UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF LOGIC GATE QUIZ BOARD THAT TEST STUDENT KNOWLEDGE IN SOLVING LOGIC GATE CIRCUIT PROBLEM USING ANDROID APPLICATION FOR DISPLAY QUESTION AND FEEDBACK

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Computer Engineering Technology (Computer System) with Honours.

by

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I hereby, declared this report entitled DEVELOPMENT OF LOGIC GATE QUIZ BOARD THAT TEST STUDENT KNOWLEDGE IN SOLVING LOGIC GATE CIRCUIT PROBLEM USING ANDROID APPLICATION FOR DISPLAY QUESTION AND FEEDBACK is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Computer Engineering Technology (Computer System) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Kit pendidikan diperkenalkan untuk memudahkan sesi pembelajaran pelajar supaya pelajar dapat memahami subjek Digital dengan mudah. Pembelajaran bahagian teori agak mencabar bagi mereka yang baru belajar menegani konsep litar logik. *Logic Gate Smart Trainer* telah dibina untuk membantu pelajar memahami tentang litar logic dengan menggunakan *Bluetooth* sebagai medium untuk menghantar data. Menggunakan kit pendidikan, pelajar akan lebih berminat untuk mempelajari subjek Digital ini dan memudahkan pengajar untuk sesi kelas. Penghasilan kit pendidikan sebagai alat pembelajaran akan dapat membantu pelajar dalam pengukuhan praktikal selain teori. Aplikasi ini dibina untuk pelajar menyambung kepadanya melalui *Bluetooth* untuk berhubung dengan kit pembelajaran. Pelajar perlu membina litar logik mengikut soalan yang diberikan ke kit tersebut dan periksa jawapan dengan menggunakan aplikasi. Kaedah ini dapat menjadikan pembelajaran subjek Sistem Digital menjadi lebih mudah dan dapat menarik minat pelajar untuk mempelajarinya.

ABSTRACT

Education kit is introduced to facilitate student learning sessions so students can easily understand the subject of Digital. Partial theoretical learning is quite challenging for those who are just learning to discipline the concept of logic circuits. The Logic Gate Smart Trainer was built to help students understand logic circuits by using Bluetooth as a medium to transmit data. Using educational kits, students will be more interested in learning this Digital subject and facilitating instructors for class sessions. The production of educational kits as a learning tool will help students in practical reinforcement other than theory. This app is built for students connecting it via Bluetooth to connect with the learning kit. Students need to build a logic circuit according to the questions given to the kit and check the answer by using the application. This method can make learning the subject of the Digital System easier and can attract students to learn it.

DEDICATION

This dedication especially to my parents. My late father Zakaria Bin Hashim and my mother, Siti Mariam Binti Man who always give a supported and taught me that to believe in hard work and put trust in Allah S.W.T.

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LIST OF ABBREVIATIONS

CMOS	Complementary Metal-Oxide Semiconductor
IC	Integrated Circuit
LCD	Liquid Cristal Display
LGST	Logic Gate Smart Trainer
PC	Personal Computer
PLC	Programmable Logic Controller
PCB	Printed Circuit Board
UV	Ultra Violet

CHAPTER 1

INTRODUCTION

1.0 Introduction

The aim of this chapter will describe the overview and the main purpose of the project. The content is about the detail of the project requirement. This chapter will explain the background of the project briefly and this chapter also include problem statement, the expected objectives that to be achieve, the scope of work and lastly the project contribution to be carried out.

1.1 Background of Study

The 1970s and 1980s were great times for electronics kits, as at that time, India has start-up with manufacturing electronics in-house attracting people to new gadgets & technologies and the educational trend was transformed from electrical to electronics engineering field. Refer to "Educational kits: Learning by Experience" (Khadijah,2014), Electronics was in a state of rapid transition. Integrated circuits were displacing many individual components, and surface-mount assembly was moving beyond hobbyist capability.

An educational kit can be defined as a tool that was created to ease the user by focusing on some topic. The educational kit was created in order to gain knowledge and build understanding after learned the theory. A logic gate is a physical device implementing a Boolean function. It also performs a logical operation on one or more binary inputs and produces a single binary output. It also depending on the context where

the term may refer to an ideal logic gate which is one that has for instant zero rise time and unlimited fan-out.

Student only exposed more on theory basic of an electronic component and their function. So student have lack information or knowledge about the circuit and how to give an answer in logic equation. The idea of created this educational kit is come from my experience of study on Digital Subject. The question was too long and need to understand clearly and start do the truth table, get the logic equation and last build the logic circuit. With this project, it can make ease to the student to study on that subject and understand step by step of getting the answer.

This aim of this project is to create Logic Gate Smart Trainer for the student who weak in the logic gate system and ease understanding of the digital subject. For example, in university we have digital system subject for study where more theoretical than practical. So that this project was created. The advantages of this project is the student can more understand by do it practically and can help the lecturer to help student to enhance their theoretical studied in class. In my research, it have 64 journal in Scorpuc.com that related with educational kit that including robotic, photographic, and electronic and so on.

