Design and development of student attendance system using QR-Code for UiTM Cawangan Terengganu

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Abstract. This paper describes the development of student attendance using QR-code for UiTM Kuala Terengganu. The existing or manual attendance in Universiti Teknologi Mara Kuala Terengganu Cawangan Terengganu Kampus Kuala Terengganu (UiTMCTKKT) requires lecturer to records student attendance in attendance sheet, calculate the percentage of student attendance manually and give warning letter to the student by hand. There are several problems may occur if lecturer still using manual method to take student attendance such as lost and damaged the attendance sheet, heavy usage of papers, time limitation, and wrong calculation while calculating the attendance percentage. This project work aims to assist the lecturer in taking student attendance, to automatically calculate attendance percentage, generate warning letters to the student and lastly preventing fraudulent activities by the student. This system is developed by using the System Development Life Cycle (SDLC) waterfall model.

1. Introduction

Attendance is the concept of people, individually or as a group, appearing at a location for a previously scheduled event. Measuring attendance could be an important concern for several organizations, which might use such information to determine the effectiveness of their efforts and to arrange for future efforts. Student attendance is used to track and monitor students that attend class. It enables the lecturer to monitor their student attendance and late arrivals.

By using the manual method of taking attendance in class, it will lead to several problems such as time constraint, perjury in signing the attendance sheet and lost the attendance sheet. Therefore, there is a need to propose an attendance system for UiTMCTKKT to manage all the attendance processes that currently be done manually by the lecturer and HEA staff. This proposed system will eliminate the necessity for manual attendance process and cumbersome process. Students can simply log on to the attendance system using the online system and the lecturer can manage all the attendance data in the system. Current process flow are shown in Figure 1 below.
Figure 1. Flowchart of current process flow of Student’s Attendance.

1.1. Problem Statement
Based on the process that currently used in UiTMCTKKT, it is difficult for both lecturer and Hal Ehwal Academic department to access the record for student attendance. This is due to attendance in UiTMCTKKT is taken using paper and its take time to find the attendance sheet. Hence, the attendance sheet might lose and may be damage due to human mistake as lecturer have to keep the attendance sheet for 14 weeks for one semester. As a consequence of that, lecturer can no longer trace the student overall attendance record throughout the particular semester.

Currently, the students of UiTMCTKKT sign an attendance paper which was provided by the lecturer’s every time they come to a class. The problem to this situation is that students can be dishonest where they can perjury on their sign attendance by asking their friends to sign for them when they did not attend a class. For the lecturer who is handling a big number of students in a lecture hall or tutorial class, they might not notice the students who are not attending the class, but their name was signed as a present student.

Lastly, it is difficult for a lecturer to monitor the student’s number of absences. In UiTM, it is a policy for students to attend at least 80% of the class attendance throughout the semester to be able to take the final exam. Therefore, it is indispensable for each lecturer to monitor his/her student’s attendances to detect the absenteeism as early as possible. Since the attendance process is done manually, lecturer have to count one by one the attendance percentage for every classes and the tendency to make wrong calculation is very high.

2. Related Works

2.1. Student Attendance System
Attendance system is used to manage people attendance in an organization, it has been used in many institutions and scholarly organizations to control people participation in an organization. Attendance system involves in keeping records, conducting transactions, reporting generations, and consolidating the significant data to be supplied at the multiple management levels [1]. The design of MIS mainly provides management-level control and decision-making characteristics. The implementation of MIS in
attendance system helps in making management decisions related to management function mainly especially for attendance system [2].

MIS is a computer-based information system that provides for management-oriented reporting based on transaction processing and business operations of the organization. Management information systems basically concerned with the process of collecting, storing, processing, and transmitting relevant fact to help the management operations. MIS consist of three parts which are management, information and system [3].

2.2. QR Code

QR Code is a sign of two dimensions. Denso Wave, one of the predominant Toyota group businesses, created it in 1994 and in June 2000 it was approved as a global ISO standard (ISO / IEC18004). This two-dimensional symbol was originally designed for use in manufacturing control of automotive parts but has become common in other areas such as product tracking, item identification, time tracking, document management, overall marketing and attendance records [8]. A QR code comprises of black squares arranged on a white background in a square grid that can be read by a camera-like imaging device and processed the use of Reed–Solomon error correction until the picture can be properly interpreted. The necessary information is then obtained from patterns current in the image's horizontal as well as vertical aspect.

2.3. Similar Existing System

Several similar existing systems implementing the latest technology in taking attendance. There are several latest technologies that can be implemented in taking attendance such as biometric, fingerprint, QR-code, RFID and barcode scanner. All the information about the existing system will be gathering to find the suitable function and benefit for the attendance system, from the research it can help to implement in this system. The example of the existing system is EGBiometric College Poly-Tech Mara (KPTM), E-attendance University Malaya, Student attendance management system and portable Fingerprint-Based Attendance Recording & Monitoring.

| Features              | EGBiometric (KPTM) | E-attendance University Malaya | SAMS | Fingerprint-Based |
|-----------------------|--------------------|-------------------------------|------|-------------------|
| Login                 | ✓                  | ✓                             | ✓    | ✓                 |
| User register         | X                  | X                             | ✓    | ✓                 |
| View attendance       | ✓                  | ✓                             | ✓    | ✓                 |
| Personal information  | ✓                  | ✓                             | ✓    | ✓                 |
| Print attendance      | X                  | X                             | ✓    | ✓                 |
| Total attendance      | X                  | X                             | ✓    | ✓                 |
| percentage            | X                  | X                             | ✓    | ✓                 |
| Print letter          | X                  | X                             | ✓    | ✓                 |
| Logout                | ✓                  | ✓                             | ✓    | ✓                 |
3. Methodology

This project goes through six phases which are planning, analysis, design, development and iteration, testing and evaluation and documentation. Table 2 outlines the details methodology followed to accomplish objectives of the project.

