

# QR Code Technology Based Laboratory User Attendance to Improve Study Program Governance

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**Abstract** – QR codes are commonly employed in today's technologies. Surabaya State University's Department of Electrical Engineering uses the QR Code to track the presence of Electrical Engineering Laboratory users. Hence far, attendance has been taken through manual scanning, hence laboratory members frequently do not take attendance. The usage of the QR Code for attendance has been carried out and tested by scanning the QR code. The QR code direct to google sheet link whereas the Laboratory used to send it to the head of the faculty. The Experiment of using QR Code were held in Telecommunication Laboratory with homogenous area of illumination and scanned at 50 cm, 100 cm, and 150 cm distances. The results demonstrate that QR codes sized 13.5 cm<sup>2</sup> can still be scanned at a distance of 100 m but fail at distances greater than 100 cm by using smart phone. The use of QR codes for attendance in the Electrical Engineering Department has numerous advantages, including being efficient in order to establish good governance, efficient, paperless and contributing to a green environment.

**Keywords:** good governance, efficient, green environment, attendance, QR Code scanner.

## I. INTRODUCTION

The attendance of QR code attendance laboratory users is a creative idea to be environmentally friendly or paperless, where the technology is based on e-Notification and e-Confirmation which notifications in real time and uses the rising technology of telegram bots. Not only that, the application of Google access such as Google forms is used to input attendance data and Google Spread Sheet as a data store or database. The advantage is that reporting is easy to manage again because of the use of Google Spread Sheet or Excel which is online, while the advantage of using it is that it is free of charge, only uses email from Google, and does not require the purchase of hosting and domain. So that the control process from the leadership can be carried out properly, the leadership can find out laboratory users, the purpose of using the lab and daily records in real time so that the target of education management is maximally achieved.

A university must have good governance, because this governance focuses on controlling and controlling both organizational structure, personnel function tasks, governance mechanisms and leadership. Governance or management can be defined as the utilization of resources, both human and other resources needed to achieve certain goals [1].

The quality of education in an institution cannot be separated from the system that is carried out in the governance of education. Good governance must also be integrated with a good management system. The word management comes from the English language 'management' which comes from the verb 'to manage' which means to organize, manage, control something [2]. Management is an activity or a series of actions or processes to achieve predetermined goals through predetermined cooperation. Effective cooperation is needed, with various interrelated actions. In the world of education, it is necessary to carry out the right management system to achieve targets, goals, and adapt to various things that are happening. Yamin (2009, p. 19) argues that education management means as a cooperative process that is systematic, systemic, and comprehensive in order to realize national education goals.

Education management can also be interpreted as everything related to the management of the educational process to achieve predetermined goals, both short, medium, and long-term goals.

Electrical Engineering Study Program as one of the Study Programs at the Faculty of Engineering, Universitas Negeri Surabaya wants to realize good governance and education management in the Study Program. With regard to this, there are several problems that must be resolved, including the

Laboratory attendance process in the study program still using manual recording. To record Laboratory activities, Lab users every day must make manual records in a ledger related to user names, days and dates, purposes of use and signatures. To solve this problem, this research proposed a real time QR Code-based attendance system.

Research related to the use of QR codes where barcode-based systems to help recognize historical objects in museums identify objects in the environment were introduced [3], [4]. The system is based on the idea of using QR codes (two-dimensional barcodes) to which an object is affixed and scanned using a camera phone equipped with QR reader software. The reader translates the barcode to a URL and directs the phone browser to fetch an audio file from the Web containing a verbal description of the object [5].

The next related research by Qurotul Aini et al [6]. The utilization of QR Code for attendance in the Laboratory room, to give an assessment to the lab assistant or Pencil (Lab Assistant Assessment). Where it will be connected to the pencil.raharja.ac.id website. The program used is native PHP based.

Muhamat Al Satrio et al [7] and Abualnadi D et al [8] utilize QR Code technology, student data can be stored in the form of QR Code images which will be affixed / attached to the Student Identity Card (KTM). Then the attendance process is carried out through the presence of a smartphone QR Code application that has been installed (installed) by all lecturers. And finally, data is sent for the presence of Bina Darma University media information via the internet.