1.2 Problem Statement

A digital system is a system which deals with discrete signal. The input and output of this system is two binary value which is 0 and 1. Examples of digital systems are mobile phones, radio, megaphones and many more. The binary number system was refined by W.Gottfried (1705) and he also established that by using the binary system, the principles of arithmetic and logic could be joined. Logic circuits include such devices

as multiplexers, registers, arithmetic logic units (ALUs), and computer memory, all the way up through complete microprocessors, which may contain more than 100 million gates.

In this generation, more student weak in study theoretical compared to practical. Some student may not give 100% concentration during two hour lecture. Student only can pay attention in less than 15 minute in the class especially in theoretical class. They might bored on the slide or the way lecturer give the lecture. The exercise that given by lecturer will only some student that finish it. Not all student do and try to understand the question and how to solve it. That's why this educational kit created to make sure the student understand about logic gate. The student can answer the question and know about the logic gate and the logic equation.

For the lab session, each lab may divide the group that consist of two or three student each group. All student need enough equipment and also the assessment from the lecturer to start their lab. Each group normally one or two person that really do or understand the lab about. Not all student take part during the lab session.

Many student bring to the failure because they do not understand how to learn or they cannot imagine what they have learned in the theory class. Other than that, they might not understand with the different learning style to study certain subject. Because of that this project must be built with electronic learning tool to attract the student to love the subject.

1.3 Objective

The main objective of this project is to make an improvement from the previous Smart Logic Gate Syazwan (2017) by displaying the question and feedback of Android'

application. The project was create without using an Android application and Bluetooth Module. The new project that created is to build the educational kit for logic gate using smartphone. Logic Gate Smart Trainer that connect smartphone with Bluetooth module to display the question and the answer. This project is carried out on the following objectives:

1. To design an educational kit using Protues for the circuit layout, drawing 3D prototype using Paint 3D and build educational kit using Arduino Mega 2560 as the controller, which the program is written using Arduino IDE. The project also use mobile application by using MIP App Inventor to display question and to check the answer.

2. To build an educational kits with low cost, durable and suitable for the univercity student to learn everywhere. For a portable educational kits with size of 12x25cm box will ease student to carry it everywhere. Them estimated cost is less than RM200.00

3. To verify the functionality of the educational kit by performing a set of system testing which will be based on a checlist. This will be done by testing one by one of the connection port on the kit and see the results either it produce the expected output or not.

4. To validate the functionality of the educational kit by performing survey consist of questionair. To measure the effectiveness taken from Google form where the

respondent consist of Faculty of Engineering Techology Electric and Electronic students.

1.4 Scope of work

The educational kits have been measured of the size and the weight. The size of the project is 20x10cm and the weight of the project is about 500g. This educational kits was improve from the previous project which is Smart Logic Gate. The previous kits use TFT as output display and keypad use as the input. The improvement making based on the simple and current platform to student use. So the project was improve by using Android application via Bluetooth connection. This project can make student interest and ease student to understand what they learn using the educational kits. Interface was created for Android application very simple where it only use MIT app inventor that easy to build.

This project included five varieties of IC gates which is 2-input AND gate, 2-input OR gate, X-OR gate and NOT gate (Inverter) instead of more because it just want to give understanding the basic of Logic Gate and use the past year question to make student more understand. To make it clear and easy, the educational kit was using smartphone where the question and the answer displayed in the smartphone. The MIT app inventor was used to create the interface. The interface was involve title of project, name of students developed and name of lecturer. The answer correct or wrong will represent with the sound, logic circuit an also logic equation.

Next, the final completed project was verify with all the component and the functionality of the project. The code of program was function clearly to burn in Arduino. Next is validate the functionality of the project by testing the project to the student and the lecturer. After that, survey was carry out from these project through Google Form and

distribute to FTKEE student in UTeM. The survey of 20 question created to collect the accurate data. There have 50 responses on the survey where all from BEEA, BEEC, BEET, BEED, and BEEI.

1.5 Project Contribution

This project can made people comfortable to use in the school or in the house because they can learn and answered the question themselves only and not dangerous things can happened to student or public. They can play the board quiz if they are bored and change the question if they want it also programed the code. This educational kit can make student more understand about logic gates in the digital subjects. It makes teachers or lecturer easy to explain logic gates to students while in theoretically.

The main reason by doing this project is to prepare the simple way that student can easy to learn from the theoretical. Student will learn how to construct the logic circuit by using the educational kits. This project also can help student to familiar with the logic gate. So that, they will more interested in this subject and also can reduce the number of failure student for this subject.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Literature review is an essential part before beginning any project because it provides all required data related to the project. Based on that, the correct direction in developing the project can be performed proficiently. In this chapter, topic that will be explained are system and software that going to be implemented and previous related work.

