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Development and Effectiveness of EPR Lab QR Code at Department Electrical Engineering, Politeknik Ibrahim Sultan

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Abstract

Laboratory use is one of the important parts for students when making practical work. The usage is compulsory for Polytechnic Malaysia students especially those who are taking hands on course such as electrical and electronic engineering. This EPR Lab QR Code is the necessary facilitator for students that are taking DEE40082-Project 1 and DEE50102-Project 2 while using the Project Laboratory (EPR lab) in Jabatan Kejuruteraan Elektrik, Politeknik Ibrahim Sultan. There are four QR code that student needs to scan when entering the laboratory. The first QR Code is for registering the student name and others recommendation detail such as carried out activity, body temperature and problem that are faced while making practical work. The second QR code is purposely for developing and etching process. The video shows the step-by-step method to do the developing and etching Printed Circuit Board (PCB) process. This video includes the safety process that is mandatory to do while doing the etching process. The third and fourth QR code is for drilling and soldering process. This QR code is beneficial for student to replace the usage of Laboratory Usage Book and student also can watch the video of developing, etching, drilling and soldering process which emphasis on safety part. The QR code are made separately for each process to give full understanding to student and they can focus only for one process to another process to complete the cycle of PCB production. There are also QR Code card that have full video of drilling, soldering, etching and developing Printed Circuit Board (PCB) process. This QR Code card were distributing to lecturer and student for them to watch the PCB process video. 15 respondents from Diploma in Electric and Electronic Engineering (DEE) course were chosen to apply the EPR Lab QR Code to assist seeking answer for questions given and the result is all of them satisfied with the product.

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Key-word: - QR Code, Lab EPR, Printed Circuit Board (PCB)

1. Introduction

Nowadays, online access is widely used by everyone. One of the most popular online access is QR Code. A QR code is a type of matrix barcode that contains information about the attached item. In practice, QR codes often contain data for a locator, identifiers, or trackers that points to websites or application. QR is short for Quick Response code, is a code that quickly readable by a cell phone.

QR Codes were first made by a Toyota auxiliary, Denso Wave, in 1994(Weir, 2010). As indicated by (Probst, 2012), Denso Wave built up the QR Code trying to improve the assembling cycle and the following of vehicles and parts. QR Codes were intended to take into account quick interpreting speeds and owe their reality to the turn of events and accomplishment of standardized tags (Wave, 2016). The utilization of QR Codes, which got boundless in Japan in 2002, was encouraged by the pattern of advertising cell phones with a QR Code-understanding element. The prevalence of the code among the overall population was because of its sheer accommodation, as the QR Code is an open code that anybody is permitted to utilize (Wave, 2016). The QR Code was made for passing on information quicker and at a fast (Weir, 2010).

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QR Codes have a little printout size, with high-limit encoding of information and an organized adding highlight, making it appropriate to use on development materials (Wave, 2016). QR Codes are as of now in their third era. The capacity limit didn't just increment with every age, except new highlights, for example, the option of organization logos on QR Codes were likewise added (Demir, Kaynak and Demir, 2015). QR Code can store a lot of data, for example, text, recordings, notices, business card data, individual data, and some other kind of computerized data (Demir et al., 2015). QR Codes are incredibly practical, as there are no beginning up expenses or month to month charges, and numerous QR Code generators and per users are free (Price, 2013). Utilizing QR Codes can spare paper, consequently showing content in a green way (Price, 2013)



Figure 1 First generation QR code



Figure 2 Third generation QR code

1.1 Problem Statement

The developed EPR Lab QR code due to the Laboratory Usage Book were not updated since 2017. Either the book has been missing or user did not find the book due to the book were misplaced. This problem happens frequently in EPR Lab. Second, most of the lecturer that had a project student always claim that their student sometimes forgot the step and solution of the chemical while dealing with the developing, etching, drilling and soldering process. Although the practical of this process had been made often. Due the wrong step or solution, it will make the PCB is unusable. And the best part is, most of the student not alert about the usage of the PPE for the safety purpose and not used a proper Personal Protective Equipment (PPE) while making the PCB. It is very dangerous due the chemical is dangerous if often inhaled or touched using bare hands.