Related research studies above utilize QR code technology to get only, from a certain place, without direct notification, so the control process does not occur immediately, there is still an interval time. So that the possibility of manipulation of the data sent. When compared to the current research, of course, this application is superior, because this system utilizes telegram bots in sending data to leaders and in real time, and e-Notification for those who do absences which are sent to email and also in real time. And utilizing Google Access media, only with email and free (no need to buy hosting and domain). The Google Access used is Google Form for the media where the attendance is and Google Sheets as a database (data storage). From the use of this technology, the android-based QR Code caller uses MIT App Inventor. With the combination of these technologies, an application is formed that provides convenience in helping efficient study program governance.

Various technological approaches are used as alternatives to replace manual attendance machines by using identity signatures. Attendance using signatures is one of the attendance models that has been used since the beginning and is still used today. The signature attendance model uses a personal identity column and is equipped with other available columns for signature proof of attendance. This approach has several weaknesses, especially the attendance recapitulation process which must be done manually. The attendance model

with the attendance card is introduced on the Amano machine. Attendance with the Amano machine has its own characteristics, namely the availability of a large clock to mark attendance and also cards with special readings from the machine to print time information accurately on the available card columns. The weakness of the Amano machine is more or less the same as the signature process, where the recapitulation process requires a manual method. Therefore, a system was built and designed in order to control the learning process in the laboratory from attendance, learning activities that are reported in real time to institutional leaders such as Head of Study Program and Deans. The direction of the application development aims to improve the quality of Education management services which leads to improved governance of Higher Education.

## **II. METHODS**

### **2.1 Initial Research**

Initial research will be carried out by research members through direct observation and interviews with educational staff and students in the Multi Media Telecommunications Laboratory of the Electrical Engineering Study Program. From these activities, interviews have been conducted and the results of these interviews there are several findings that prove that many students and lecturers during activities in the laboratory do not do manual presence due to the lack of effectiveness of the presence process.

### **2.2 Problem Formulation and Research Objectives**

This activity was carried out by the chairman and members of the study. From the results of interviews and observations in preliminary research, there are several problems that must be resolved with a well-organized and planned system. The current attendance process is still manual using paper and it is difficult to record any activities in the laboratory. Of course, the existence of this system can provide convenience in controlling the attendance of laboratory users, and information on the attendance of students and students and lecturers in real time with chat bot technology.

### **2.3 Data Collection.**

Data collection was carried out by the head and members of the study. Data collection in this section is a follow-up to interviews and observations in initial research, which is supported by literature studies. Literature study is an activity carried out to study and understand e-Confirmation-based QR Code Attendance (telegram bot) and e-Notification with Google Access technology, information system development, MIT App Inventor as a QR-code reader, Google form for input, Google Spread Sheet as data storage or database and using telegram bot technology as real time data transmission.

### **2.4 System Design**

The system design process is carried out by the research

leader. The system design in question is the design of a system for understanding e-Confirmation-based QR Code Attendance with Google Access technology conceptually. The intended system design includes three important aspects, namely (1) database design as a data mining base; (2) design of the interface of the software being built and (3) design of program algorithms. (Figure 1).

