

Smart Attendance System for Covid-19 Social Distancing

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DOI: <https://doi.org/10.30880/peat.2022.03.02.034>

Received 27 January 2022; Accepted 07 November 2022; Available online 10 December 2022

Abstract: The purpose of this project is to develop a GUI-based system that can record student attendance using a QR Code during the Covid19 pandemic. When lecturers use paper as a record of the student attendance, students do not follow social distancing that causes several direct contacts. The objective of this study is to design a Smart Attendance System using QR code by developing a Graphical User Interface (GUI) that will be integrated with the QR code system and develop a database. The system is also able to record student temperatures when attendance is recorded. The development process of the Smart Attendance System is based on the design, development of the ADDIE model which contains five phases, namely analysis, design, development, implementation, and evaluation. Visual Basic is used to produce interface displays and databases are developed using Microsoft Access. Altogether, the designed system is capable of helping lecturers to take student attendance faster and easier. While, avoiding close contact among students.

Keywords: Smart Attendance System, QR Code, Visual Studio, Microsoft Access, VB.NET

1. Introduction

Coronavirus disease (COVID-19) is an eventually discovered coronavirus that causes an infectious disease. [1] COVID-19 is an infection caused by a new coronavirus strain. Corona is represented by the letter CO, virus by the letter VI, and diseases by the letter D. The majority of patients infected with the COVID-19 virus will have mild to moderate respiratory symptoms and will recover without needing any specific therapy. In every institution, the practice of monitoring attendance is critical in measuring the efficiency of the services provided and the general interest of individuals who benefit from the organization's services. With the former system, which required handwritten attendance registers, this was a time-consuming procedure.

Advances in technology now allow information to move without limits and boundaries. Everything is available immediately and quickly through the media electronics. Sophisticated advances that are

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capable of saving time and energy consumption even facilitate the transfer of this information moving and occurring in cyberspace or virtual space that has no location, is now increasingly becoming a reality in the world of education in Malaysia.

Technology nowadays has changed; everything is moving to something that can be used using only fingertips. In order to meet and catch up with the current modernization of this technology, everyone is turning to faster, faster and easier management and services than the old way. The system is one of the software that facilitates human movement. So compared to the traditional way of using paper to fill in all the information and data, the system simplifies because it is faster and more efficient. It is more systematic, if a centralized data management system is used to facilitate the retrieval of operational information as all the information will be combined in one database.

An organization needs a specialized system to facilitate and speed up the work process in an effort to increase the efficiency and productivity of the organization. The existence of a good, systematic and secure system is very meaningful for the management to monitor all its management information effectively.

Large organizations such as a university also need to have a more systematic system in dealing with the increasing number of students every year. A system needs to be developed to facilitate the work of lecturers in the university. Among them is the process of taking student attendance. The process of taking attendance at the university still uses the traditional way that lecturers have to print attendance lists and distribute to students to be signed each time lectures and data counts have to be calculated manually, and it will take a long time.

The idea of producing this attendance system from the process of taking attendance in the lecture room. The process of taking attendance records manually, there are still shortcomings such as this method takes time, if not practice social distancing will cause a lot of direct contact in a class. Lecturers may have difficulty accessing student data. So, with this system it can be made easier with a GUI system. This project can reduce time and increase speed of taking attendance. In this project, a QR scanning system was used to record student attendance automatically. This project will use student ID/Matrix. The system will integrate with the software. This method is more effective in preventing problems in the process of obtaining attendance manually.

The objective of the project are as follows:

- (i) To study on the digital attendance method incorporating Graphical User Interface (GUI).
- (ii) To develop a user-friendly Smart Attendance System for recording student attendance and temperature with Graphical User Interface (GUI)
- (iii) To evaluate the performance of Smart Attendance System in terms of usability and effectiveness.

2. Materials and Methods

This section provides a comprehensive summary of the project's methods and materials. The data will cover all parts of the work plan at each stage, such as software used, block diagram and a system flowchart.

2.1 Materials

In this Smart Attendance System design process, the researcher produces a suitable and user - friendly system design. This design includes developing the interface design and developing the programming software so that it works as planned. Software system is a key element in the process development of this Smart Attendance System. There are two types of software used to assist in the implementation of the project so that it becomes more efficient and structured as well as able to adapt

to the latest computing technology. The list of software used for this system are Visual Studio Enterprise 2022 and Microsoft Access

There are several aspects that need to be considered. Thus, in the course of this phase is designed to produce a design that really efficiently while minimizing the problems that may occur. In this phase, the software has been determined to be used. The researcher also needs to draw an interface display that will be an intermediary between the user and the system.

Figure 1 is a conceptual framework for the development of Smart Attendance System using QR Code. The input and output of this project are represented through the block diagram. The student acts as input. When the student scans the QR code it will appear at GUI and be able to let the student fill the temperature. The data will be stored in the database.

