**DEVELOPMENT OF INFO BOARD USING RASPBERRY PI**

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**A Thesis Proposal Presented to the**

**Faculty of the College of Science**

**Technological University of the Philippines**

**Manila**

**In Partial Fulfillment of the**

**Requirements for the Degree**

**Bachelor of Science in Information Technology**

**August 2018**

**Table of Contents**

**Page**

Title Page 1

Table of Contents 2

List of Table 4

List of Figures 5

List of Appendices 6

**Chapter 1 THE PROBLEM AND ITS SETTING**

Introduction 7

Background of the Study 7

Objectives of the Study 8

Scope and Limitations of the Study 10

Significance of the Study 10

**Chapter 2 CONCEPTUAL FRAMEWORK**

Review of Related Literature 12

Related Studies 16

Conceptual Model of the Study 19

Operational Definition of Terms 21

**Chapter 3 METHODOLOGY**

Project Design 23

Project Development

Operational Testing Procedure

Evaluation Procedure

**REFERENCES** 24

**CURRICULUM VITAE** 25

**List of Tables**

**Table Page**

1. Testing Procedure 25

2 Numerical Rating and Its Qualitative Interpretation for 26

Evaluation Instrument

3 Scale Range and Its Qualitative Interpretation 27

**List of Figures**

**Figure Page**

1. Conceptual Model of the Study 19

2 Block Diagram 23

3 Use Case Diagram 24

**List of Appendices**

**Appendix Page**

A Evaluation Form

B Sample Answered Evaluation Sheet

C Summary of Respondents’ Evaluation

D Gantt Chart

E User’s Manual

**Chapter 1**

**THE PROBLEM AND ITS SETTING**

**Introduction**

Technological University of the Philippines is considered as the premier state university of technology education in the Philippines. It is, by far, can be proven by professors and students by TUP. However, having considered as a premier state university of technology education, there are still such problems that could be set as a subject for automation. One of these is the bulletin board.

The project of Development of Info Board using Raspberry Pi helps professors and their students to be updated easily. It can display important messages, reminders or announcements that can be seen by students or professors within the building. Also, professors that are not inside the campus can still send messages to Info Board because of the GSM module attached in the device. This project can help posting public announcements a lot easier than using papers and pens as a bulletin, for it only uses less resources and it is ever-ready.

**Background of the Study**

As years goes by, it is clearly seen how technology evolves within TUP. It can also be seen how students and professors help each other to keep progressing in fulfilling automations inside the campus. However, there are still minor problems that exist within the campus that if are studied deeply, the possible solutions to these problems could help maximize the use technology and may save a lot of resources and energy.

Faculty members of TUP are commonly busy and are also working off-campus. For this apparent reason, they can hardly post announcements and they will need to ask a faculty member (who is present in school) to disseminate the message to students or co-faculty members.

Public announcements and updates in TUP are only posted using papers and pens. However, a faculty member needs to be present in school to write and post it; or if ever they are not present in school they may ask assistance from someone who is present but that commonly leads to misunderstanding.

The main purpose of the Info Board is to post public announcements along the hallway directly from the sender through SMS. Since the project is GSM-based, messages received by the device can be posted exactly from what was sent by the faculty member. Also, most professors use SMS for communication; which will not make it a problem for them to use the device.

The Development of Info Board using Raspberry Pi will help display and disseminate messages clearly. It is highly accessible anytime anywhere in the country, plus, it may help lessen paper wastes in school.

**Objectives of the Study**

The general objective of the study is to develop Info Board using Raspberry Pi for Technological University of the Philippines.

Specifically, the study is aimed to

1. Design an Info Board using Raspberry Pi with the following features:
2. GSM – support device which can transfer messages using SMS
3. Raspberry Pi – project which may store huge amount of data and memory
4. Arduino to Raspberry Pi connection to be more responsive and efficient in the process.
5. Enabled with text messages using GSM to send information to the Raspberry Pi
6. Display messages and announcements in a two-line scrolling Info board
7. Create the Info board using:
8. C Programming Language
9. Python
10. Raspbian OS
11. Raspberry Pi 3 Model B
12. GSM Sim800
13. Test and improve the Development of Info Board using Rasberry Pi in terms of:
14. Responsiveness of the device in sending messages from the system to the users.
15. Real-time Application of the sending messages and displaying announcements.
16. Display/UI of the message in the info board.
17. The accuracy of the device in showing or displaying letters in either uppercase or lowercase.
18. Determine the level of acceptability of the developed Info Board using Rasberry Pi using TUP Evaluation Instrument for Prototype Develop.