1.2 Objective

The objective of the EPR Lab QR code are: -

- 1.2.1 To make the QR code for registration process while entering project lab to replace the Laboratory Usage Book.
- 1.2.2 To design the video and QR code on each developing, etching, drilling and soldering process with a proper PPE for safety purposes.
- 1.2.3 To analyse the satisfactorily of EPR Lab QR codes product on student.

2. Methodology

The Method Can Be Categorized into A Few Section. The sections are:

2.1 Registration Form QR Code

- 2.2.1 Researchers need to build the item that need to fill.
- 2.2.2 Build up the item detail using Google Form
- 2.2.3 QR Code Generator process

2.2 Developing, Etching, Drilling and Soldering PCB Process QR Code and EPR Lab QR Code Placard

- 2.2.1 Video Shooting on overall PCB process
- 2.2.2 Video Editing on PCB process
- 2.2.3 Upload the video on YouTube Channel
- 2.2.4 QR code generator process.
- 2.2.5 All the video will be upload on the Google Drive to make a EPR Lab QR Code placard.

2.3 Analysis of satisfaction among students using the questionnaire that was made using Google Form and analyse using IBM SPSS version 23.

2.3.1 Sample research

This EPR Lab QR Code placard were distributing to lecturer and student that took Project 1 (DEE40082) and Project 2 (DEE50102) for them to watch the PCB process video. 15 respondents from semester four Diploma of Electric

Electronic (DEE) course were chosen to apply the EPR Lab QR Code to assist seeking answer for questions given. The Google Form for student to answer the questionnaire after using this product.

The action study was quantitative because the data were analysed using percentage and mean score analysis. The questionnaire was conducted using Google Form and the URL link were distributed to respondents involved. This method is does not use any costs and facilitate the respondents to answer the given questions (Dasar Teknologi Hijau Negara, 2009). The data were analysed using Static Package for Social Science (SPSS) version 23.0 software. The questionnaire consists of 16 question items that present questions based on two parts which is Part A- Format for EPR Lab QR Code (4 item) and Part B-Operation of EPR QR Code (12 item) The form of items in sections A and B is using the Likert Scale and guideline for Mean Score Value as in the Table 1 and Table 2.

Table 1 Likert Scale

Scale	Definition
1	Strongly Disagree
2	Not Agree
3	Agree
4	Strongly Agree

Table 2 Guidelines For Mean Score Values

Mean Score Range	Min Score Value
1.00 – 1.50	Very low
1.51 -2.50	Low
2.51 – 3.50	Moderate
3.51 – 4.50	High

3 Result

3.1. By referring to Figure 3, it shows the EPR Lab QR CODE placard that were distribute among student and project lecturer of Department of Electrical Engineering, Politeknik Ibrahim Sultan. This placard consists of the video of developing and etching, drilling and soldering PCB process. It is also it includes manual of each PCB process with safety process and PPE. The step of using EPR Lab QR Code placard were shown in Figure 4. From Figure 5, it shows four QR code (registration QR Code, drilling PCB process, soldering PCB and of developing and etching PCB process. These QR Codes were put in the project laboratory (EPR lab) at each partition of PCB process.