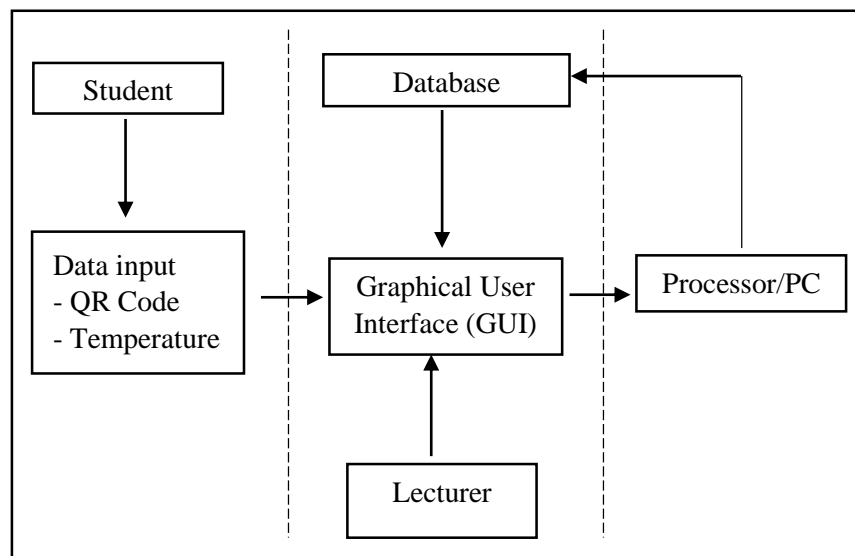


Figure 1: Block Diagram Smart Attendance

2.2 Methods

Each selection and action performed during the implementation of the attendance system will be described clearly and in depth in stages until the project is successfully produced. The development phase is implemented with VB software where the representation of the number on the user ID will be entered into Microsoft Access and Microsoft Access will send information to Visual Basic and then display the arrival of students. The merging of these two systems occurs with coding that has been written to the module in VB.

Basically, programming in VB can be said to be a complicated and challenging task in the process of forming the interface and coding of a program. The important steps for designing a VB program are as follows:

- Define in advance the function of a program.
- Determine the shape and position of the program user interface.
- Forms and drawings of the user interface used such as forms, buttons and others.
- Specify a name, color, size, and appearance for each interface object.
- Write a program to allow each part of the program interface to work.
- Identify and repair program programs if errors occur.

Figure 2 is a layout screen of the internal development environment found in the VB program. It contains a menu bar and toolbar where it is divided into five small windows such as browser windows, shape windows, ownership windows, window shape layout and tool box window. When VB is started

a splash page will appear to allow the selection of the appropriate form type to be used in forming the program system.

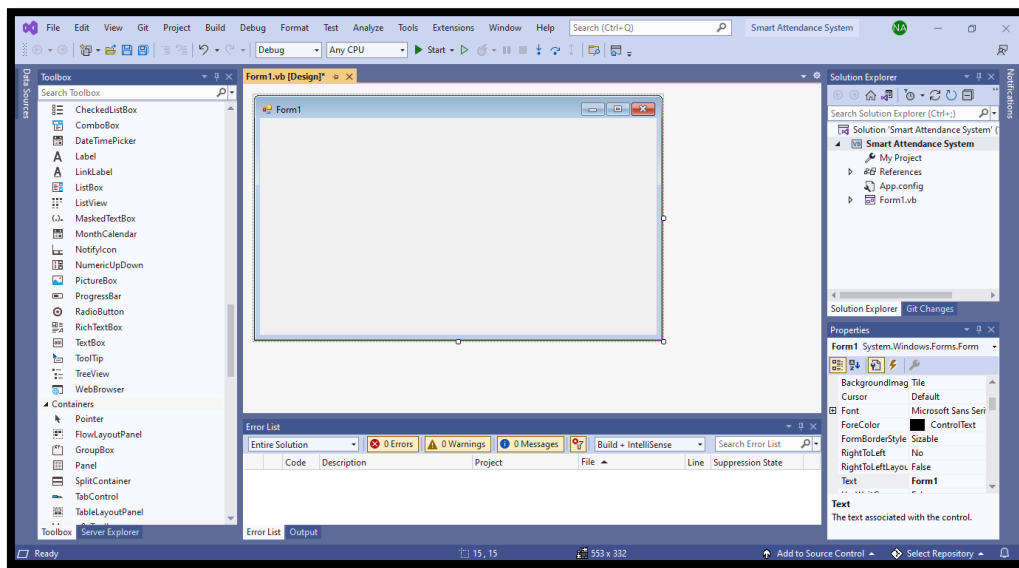


Figure 2: Layout Screen Interface in VB

The program that is implemented has an interface that is connected between forms with other forms. The functions of each constructed form are briefly explained in Table 1.