2.1 Past Related Research

In order to make this project successful, some studies and inquiring as part literature been taken out. Data and studies for this project was gathered from numerous sources such as books, articles, journal and also websites. All this data was utilized in this project as a guide to ensure this project should be possible in the time given. All the studies and information gathered depended on significant and topic that related to this project.

All of the information about the past related researches is obtained by the sources. There have a few articles and publication journals from Scopus website are explored based on the scope. This literature review focuses on educational kit that connected to the application to improve the logic circuit interpretation ability for

engineering student. There have ten articles about educational kit are chosen and five from it are focusing in development of educational kit for digital subject.

Figure 2.1 The related article and publication journal

2.1.1 An educational kit to teach and learn Operational Amplifiers

The Operational Amplifiers can be simply to design the simple and the complex electronic circuits. It widely used to improve the way of this integrated circuit that included in electronic engineering course. According to Costa *et al.*(2017), understanding how they work and their common application are therefore fundamental. The laboratory work is fundamental for engineering educator, which is required the adoption of real laboratories experiment OpAmp-based circuits. Currently the kits was be accessed and reconfigured through a computer. It includes a tool to simulate some basic and typical circuit.

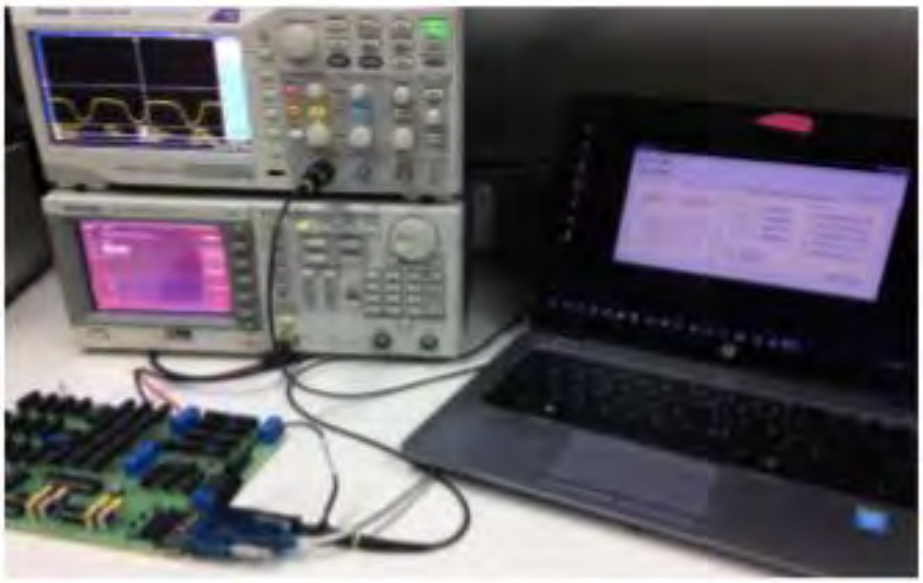

Figure 2. 1: The exemplifying the electronic kit using teo external instruments from Costa et al.(2017)

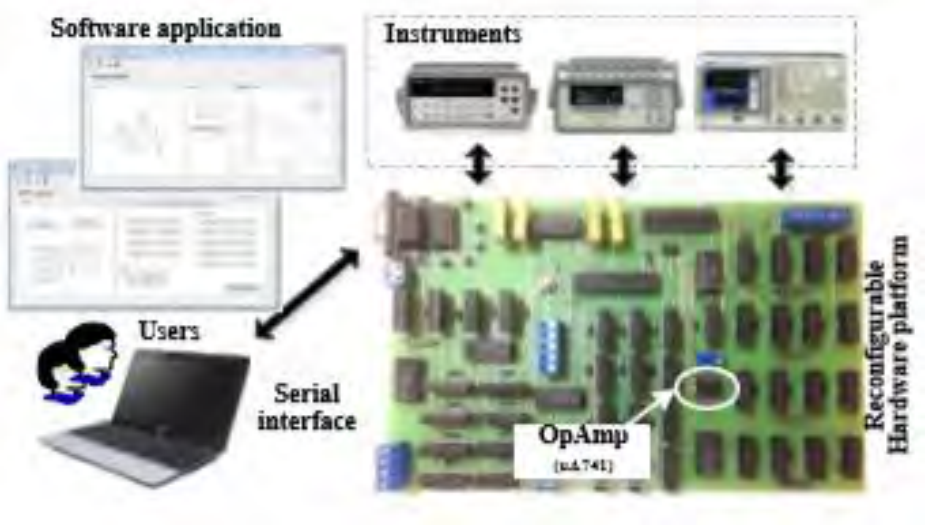

Figure 2. 2 An overall architecture of the electronic kit Costa *et al.*(2017)

The development kit allows the simulation, setup and experimentation of an electronic circuit. Figure 2.1 and 2.2 show the kit comprises a reconfigurable hardware platform interfaced with a common PC through serial communication. It based on the OpAmp uA741 and it was supported by a local architecture comprising a hardware platform through software. The OmAmps are probably the most known IC in the