



Conceptualizing an Attendance Monitoring System for Malaysian Educational Institutions

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ABSTRACT

Absenteeism monitoring is one of the problems faced by many organizations, especially universities. The difficulties to properly manage students' attendance and its subsequent actions and potential responses to certain problems have caused the underutilization of organizational resources. Therefore, the objective of this study is twofold: first, the study aims to investigate the problems related to absenteeism management among academicians, while secondly, the study also aims to develop an integrated platform for the proper management of absenteeism. To address the research objectives, a study was conducted in two phases: (1) a qualitative study investigating the problems associated with absenteeism management among academicians at Universiti Teknologi MARA, Kelantan, and (2) development of a prototype system based on the rapid application development methodology. Findings show that respondents prefer a user-friendly information system compared to the conventional method. Moreover, the tedious process of absenteeism reporting forced respondents to ignore such reporting; instead, they chose to act on their own. Based on the qualitative findings, four problems were identified; (1) missing of student attendance, (2) difficulty to monitor and track student attendance, (3) difficulties to bring the attendance sheets, and (4) difficulty to download the attendance sheet. These problems are grouped into two themes which are personal and technological. In terms of the application, the result shows that the implementation of a new platform has increased the number of reporting, improved the transparency of the absenteeism process, as well as reduced the number of absenteeism cases. The contributions of this paper are as follows: first, the paper provides insight on the problems associated with absenteeism management in the context of Malaysian educational institutions, and secondly the paper proposes an integrated platform for the absenteeism monitoring process. The implications of the study and future directions for research are outlined.

Keywords:

Absenteeism, attendance, monitoring, and performance.

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1. Introduction

Absenteeism is one of the crucial problems faced by organizations nowadays. Companies, schools, and universities all face the same problem when it comes to absenteeism. Cucchiella, Gastaldi, and Ranieri [1] defined absenteeism as an individual's intentional or habitual absence from work. The severity of this problem had caused organizations to take countermeasure actions. For example, universities use many approaches to prevent student absenteeism. One of the approaches is attendance-taking. Attendance is a basic tool which serves as the most important criteria needed in all education systems. Attendance is usually used as evidence to assess student consistency and

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participation. Each student is usually required to attend all teaching activities held by the institutions. Once attendance is below the required policy, the student will be subjected to further action or suspended from taking final exams, depending on the decision made by the respective institutions they are in.

Absenteeism is considered as a strategic problem in human resource management. Cucchiella, Gastaldi, and Ranieri [1] argued that those who work in the public sector have a higher tendency to apply for sick leave compared to those working in the private sector. Absenteeism provides either positive or negative consequence to the organizations [2]. In the context of universities, absenteeism leads to poor student performance [3]. Looking into past literature, many researchers had proven that absenteeism directly affects job performance [3-6].

In the context of Malaysian educational institutions, many private and public universities still practice the conventional method of taking students' attendance daily. The academic staff usually needs to print out the attendance sheet and bring it with them to the class. However, using the conventional method can sometimes cause problems such as: (1) forgetting to print out the attendance sheet, (2) missing or misplaced attendance sheet, (3) Failing to bring the attendance sheet to class, (4) miscalculation in the number of absentees, and (5) probability of students to cheat friends' signature. Moreover, using the conventional method deprives academic staff, students, and guardians from transparency of the absenteeism process. Sometimes, guardians have no knowledge of their children's attendance. Academic staff likewise also have little knowledge of the absenteeism process. Therefore, the objectives of this study are as follows:

RO1: To identify the problems associated with absenteeism management among academicians.

RO2: To develop a platform for the management of students' attendance.

The contributions of this paper are as follows: first, the paper provides insight on the problems associated with absenteeism management in the context of Malaysian educational institutions; and second, the paper proposes an integrated platform for the absenteeism monitoring process.

The remainder of the paper is organized as follows. First, the paper will explain relevant Information System (IS) literature related to the study. Then, the methodology of the study will be presented. Next, the findings of the study will be highlighted. Finally, the paper concludes with recommendations for future studies, as well as mentions some limitations faced while conducting this study.