Table 1: Brief Description of Interface Forms

Form Name	Description
Login Form	This window displays for the user to login the application.
Menu Form	This window displays the menu of the program.
Register Form	This window allows lecturer to manage student registration. Either to add, delete, update, generate student’s QR code and download QR code for student.
QR code Scanner Form	This window is for the lecturer to scan the QR code and key in the temperature and save to the database.
Database Form	This window displays the database gain from Microsoft Access.

This phase is the phase that describes the implementation process of the Attendance System. In this phase, programming is the main process of the system for the software. This system works by using coding written on the VB module. The system is designed to enable the data scanned on the QR scanner to be interpreted by a computer. Figure 3 shows the flowchart for the scanning system using QR code smart attendance. This flow chart describes the process to see the information in the system developed by the researchers. This interface is built in Visual Studio software to show the whole system works.

The start of this system is the login Interface. Users need to enter a predefined username and password. If the username and password are incorrect, it will return to the Login interface until the specified password is entered correctly. The menu interface display is for the lecturer to select either to register a student, QR code scanner or student database. For the register student menu, lecturers are given the option to add, delete, update and generate QR code for students. In this form also can display database registered students. The data will be stored in the database.

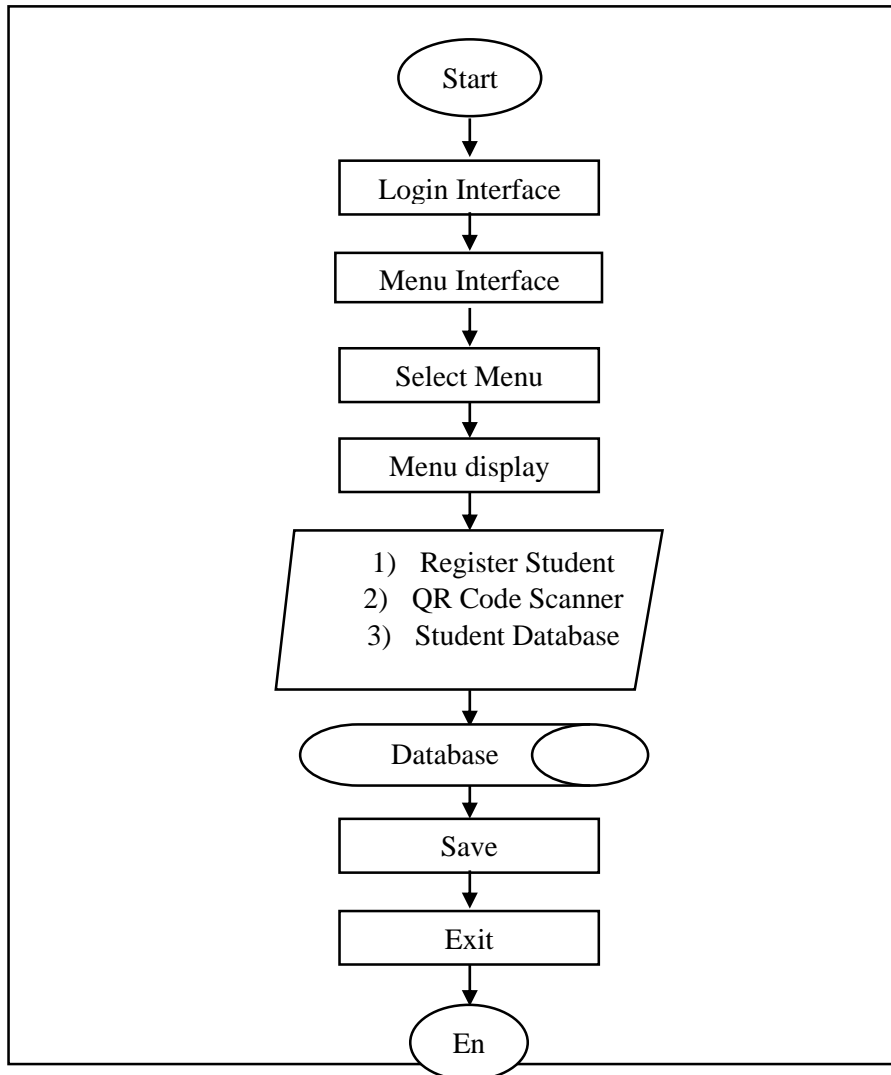


Figure 3: Flowchart Smart Attendance Systems User Interface

3. Results and Discussion

In this section, the results of the analysis that has been conducted on several important aspects in the production of this Smart Attendance System project. It is an important element and must be in writing to document a project accurately and in detail. The analysis conducted involves various methods and instruments as appropriate.

There are two software that have been used in producing this Smart Attendance System. All this software is required to ensure that the system runs smoothly and the information received can be processed and stored in a more organized and systematic manner.