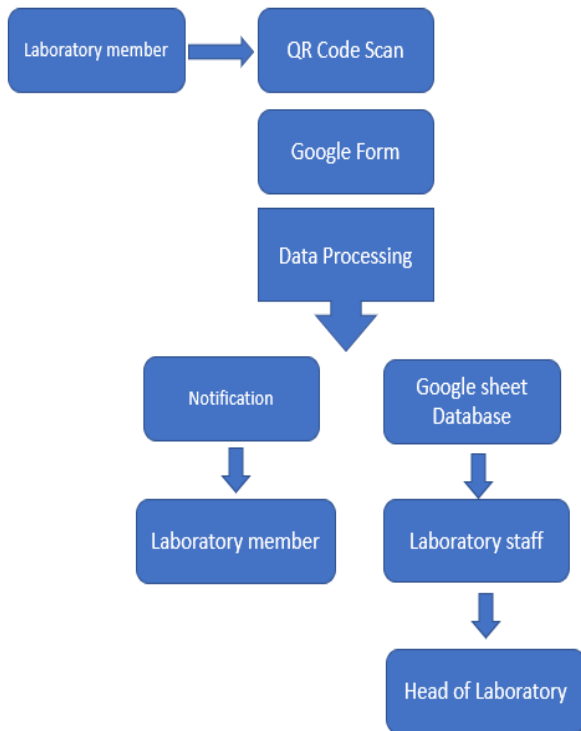


Figure 1. System Design

#### 4.4 Design Implementation.

Design Implementation is carried out by the research leader. This stage is making the application and coding the application on Google Spread Sheet in the script-code section, which is in accordance with the system design. So that an application is built to solve the problems in this study.

#### 4.5 System Testing

The head and members of the study carried out this activity. Test the application by testing the system. If appropriate then continue if not then return to system design. In this testing stage, barcodes are scanned using 3 different mobile phone cameras and different resolutions and from different scanning angles, namely 30°, 45° and 60° angles in the left and right directions, as well as at radii R1 = 50 cm, R2 = 100 cm and R3 = 150 cm (Figure 2). The scanning process was carried out at the same place and handling.

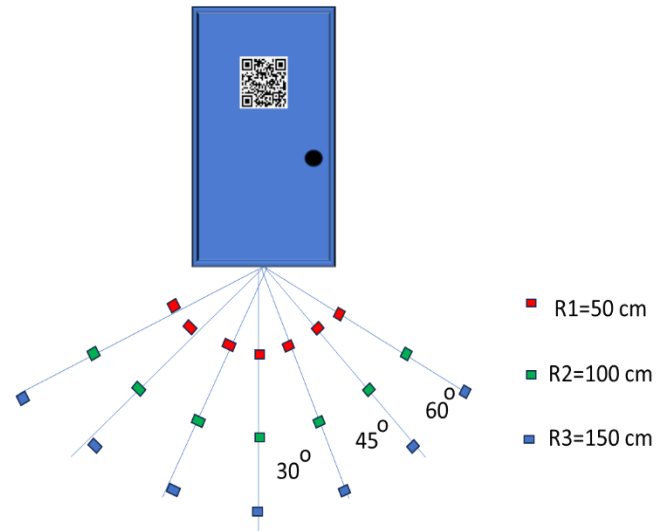


Figure 2. System testing design

#### 4.6 Conclusions

Conclusions were drawn by the head and members of the study. Conclusions obtained from the application and research process carried out and not further from the research will be suggestions that will be further developed by the research.

### III. RESULT AND DISCUSSION

The final result of this research is the attendance of lab users using QR Code with Google Access technology. The manufacturing stage is as follows:

#### 1. Creating Google Form.

The screenshot shows a Google Form titled "DAFTAR HADIR MAHASISWA LABORATORIUM TELEKOMUNIKASI". The form includes a header with a QR code and a message: "Sebelum Anda memasuki kelas hari ini, jawablah beberapa pertanyaan berikut." Below the message, there are three required questions: "Email", "Tanggal" (Date), and "Nama". Each question has a text input field and a "Your answer" label. The form is displayed on a mobile phone screen.