Figure 3 EPR LAB QR CODE placard

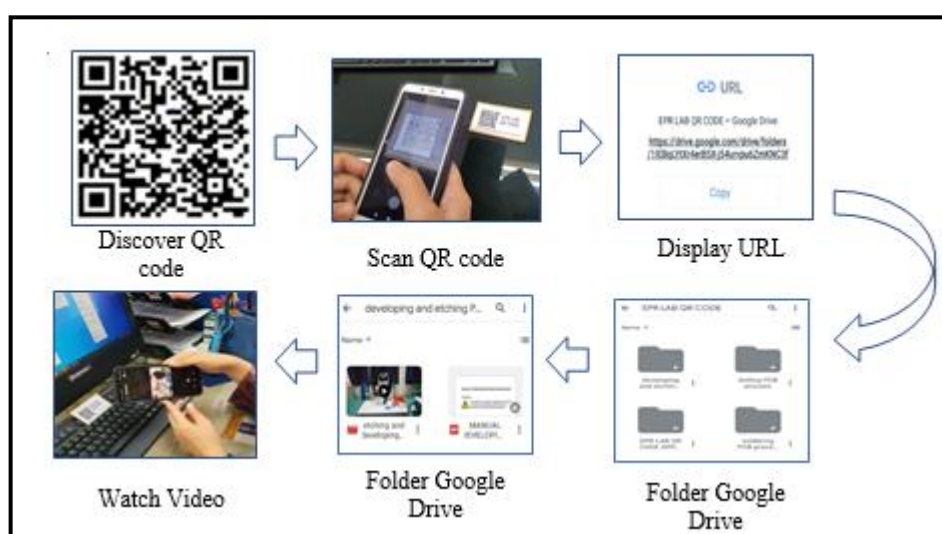


Figure 4 Step of using EPR Lab QR Code placard



Figure 5 Four QR code were put in the project laboratory (EPR lab) at each partition of PCB process.

3.2 Results of the analysis obtained through questionnaires to respondents are discussed in this section. Prior to the actual study, a total of 10 students of semester Four Diploma in Electrical and Electronic Engineering (DEE) were selected for a pilot study. The purpose of this pilot study is to obtain high reliability coefficient. Analysis of the data shows the value of Cronbach's Alpha is 0.955 for 16 items (question). This proves that the questionnaire has high reliability and can be used in actual studies. The results for each part are discussed below:

Table 3 Part A: Format for EPR Lab QR Code

No.	Item	Percentage	Mean Value	Mean Score Value
1	ER Lab QR Code placement is easily accessible	87.5%	3.87	High
2	The colour and brightness of EPR Lab QR Code is easy to see	87.5%	3.87	High
3	EPR Lab QR Code size make it easy to scan	87.5%	3.87	High
4	A brief description is enough to help in using the EPR Lab QR Code	87.5%	3.87	High

Table 4 Part B-Operation Of EPR QR Code

No.	Item	Percentage	Mean Value	Mean Score Value
1	I understand all the objectives clearly.	81.3%	3.80	High
2	I understand the ideas presented	81.3%	3.80	High
3	All instructions given are easy to understand	87.5%	3.87	High
4	I can easily understand the function of this EPR Lab QR Code	81.3%	3.80	High
5	The use of EPR Lab QR Code easy to understand.	75%	3.73	High
6	The explanation of EPR Lab QR Code for each Printed Circuit Board (PCB) process easily to understand.	75%	3.73	High
7	The video of EPR Lab QR Code for each Printed Circuit Board (PCB) process are very clear	81.3%	3.80	High
8	The steps shown to implement the practical process are very clear using the EPR Lab QR Code.	87.5%	3.87	High
9	The use of these EPR Lab QR Code makes me confident of doing practical on Printed Circuit Board (PCB) process.	87.5%	3.87	High
10	This EPR Lab QR Code helped my Printed Circuit Board (PCB) production process successfully	87.5%	3.87	High
11	The video on each QR code show the handling process with safety Personal Protective Equipment (PPE) make me more confident to do the Printed Circuit Board (PCB) production	81.3%	3.80	High
12	This EPR Lab QR Code managed to attract the interest of the students	87.5%	3.87	High

The result of Part A: Format for EPR Lab QR Code were shown in Table 3. From the data, respondent give HIGH mean score value for all of the item. Overall percentage for Strongly Agree is 87.5% and the mean value is 3.87. It can be concluded that the format of EPR Lab QR Code is easy to access and scan where the colour and brightness is clear and the brief description at the placard and QR Code at EPR Lab is understandable to use.

For Part B: Operation of EPR QR Code on Table 4, it can be figured out that the respondent also gives HIGH mean score value for all of the six items. The percentage for Strongly Agree also around 75% till 87.5%. For item No.5 and No.6 that give 75%, researcher had inserted the manual operation of each PCB process in the placard with sentences that are easy to understand.

4 Discussion and Conclusion

The QR code for registration process has been made including with the EPR Lab QR Code placard. The video and QR code on each developing, etching, drilling and soldering PCB process with a proper PPE has been designed. The satisfactorily of EPR Lab QR codes product on student has been made and all of the student satisfied with the product with HIGH mean score value.

EPR Lab QR Code can be used by lecturers and students in the Department of Electrical Engineering to increase the understanding and knowledge about the PCB process and cultivate the safety part when entering the lab. It also makes the student and lecturer normalize the fact that when entering the lab, they need to scan the registration QR code for safety purposes.

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