**Scope and Limitations of the Study**

The process of this device will start with GSM. Where the user will send a message to this device and the device will convert it to SMS. The scope of this thesis is when a professor input an announcement in the system and the information will automatically appear in the Info Board. Regardless of the distance this device can send a text as long the SIM card is originated as the local network.

In using this system there are some limitations. First, a minimum memory capacity of GSM has. It can only store a few numbers of messages depending on its length. Second, the Info Board is a two-line display board which limits the display of the announcement in two lines. Third, for the security purposes only authorized person or the Professors can use the system. Lastly, the system will work through the local network’s signal.

**Significance of the Study**

In our generation, everyone knows what a prominent role technology plays in our society. It became such an important aspect in our lives with all of the different ways it can help us. The study focuses on how we can improve the communication of the professors and the students of the university. This study helps the professors easily announce even they are not in the premises without any hassle. And also, helps the student easily caught announcements without wasting their time waiting for the notice of the professors.

This might be a step up of our university to consider as more modernize when it comes to technology, among the state universities in Manila.

**Chapter 2**

**CONCEPTUAL FRAMEWORK**

**Insert intro paragraph here**

**Review of Related Literature**

***Operating System***

Operating system is a system software which is required for a basic computer to function. It acts as a medium for both software and hardware devices to work in sync. It manages system resources, processes and memory allocations. According to statistics, the widely known Microsoft Windows is the leading desktop operating system worldwide in market shares, followed by Apple Inc.’s MacOS, while Linux are collectively in third place from 2013 to 2018.

***Types of Operating System***

According to TechSpirited, there are 8 types of Operating System. An Operating System can either be defined by a one or many of the following:

Real-time Operating System is a multitasking operating system that executes real-time operations or applications. Real-Time Operating System’s main goal is to response within the given time constraints or to quickly switch between tasks based on their level of priorities.

Multi-user operating system supports multiple-user access to a computer. However, having multiple user accounts on a Windows OS does not mean that it is a multi-user operating system. A multi-user operating system, basically, refers to the network administrator as a user, and multiple users can log in simultaneously. In contrary, a single-user operating system also exists, in which an operating system can only be logged in by a single user at a time.

Single-tasking operating system allows only one program to run at a time. But, there corresponds multi-tasking operating system. Multi-tasking operating system can either be, pre-emptive or co-operative. A pre-emptive multi-tasking OS is able to run multiple programs with proper allocation of slots for each programs, or without interrupting a preceding program. While, in co-operative multi-tasking OS, it runs multiple programs by running a program until interrupted by another program,

Distributed Operating System manages multiple independent computers to work in cooperation as one computer.

Embedded System is a compact system designed for computer embedded systems.

Mobile Operating System used for latest technology which are made for phones and tablet PCs. It focuses highly on wireless communication and mobile applications.

Batch Processing and Interactive Systems execute programs in batches without manual intervention if input data are collected at an earlier time to be processed later. However, after all the programs have been executed, this will require another user intervention for collecting input data.

Online data processing is when the user intervenes with the computer and processes are executed by the control of CPU. Offline data processing is when neither user nor CPU is involved in process execution.

***Raspbian OS***

Raspbian OS is a system optimized for the Raspberry Pi hardware. The system is free to use and also provides over 3,500 packages and pre-compiled software. It is based on Debian Linux and created by a small team of developers. Although it was said to be completed in June of 2012, the system is still under active development to improve its stability and performance.

The Raspian desktop environment is known as the “Lightweight X11 Desktop Environment” or in short LXDE. This has a fairly attractive user interface that is built using the X Window System software and is a familiar point and click interface. We shall look more into how to install and use this OS in the next section.

***Raspberry Pi***

Raspberry Pi is a small-sized computer that was originally planned to help to motivate the interest of school-age children and promote basic education about computer science. The goal of Eben Upton, the creator of Raspberry Pi, is to create an affordable computer that would enhance hardware understanding and programming skills of software students. Raspberry Pi consist of feature ports for SD Card, USB 2.0, HDMI, analog audio, composite video, internet, and power.

***Types of Raspberry Pi***

Raspberry Pi 1 Model B is the original Raspberry Pi**.** Thespecifications of this type has two USB ports, with a RAM of 512mb, the Ethernet port is 100mb, and the SD card is not included.

Raspberry Pi 1 Model A is simpler and cheaper than Raspberry Pi 1 Model B. The memory of Model A was originally to have had 128mb of RAM, and was upgraded to 256mb before release.

Raspberry Pi 1 Model B+ is the final revision of the Raspberry Pi 1 Model B, the original Raspberry Pi. The specifications of this type has four USB ports compare to Model B only provides two, it has more GPIO pins with 40 pins with the same pinout for the first 26 pins as the Model A and B, and it also has micro SD card included.

