.1: Theoretical and Conceptual Framework Model

The interrelation of the concepts illustrated in the figure 1.9.1 makes up the whole framework of the designed project. The coins will be confirmed by a coin slot validator and send a pulse signal to the main controller and identify user input through a touch panel. The items will be released on the take-out port.

* 1. DEFINITION OF TERMS

**Arduino Mega 2560** – is a microcontroller board based on the ATmega2560 and has 54 digital input/output pins. It will be the main controller for the physical modules of the system.

**Apache** – is a web server. The web application will be hosted on the localhost machine using apache web server.

**Coin Slot** – is an electronic device that accepts and validates coins. The coin slot will send pulses to the Arduino based on the coins inserted.

**Dispenser** – is a mechanical device that dispense the medicine.

**Linux** – is an open source operating system developed by Linus Torvalds. The system will be powered by the Linux operating system.

**Micro SD Card** - is a storage device. The operating system and the web application will be stored in the micro SD card.

**MySQL** – is a database server. Product information and transactions will be stored in the database.

**PHP** – is a server side scripting language. It is the programming language used for the system.

**Raspberry Pi** – is a single board computer. It is the main component of the system that is responsible for the processing of information and controlling the Arduino.

**Router** – is a networking device. It will give connection to the Raspberry Pi and the tablet.

**Thermal Printer** – is a thermal based printer. It will print the official receipt.