3.1 Visual Studio Enterprise 2022

VB.Net codes used as a programming for Smart Attendance System to allow an interface between the user and the system work. VB.Net is among the most user-friendly codes because it makes it easy for users to access information easily and quickly. Based on Flowchart Figure 3, the first window form was a login interface form. Figure 4 shows the programming for the login system. Figure 5 shows the interface of the security system that must be filled in by the user before entering the Smart Attendance system.

```

Public Class Form1
    Dim con As New OleDb.OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data Source=C:\Users\Asus\OneDrive\Desktop\PSM2.3\smart_attendance_database.accdb")
    Private Sub loginbtn_Click(sender As Object, e As EventArgs) Handles loginbtn.Click
        If username.Text = "admin" And password.Text = "1234" Then
            MsgBox("Log in Successfully!", MsgBoxStyle.OkOnly, "Log in Form")
            MenuForm.Show()
            Me.Hide()
        Else
            MsgBox("Sorry Incorrect Username and Password", MsgBoxStyle.OkOnly, "Invalid")
        End If
    End Sub
End Class
    
```

Figure 4: Login System Programming

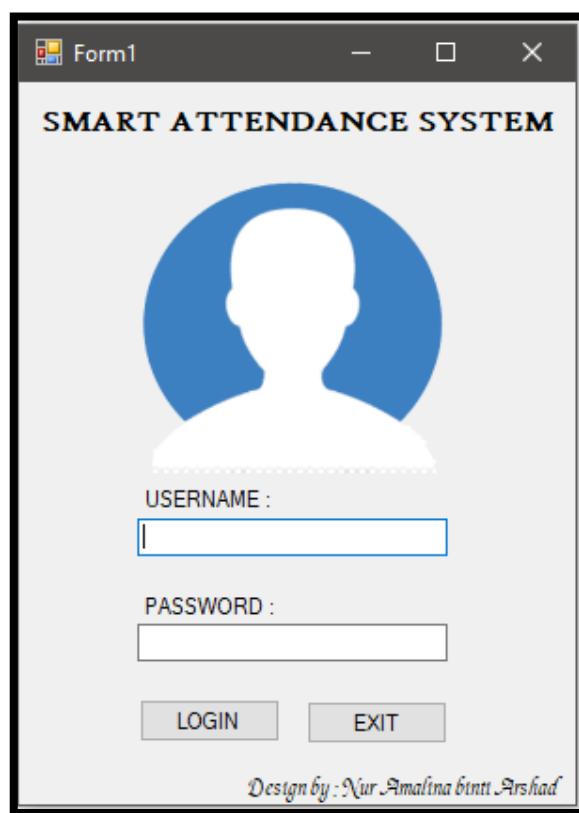


Figure 5: Login Interface

In this software, there are several applications that can be used by lecturers. Among them is that there is a menu window that shows three buttons which are the register student button, QR code scanner button and database student button. Figure 6 shows a register student interface built to make it easy for users to fill in or update any required information. If information is to be read and new information is to be added, the lecturer can do it simultaneously as the system is built to perform multiple tasks. The other function of this system allows data to be entered by the user simultaneously where the student information is read and at the same time the new student information is filled. In this interface as well, there is a button update which allows user to update data to the database. This system makes it easy for users to update all information without having to exit the software. The delete button also serves as a function to delete student information that is not needed in this system. There is a generate QR code button that will provide code for each registered student. The download button allows the user to print

out QR code to be placed on the matric card. Load record button is for displaying the registered student database.

Register Database	FULLNAME	MATRIC	IC_NUMBER	SUBJECT	EMAIL
	SITI AMINAH BI...	AK210001	020314137426	1BNT	minahharun@gm...
	HASHIM BIN JA...	AK210002	020412104234	BNK25343	icamel@gmail.co...
	KARIMAH BIN S...	AK210003	011021032244	BNK25343	karimahsood@g...
	SALEHUDIN BIN...	AK210004	980101053242	BNR23043	salehayub@gmail...

Figure 6: Register Student Interface

Figure 7 shows the programming that is used for the delete button in register form. Figure 8 shows the programming for generating QR code button and download button. While Figure 9 shows the programming that was used for the save button and Figure 10 shows the update button programming. This is programming in the development of the Smart Attendance System in which this programming is built to execute a number of commands to ensure that the built system runs smoothly.

```
Private Sub deletebtn_Click(sender As Object, e As EventArgs) Handles deletebtn.Click
    Try
        Dim sql As String
        Dim cmd As New OleDb.OleDbCommand
        Dim i As Integer
        con.Open()
        sql = "Delete * from register WHERE ID=" & Val(Me.Text) & ""
        cmd.Connection = con
        cmd.CommandText = sql

        i = cmd.ExecuteNonQuery
        If i > 0 Then
            MsgBox("Record has been deleted successfully!")
        Else
            MsgBox("No record has been deleted!")
        End If

    Catch ex As Exception
        MsgBox(ex.Message)
    Finally
        con.Close()
    End Try
End Sub
```