Raspberry Pi 1 Model A+ replaced the original Raspberry Pi 1 Model A. Compared to Model A it has more GPIO pins with 40 pins with the same pinout for the first 26 pins as the Model A and B, it also has micro SD card included, and smaller neater form factor.

Raspberry Pi Zero is most affordable Pi and smallest as half the size of a Model A+ with twice a utility. The specifications of this type has 1GHz single-core CPU, 512 RAM, Mini HDMI port, Micro USB OTG port, Micro USB power, HAT-compatible 40-pin header, and CSI camera connector (v1.3 only).

Raspberry Pi 2 Model B replaced the original Raspberry Pi 1 Model B+ and a second-generation Raspberry Pi. The specifications of this type has ARMv7 quad core processor with 900MHz, and 1 GB RAM compared to Raspberry Pi 1.

Raspberry Pi 3 Model B replaced the original Raspberry Pi 3 Model B and it is the earliest model of the third-generation Raspberry Pi. The specifications of this type has 1.2GHz quad core processor with wireless LAN and Bluetooth connectivity.

Raspberry Pi 3 Model B+ replaced the original Raspberry Pi 2 Model B and Raspberry Pi Model B+ and a third-generation Raspberry Pi. It was faster than the first and second generation of Raspberry Pi. It has more powerful processor with additional features, the wireless LAN and Bluetooth connectivity.

Raspberry Pi Zero W extended the Pi zero family with added features. The specifications of this types is the same as the Pi Zero but with additional features, the wireless LAN and Bluetooth connectivity.

***Python Programming Language***

Python is a popular language preferred to teach beginners some basic serial programming. It is a high-level programming language that supports multi programming paradigms such as imperative, functional, and object-oriented.

**Related Studies**

This part of the document, it contains different studies, researches, thesis and documents that related to this study. And it also a crucial aspect of the planning of the study.

***Title: Development of an Electronic Bulletin Board with GSM using Raspberry Pi for Technological University of the Philippines***

***Author: Queenilyn V. Martinez, Kristel Joy Morales, Ernest Jovan G. Recalde***

The study is about the Development of an Electronic Bulletin Board with GSM using Raspberry Pi that helps the administrators post announcements and other important information in an efficient manner utilizing the available technologies. The developed system can record cellphone numbers and messages received by GSM and store them in the system database. It can help the students to be updated on the current information and activities other important rules and regulations, they need to know. This study used the hardware like Raspberry Pi, GSM, Arduino and Dot Matrix for displaying the announcement, and software like Java, C, and MySQL. The system was evaluated using the TUP Evaluation Instrument for Prototype Developed, and it was rated highly acceptable.

***Title: Development of a PC-Based Electronic Bulletin Board***

***Author: Morvic D. Bayais, Linnacus T. Bundalian, Rizelle Maurine Hazel Z. Contreras, Neljon P. Lusterio, Dianne T. Mangilin, Rhowel Dellosa, Rionel Caldo, Joseph Maiquez.***

The study is about of development of a PC-Based Electronic Bulletin Board that use to give an information to the students like announcement, notices or messages. It will easy for them to inform the latest announcements or notices. The display message is coming from the messages that were sent through an SMS by a user. It is a computer based system that used mobile and web technology. It was developed on Visual Basic Studio and Microsoft SQL Server Management Studio. For Hardware, a computer unit, broadband dongle, Sim Card, LED television. It is designed with a user-friendly interface where the users can easily understand and use the system

***Title: Teachers and Computer Bulletin Board***

***Author: Paul D. Chandler***

The study is about the implementation of a Wireless Bulletin Board where it used a Bluetooth technology. In this application, the duty of the Bluetooth is to connect the client to the server where it will construct a connection between them. After the connection was accepted by the Bluetooth, the client can transmit a data and display the data to a message board or LED Screen. It included a hardware component which consists the KC wireless Bluetooth and BX-4A1 with additional of LED Screen.

**Conceptual Model of the Study**

**Introduction**

**INPUT PROCESS OUTPUT**

Information Board

System Analysis

* Studying the method of displaying the sent messages through SMS on the information board.

System Design

* System Flow
* Use Case Diagram
* Block Diagram

System Development

* Project Development
* Project Design
* Operational and Testing Procedures

System Implementation

* Displayed messages can be read by the students.
* Only authorized users can use the system and send messages.