Planning is a phase where an interview session was conducted with several lecturers and Hal Ehwal Academic staff in UiTM Kuala Terengganu to gather all information related to the project development. Open-ended is used in the interview session as an open-ended question will encourage the interviewee to respond spontaneously and delivers unstructured responses. Current business flow, as well as problem statements, are the outcome from the interview session.

As for analysis, Interviews with potential users lead to the establishment of refined the problem statement, system and user requirements. It helps to describe the expectation of user on the system. For design, with the guide of knowledge acquired in analysis phase diagrams such as Context Diagram, Data Flow Diagram (DFD), Entity Relationship Diagram (ERD), Site Map and User Interface are produced. Designing those diagrams provide a clear view on how the system operates from beginning to the end.

Development phase objective is to develop a system that has all functionality which follows all the requirements that have been gathered during analysis. Next is testing and evaluation, the system has been tested by 3 expert user and 30 respondents to ensure that the system fulfils all the requirements and is achievable. Documentation is a process where all the project outcome has been documented as a report of the system comprising the whole project activities is deliverable and achievable.

| Phases          | Activities                                                                 | Deliverable                                                                 |
|-----------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Phase 1: Planning | 1. Interview with several lecturers, and staff in the HEA department          | 1. Current process practice, Problem statements and objective has been identified. |
| Phase 2: Analysis | 1. Analysis of the systems development, process and activities               | 1. Problem statement of the current process, user requirement and System requirement. |
| Phase 3: Design | 1. Design system interface                                                  | 1. User interface                                                          |
|                 | 2. Design Entity Relationship Diagram (ERD)                                 | 2. Entity Relationship Diagram (ERD)                                         |
|                 | 3. Data Flow Diagram (DFD)                                                  | 3. Data Flow Diagram (DFD)                                                   |
|                 | 4. Context Diagram                                                          | 4. Context Diagram                                                          |
|                 | 5. Construct Information Table                                               | 5. Construct Information Table                                               |
|                 | 6. Site Map                                                                 | 6. Site Map                                                                 |
| Phase 4: Development and Iteration | 1. Develop the system by writing the programming codes to develop a web-based application | 1. Student attendance system                                                  |
| Phase 5: Testing and Evaluation | 1. Prepare test plan for the system to test the functionalities of the system | 1. Peers and expert feedback                                                  |
|                 | 2. Conduct user testing for the system                                      | 2. User feedback                                                            |
|                 | 3. Conduct system testing for the system with expert user                   | 3. Tested system                                                             |
| Phase 6: Documentation | 1. Write a complete report for the system                                  | 1. A complete report for the system                                           |
4. Results and Discussion

4.1. Student Attendance System

Student attendance system has been developed to be used by three main users which are student, lecturer, and staff. Each user has different access and views in this system. Table 3 outlines system functions accessible for the user.

Table 3. System Functions for User.

| User    | Functionalities                                                                 |
|---------|---------------------------------------------------------------------------------|
| Student | 1. Login into the system
|         | 2. View student personal information.                                            |
|         | 3. Take attendance using QR-code.                                                |
|         | 4. View attendance percentage.                                                   |
|         | 5. View date that they did not come to class.                                    |
|         | 6. View reminder or warning letter that they received.                           |
| Lecturer| 1. Login into the system                                                         |
|         | 2. View student personal information and lecturer information.                   |
|         | 3. View list of student name register for the subject.                           |
|         | 4. View report of student attendance.                                            |
|         | 5. View list name of student that get reminder or warning letter.                 |
|         | 6. Create session for class.                                                     |
|         | 7. Send reminder or warning letter to student.                                   |
| Staff   | 1. Login into the system                                                         |
|         | 2. Manage student and lecturer information.                                      |
|         | 3. View reminder or warning letter list.                                         |
|         | 4. View report for attendance.                                                   |

Figure 2 until 4 shows the screenshot of the system which display the process of taking attendance and record the attendance for every class. Lecturer creates session, display the QR-code, view daily attendance report, view overall report for the attendance and student view the attendance percentage and date that student did not come to class.

![Figure 2. Create session for classes and Display QR-code for student.](image-url)
4.2. System Testing and Evaluation

System testing is to validate the functionality of the overall system. The test plan was used to record findings of the system. System usability then was evaluated by two type of users namely expert user and other potential users. Three experts have validated the system usability and functionality of the system. Figure 5 shows sample testing result from the experts for two constructs which are the efficiency of the system and the interface.
For user evaluation, 30 respondents have evaluated the system usability. Findings were recorded using a set of questionnaires. Overall, all means are above 4. It indicates most of the respondents are satisfied with the usability of this system. Figure 6 shows the graph for overall user evaluation for seven constructs which are ease of uses, usefulness, consistency, satisfaction, efficiency, user interface and QR-code.

![Figure 6. Overall Means for User Evaluation.](image)

5. Conclusion
As a conclusion, Student attendance system using QR-code has improved the current process of recording the attendance in UiTM Kuala Terengganu and solve all the problem occurs while using the manual method of taking the attendance in classes. The objective of the development of this system is to help lecturer and staff to manage the attendance of student and make the process of recording the attendance more systematic and efficient. The evaluation results have provided a positive indicator to enhance the attendance system in the near future.

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