Figure 7: Delete Button Programming

```

Private Sub generatebtn_Click(sender As Object, e As EventArgs) Handles generatebtn.Click
    Dim objqrcode As QRCodeEncoder = New QRCodeEncoder
    Dim img As Image
    Dim btn As Bitmap
    Dim str As String

    str = matric.Text
    objqrcode.QRCodeScale = 2
    img = objqrcode.Encode(str)
    btn = New Bitmap(img)
    btn.Save("qrcode.jpg")
    PictureBox1.ImageLocation = "qrcode.jpg"
End Sub

0 references
Private Sub downloadbtn_Click(sender As Object, e As EventArgs) Handles downloadbtn.Click
    Try
        If Me.PictureBox1.Image IsNot Nothing Then
            Me.PictureBox1.Image.Save(IO.Path.Combine(My.Computer.FileSystem.SpecialDirectories.MyDocuments, Me.fullname.Text & ".jpg"))
            MessageBox.Show("QR is successfully saved.")
        End If
    Catch ex As Exception
        MessageBox.Show(ex.Message, "Error!", MessageBoxButtons.OK, MessageBoxIcon.Information)
    End Try
End Sub

```

Figure 8: Generate QR Code and Download Button Programming

```

Private Sub savebtn_Click(sender As Object, e As EventArgs) Handles savebtn.Click
    Dim sql As String
    Dim cmd As New OleDb.OleDbCommand
    Dim i As Integer

    Try
        con.Open()
        sql = "INSERT INTO register (FULLNAME,MATRIC,IC_NUMBER,SUBJECT,EMAIL) values ('" & fullname.Text & "','" & matric.Text & "','" & icbox.Text & "','" & classbox.Text & "','" & emailbox.Text & "');"
        cmd.Connection = con
        cmd.CommandText = sql
        i = cmd.ExecuteNonQuery()
        If i > 0 Then
            MsgBox("New record has been inserted successfully!")
        Else
            MsgBox("No record has been inserted successfully!")
        End If
    Catch ex As Exception
        MsgBox(ex.Message)
    Finally
        con.Close()
    End Try
End Sub

```

Figure 9: Save Button Programming

```

0 references
Private Sub updatebtn_Click(sender As Object, e As EventArgs) Handles updatebtn.Click

    Try

        Dim sql As String
        Dim cmd As New OleDb.OleDbCommand
        Dim i As Integer
        con.Open()

        sql = "UPDATE register SET FULLNAME='" & fullname.Text & "', MATRIC='" & matric.Text & "', IC_NUMBER='" & icbox.Text & "',_
SUBJECT='" & classbox.Text & "', EMAIL='" & emailbox.Text & "' WHERE ID=" & Me.Text & ""
        cmd.Connection = con
        cmd.CommandText = sql

        i = cmd.ExecuteNonQuery()
        If i > 0 Then
            MsgBox("Record has been UPDATED successfully!")
        Else
            MsgBox("No record has been UPDATED!")
        End If

    Catch ex As Exception
        MsgBox(ex.Message)
    Finally
        con.Close()
    End Try
End Sub

```

Figure 10: Update Button Programming

Figure 11 shows a window for the QR code scanner. The start cam button is for detecting QR code that displays from the camera. The QR code will decode the image that appears as a matrix number. The button search is for retrieving the data from the database which displays the full name, matric

number and subject. This interface allows the user to fill the temperature in the space provided. All the information will be stored in the attendance database.