Figure 3. Google Form for Laboratory member

## 2. Generate QR Code using get-QR code

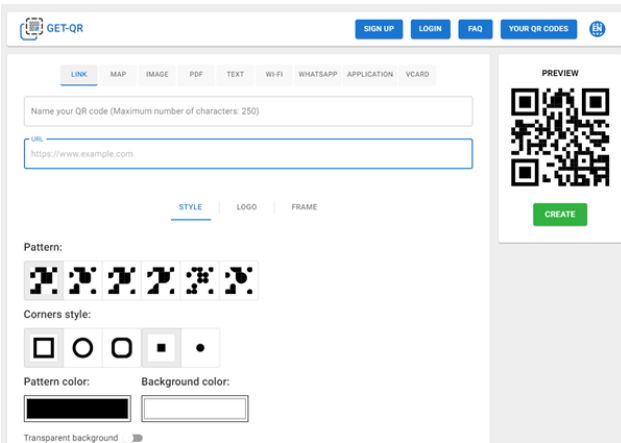


Figure 4. Generate QR-code using get-QR code

## 4. Test results of Telecommunication Lab member data attendance on google sheets

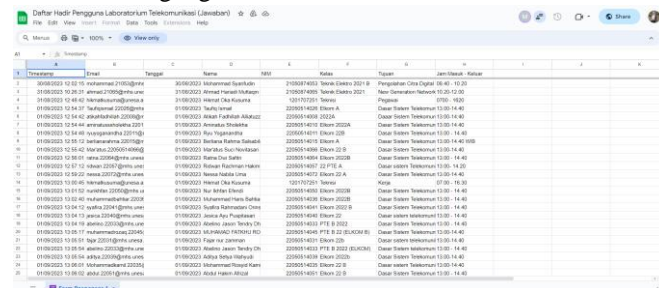


Figure 5. View attendance on google sheets

Figure 5 shows the results of the presence of laboratory members who carry out activities in the laboratory. From the results of the attendance, laboratory users no longer use manual recording but have been directly recorded in the laboratory officer's google sheet. For reporting purposes to the faculty leader, it can be sent in paperless form.

System testing is carried out using the black box testing method, where this test is carried out by testing the functionality of the system built to find out whether it is in accordance with the wishes when designing with implementation. Presence testing is carried out by means of students logging in to the application that has been installed on their respective smartphones then scanning the QR code using a google lens as in Figure 5. The results of the attendance made by students can be seen by the laboratory assistant directly through google sheets. This attendance can be managed by the laboratory assistant for reporting to the Head of the Faculty of Engineering Laboratory, Surabaya State University. Presence view page as shown in Figure 5. The results of the QR code scanning trial can be seen in table 1. Table 1 shows the results of the experiments that have been carried out, namely scanning QR codes using three different self-phone brands, different scanning distances and different angles.

From Table 1 above, it can be seen that the maximum scanning distance can be done for barcodes with an area of 30.25 cm<sup>2</sup> is 100 cm. The QR code scanning retrieval position can be done in the direction perpendicular to the laboratory

door for all self-phone brands. While for the retrieval of QR code scanning with the direction of the scanning slope of 30° and 45° from the laboratory door can be fulfilled for two brands of cell phone only.

From Table 1, we can also see the effect of camera resolution on QR Code scanning. The I phone camera (12 MP) has a better QR Code scanning ability than the other two brands even though the resolution is the lowest.

The ability to scan barcodes depends on the quality of the camera, even though the camera has a low resolution, but if it is equipped with a larger sensor size, so the QR code scanning ability is better than the other two brands.

Table 1. Test results of QR code scanning using different smartphone brands, distances and angles.

Length (R)	Brand of smartphone and its resolution	0°	30° Right	30° Left	45° Right	45° Left
50 cm	Brand iPhone (12MP)	✓	✓	✓	✓	✓
	Redmi Note 10S (64MP)	✓	✓	✓	✗	✗
	Samsung A12 (50 MP)	✓	✓	✓	✓	✓
100 cm	iPhone (12MP)	✓	✗	✗	✗	✗
	Redmi Note 10S (64 MP)	✓	✗	✗	✗	✗
	Samsung A12 (50 MP)	✓	✗	✗	✗	✗
150 cm	iPhone (12MP)	✗	✗	✗	✗	✗
	Redmi Note 10S (64MP)	✗	✗	✗	✗	✗
	Samsung A12 (50 MP)	✗	✗	✗	✗	✗

## IV. CONCLUSION

The implementation of policy research for the Faculty of Engineering with the title "User Presence of the Electrical Engineering Department Laboratory Using QR Codes with Google Access Technology to Improve Study Program Governance" has reached the trial stage. At this trial stage, users of the Electrical Engineering Laboratory have succeeded in scanning the QR code properly. . The results of the transfer are stated in a Google sheet which can be accessed by laboratory staff. By using web-based recording, the study program can achieve many efficiencies, including reducing the use of manual recording so that study program governance also improves. The next stage, namely the implementation stage and taking user response questionnaires regarding the presence of users of this Lab, will be carried out.

## ACKNOWLEDGMENT

This research has been supported by Faculty of Engineering Research trough The Institute for Research and Community Service Universitas Negeri Surabaya (LPPM)

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