Knowledge Requirements

* GSM Module
* Operating System
* Raspbian OS
* Raspberry Pi
* Arduino­­ Uno R3
* MySQL
* Dot Matrix
* Phyton Programming
* C Programming

Software Requirement

* Arduino IDE
* Raspbian OS
* MySQL
* C Compiler
* Phyton Compiler

Hardware Requirement

* Arduino Uno
* Raspberry Pi 3 Model B
* Dot Matrix Board
* GSM Sim800l
* Electronic Wires­
* Memory Card

***Figure 1.*** Conceptual Model of the Study

**Input**

The knowledge of inputs the research requires were different terminologies like GSM Module, Raspberry Pi, Arduino Uno and MySQL. And require knowledge in Phyton programming and C programming. The software development tools like Arduino IDE, Raspbian OS, MySQL and compilers of C and Phyton are needed in this study.

This study involves hardware components like Arduino Uno, Raspberry Pi, Electronic wires and memory card. GSM based Dot Matrix shows the wireless connection between user mobile and information board effectively.

**Process**

The messaging process was the basis of this research which the development phases requires data and creates diagrams. The development execution produces accurate result.

The research used a diagram to discuss and defined the procedures in every situation occurs. Accurate result displays as the required operations shows. The expected output of the study implies by the complete requirements and process which contains its functionality.

To provide the stability and level of how accurate result for the prototype the evaluation for the research defined the responsiveness, functionality and workability. And discuss and produce the expected and actual results for the research.

**Output**

This research has expected output for displaying and transmitting information which reliable enough as a source of information for students and department members in the university. Provides the facility of real-time message displaying for the user can change the message content that is to be display according massage sent.

**Operational Definition of Term**

For the clarity of the research the following terms are defined operationally.

***Information Board*** refers to a board which usually attached to a wall in order to display and inform people with an announcement or advisory. It has been in public like in the business industry and in academe for indoor communication that is a lot helpful, functional and helpful for the delivery of announcement.

***Dot Matrix Board*** is consisting of dots that creates and emit lights which convert to pixels when it connects and establish an object and display the text message. This material is prototype circuit boards are used for both high frequency and analogue circuit building and can be used for laying out electrical components securely.

***Arduino Uno*** is an open-source electronics platform based on easy-to use software and hardware. It is a device to adapt GSM in order to connect to Raspberry Pi to

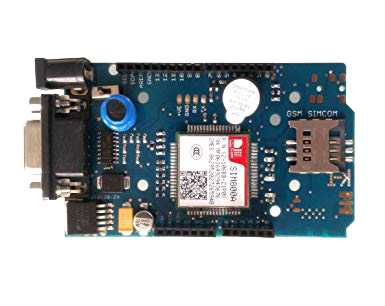
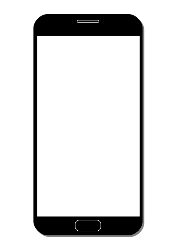
Microcontroller and to display it to Information Board. It can also tell to the information board what to do by sending a set of instructions to the microcontroller on the board.

**Chapter 3**

**METHODOLOGY**

This chapter contains the project design including the flow chart, block diagram, use case diagram, circuit diagram, and isometric view of the project design. And project development

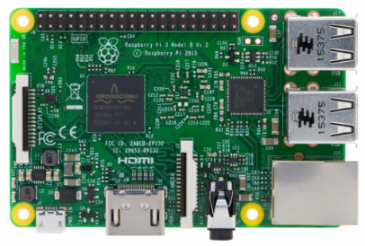
**Project Design**

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Database

Phone

GSM

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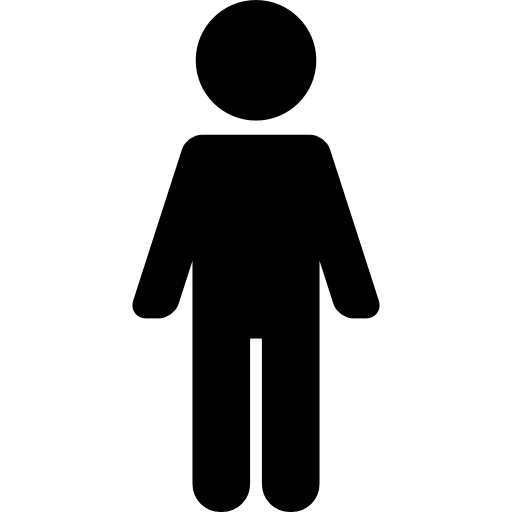
Rasberry Pi 3

Arduino Uno 3

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Dot Matrix

***Figure 2.*** Block Diagram

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Record in Database

Display Messages

Professor

Input Announcement

View Database

***Figure 3.*** Use Case Diagram

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