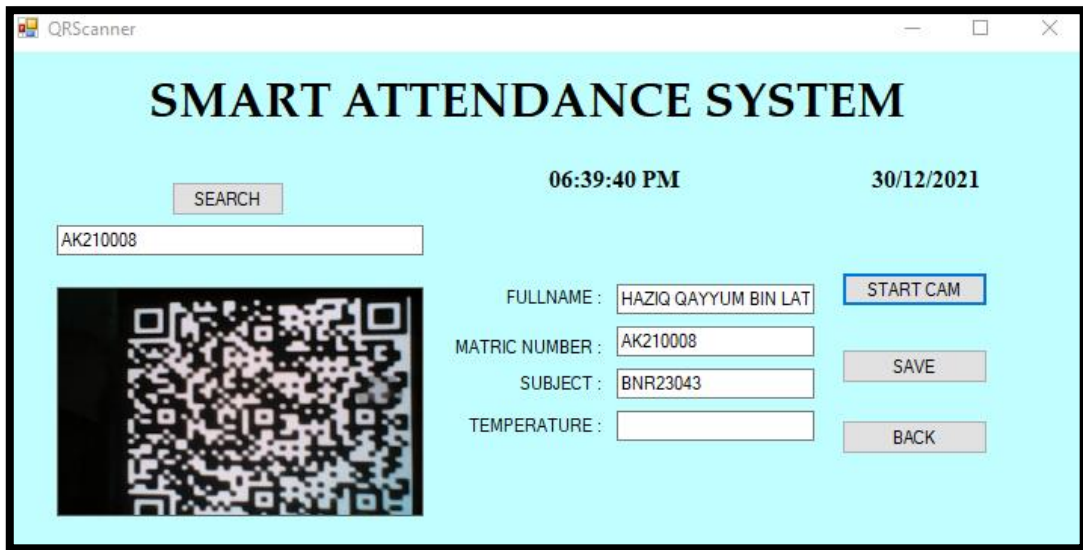


Figure 11: QR Code Scanner Interface

Figure 12 shows the window that can display the attendance database that stores in Microsoft Access. The load record button function is for retrieving the data from the database.

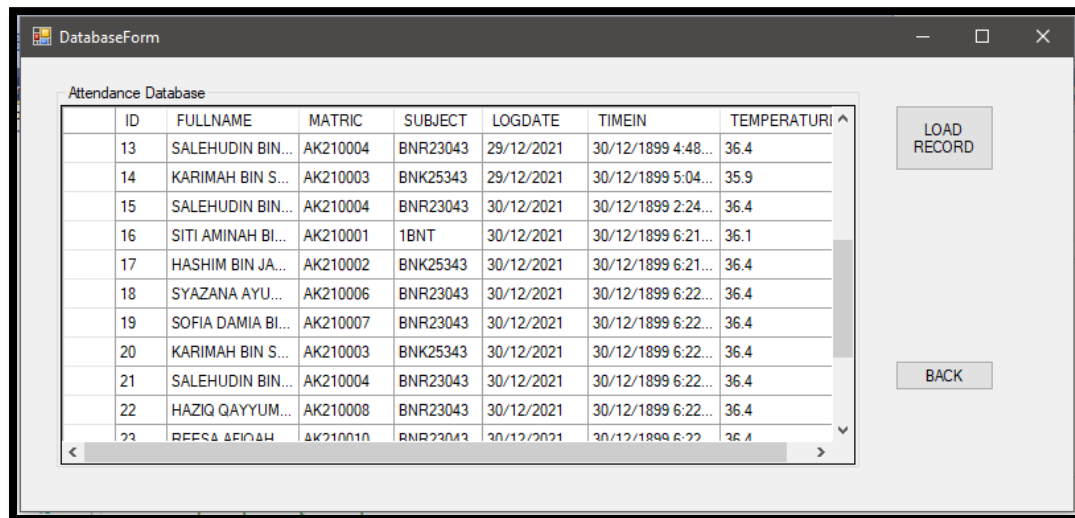


Figure 12: Attendance Database Interface

3.2 Student Database in Microsoft Access

In this system, data storage is required to store all student information including student name, matric number, IC number, subject, time log, date log and email address. All this information must be stored in a database and it can be accessed out. In this system the software used to store data is Microsoft Access. The software is easy to use and it is able to store in large amounts. In addition, the data in this software can be changed and stored easily and securely. Microsoft access is required to ensure the functionality of this system to store scanned data and displayed in a basic visual interface.

Figure 13 shows the date and time when the QR code was scanned. This software will display the required student information such as name, matric number, IC number, subject code and email. The matric number is representative as the input for the operating database and Visual Studio.

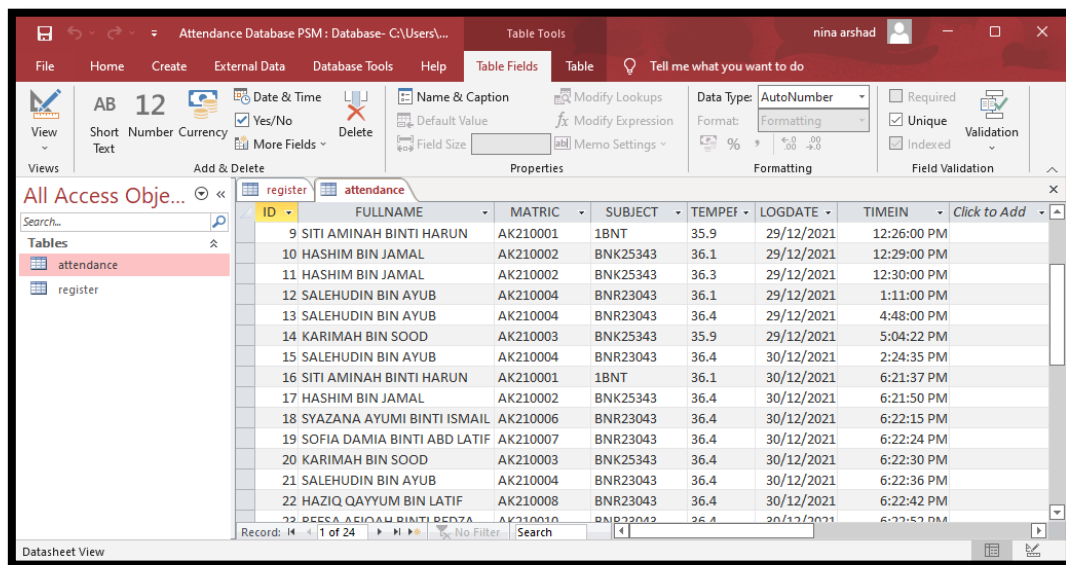


Figure 13: Database in Microsoft Access

3.3 Expert Verification

The analysis is done based on the feedback provided by three experts after verification. The questionnaire constructed for experts that has been determined and marked by one respondent in the field of Mechanical Engineering, ILP Pasir Gudang, one respondent in the field of Automotive Engineering, ILP Kuala Lumpur and one respondent in the field of Electrical Engineering, Kota Bharu Polytechnic. The analysis was conducted based on the feedback or answers given by the selected experts in the expert form as well as the questionnaire made. In this questionnaire it is divided into two parts:

- (i) Part A: Design of Smart Attendance System
- (ii) Part B: Functionality of the Smart Attendance System

Part A of the questionnaire submitted by the researcher consists of items to assess the suitability of the design of this system. The researcher performed the analysis based on the answer given by the expert in the expert confirmation form. The researcher constructed a questionnaire for experts based on measurement for aspects of design suitability as a Smart Attendance System as shown in Table 2.

Table 2: Average Level of Measurement for Aspects of Design Suitability as a Smart Attendance System

No.	Item	Expert			Approval Amount	Approval Percentage
		1	2	3		
1	Is the design of this system attractive?	✓	✓		2	67%
2	Is the system interface too compact?	✓	✓		2	67%
3	Is the information displayed easy to understand?	✓	✓	✓	3	100%
4	Is this system easier to use than the manual method?	✓	✓	✓	3	100%
Average Level of Measurement					2.5	83%

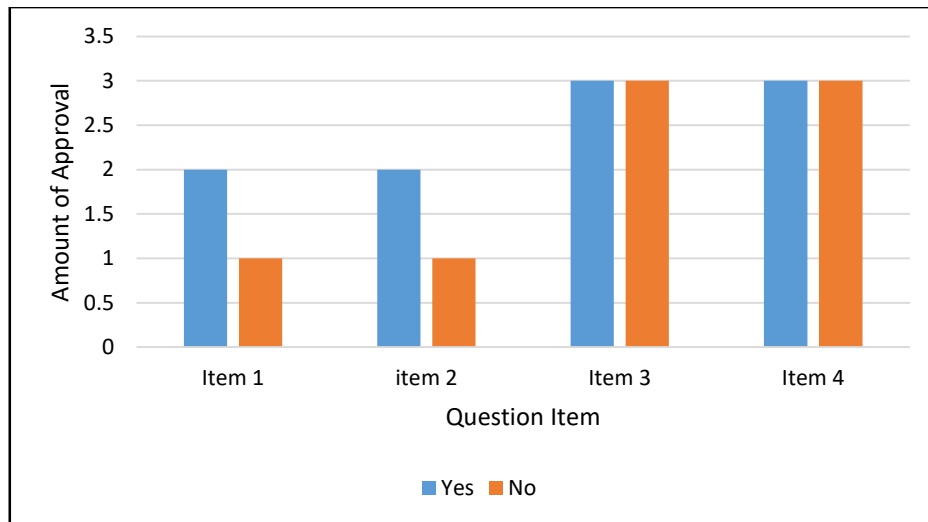


Figure 14: Measurement Level Agreement Graph Suitability Aspect of The Smart Attendance System

Table 2 and Figure 14 above show the analysis of the total consent of the respondents by item for the level of design suitability measurement designed to meet the suitability of the Smart Attendance System. Based on statistical data for interesting system design items, it was found that only one respondent disagreed with this system design and two other respondents representing 67.00 % agreed with this design. Next, two respondents representing a percentage of 67.00 % agreed to say the interface on the system was too dense while one respondent disagreed. In addition, for the information items displayed, all respondents agreed with this item. While this system item is easier to use than the manual method, all respondents agreed because it will save more time and be more efficient.

In summary, based on the calculations on the table, the average agreement calculated on the suitability of the system design that the design meets the required suitability is at a good level and the overall percentage of agreement on the suitability of the system design is 83.00 %.

Part B of this questionnaire is about the functionality of the Smart Attendance System. For this second question, the researcher wants to identify the system that is built that can function to show the operation of data transfer. Functionality testing was performed first before being brought to expert verification. The researcher has constructed a questionnaire on the functionality of the product based on the operation of the Smart Attendance System that has been developed as shown in Table 3.

Table 3: Average Level of Measurement for The Functionality Aspect of The Smart Attendance System

No.	Item	Expert			Approval Amount	Approval Percentage
		1	2	3		
1	Is the data can be transferred into the system?	✓	✓	✓	3	100%
2	Can data be displayed on the interface?	✓	✓	✓	3	100%
3	The steps that need to be implemented in the system are easy for you to understand?	✓	✓	✓	3	100%
4	Is the overall use of the system easier than the manual method?	✓	✓	✓	3	100%
Average Level of Measurement					3	100%

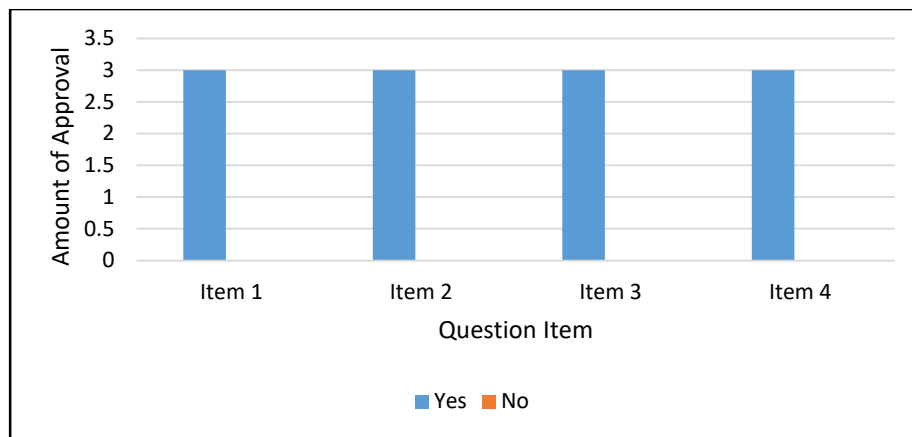


Figure 15: Smart Attendance System Functionality Agreement Graph

Table 3 and Figure 15 above show the analysis of the total consent of the respondents by item to identify by the functionality of the Smart Attendance System. Based on the graph above, all the items were agreed by the respondent but there were suggestions by a respondent who thought that the warning letter function should be added so that users can easily give a warning letter to students if not present.

Overall, based on the average agreement calculated in the table on the functionality testing part of the Smart Attendance System is at a very good level and the overall percentage count on the functionality part of this system is 100.00 %.

3.4 Discussion

This system was developed to make it easier for instructors or lecturers to record student attendance more easily and systematically. The software used to develop this system is Visual Studio Enterprise 2022 and Microsoft Access. Items discussed include the advantages of the systems developed as well as the shortcomings of the system, the achievement of objectives, design development, and problem that occur during the construction of the system. The Attendance System was developed to record student attendance and temperature in a more systematic, organized manner and avoid contact. From the result of this design, it is found that the design development objectives outlined have been achieved. Researchers were able to design an interface and develop a database that could record student attendance using VB software.

From the design analysis discussed earlier, the system development process takes quite a long time because the database development process needs to be compatible with the use of a QR code scanner. Several tests were performed on the system to enable the system to communicate with the QR code scanner used. There are also a few problems in the construction of programming during the system development process. This system is used only to take student attendance only. Therefore, the researcher has added another function so that the system can record the temperature while the students are attending the class face to face. However, only students who are registered with the lecturer can attend, because in order for a person's ID card to be read, their information must first be entered into the database.

As a result of the design of this system, it is hoped to be able to give an initiative to those involved in recording student attendance and student temperature and be able to manage this attendance system more systematically, quickly and effectively. This system can prevent students from touching each other when recording attendance.

4. Conclusion

In conclusion, from the observations made, it is found that there are many constraints faced by the current attendance recruitment system in terms of implementation efficiency, information management,

time and so on. Therefore, a new attendance recording tool and system should be developed to increase the application of the use of technology by the new millennium in line with the country's desire to promote a world without borders. However, this system can also be applied if there are forums or seminars that require student attendance to be taken. This is easier when compared to distributing attendance papers by class or program. Some improvements can be made for future work.

Overall, all aspects discussed are expected to be guidelines and guidelines for future researchers in continuing this study as well as implementing modifications to the design of the development of this system. In conclusion, this Smart Attendance System GUI has successfully achieved the set objectives. It is hoped that future researchers in the future can improve the design of this system and be able to solve problems faced by users.

Acknowledgement

The authors would like to thank the Faculty of Engineering Technology, Universiti Tun Hussein Onn Malaysia for its support.

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