2. Literature Review

The Merriam-Webster [7] defines absenteeism as chronic absence from work or school. From the perspective of education, absenteeism is defined as the habitual or intentional failure of going to school. This issue cannot be denied; no matter when, this problem will continuously happen if there are no actions taken. Students who are absent from class will miss some educational activities; this may lead to many problems that will soon give a bad impact on these students' academic progress. Besides that, higher education institutions such as universities face many issues related to absenteeism. For example, Schmulian and Coetzee [8] who investigated the direct relationship between absenteeism and student's performance found a positive correlation between class attendance and academic performance; however, the correlation was very low and not very meaningful. In another work, Gottfried [3,6] found out that students suffer academically as a side effect of having a chronically absent classmate.

One of the factors encouraging student participation in the classroom is user engagement. According to Schaufeli, Bakker, and Salanova [9], engagement can be defined as a positive, fulfilling, work-related state of mind that is characterized by vigor, dedication, and absorption. Rather than a momentary and specific state, engagement refers to a more persistent and pervasive affective-cognitive state that is not focused on any particular object, event, individual, or behavior. An engaged individual (i.e. student) will have the tendency to attend classroom sessions as well as encourage others to do the same. Engagement is considered as a positive pool, while burnout is considered as a negative pool. Improving the effect of a positive pool will enhance the potential benefits of engagement. Recent study shows that

Several researchers have studied the need for the proper development of a platform to effectively manage students' attendance. Managing and proper monitoring of attendance are the best methods to improve student engagement with classroom sessions [10]. Moreover, according to Patel, Patel, and Gajjar [11], students' attendance is one of the important parts of any organization or institution. The recording and monitoring of class attendance is an area of administration that can require significant amount of time and effort, be it at school or university environment largely due to the amount of time required in lectures to get the necessary information. Besides that, the aforementioned authors had also proposed the usage of an online student attendance monitoring system in classrooms using radio frequency identification technology as this may lead to better student attendance management. RFID technology is a powerful and useful tool in managing students' attendance throughout the education process. It can also enhance classroom security. RFID technology has already been applied to solve problems where it is necessary to automatically record the movements and locations of students in a classroom of a school or university. A real-time intelligence system is implemented in conjunction with the RFID hardware to record students' attendance in lectures and laboratories in a school/university environment. RFID is a technology that allows for a tag affixed on identity card to communicate wirelessly with a reader in order for the tag's identifier to be retrieved.

In another work, Othman, Ismail, and Raus [12] conducted a study focusing on the development of a web-based attendance register system (ARS). The authors argued that the capability of web-based systems have now become one of the important things or preferable technologies used to ease the process of managing data and records resulting from the attendance-taking process. Besides that, the authors also stated that the efficiency and effectiveness of the web-based system in handling rapid access to documents and its ability in supporting multi-users simultaneously saves a lot of time and is hassle-free.

Salman, Uddin, Acheampong, and Xu [13] meanwhile develop an attendance system based on Internet of Things (IoT) and embedded Linux platform. The main objective of the development of the system is to provide a system that is reliable, timesaving, as well as autonomous class monitoring system. The system also capable to send an email notification to student and lecturers consequently. The authors utilize the cloud server technologies based on python web framework.

In summary, a glance of related literature show that the development of an attendance monitoring system is largely drawn from the perspective of IS only without proper preliminary studies to identify the actual problems faced by organizations. Moreover, to the best of our knowledge, there is a lack of studies on attendance monitoring systems from the perspective of Malaysian universities. Therefore, the subsequent section will discuss the methodology adopted for this study.

2. Methodology

This study employed a qualitative research method and the rapid application development (RAD) methodology to conduct the research. The first phase was conducted using a guided interview session. The findings from the session were used to generate the requirements for the development of the information system.

2.1 Qualitative Study

In order to solve the research problem, the study was conducted in two phases. The first phase involved a qualitative interview with respondents based on procedures by Yin [14]. Yin [14] stated that the qualitative study is more applicable in explaining a certain phenomenon, as well as gain a holistic view of problems. Six participants were selected for the interview session using the snowball sampling technique. The participants were chosen based on the following criteria: (1) years of experience, (2) academic position held, and (3) level of education. To eliminate bias and inconsistency, each respondent was guided on the purpose of the study, the objective, as well as the issues surrounding the study. A guided interview session between 30-40 minutes was conducted with each respondent. Participants were asked on the current practices of absenteeism management in the organization, the problems faced in dealing with absenteeism, as well as features of a possible information system related to absenteeism management. To support the result from the interview sessions, a survey, document analysis, and observation were also conducted on the organization.

The interview data was transcribed and coded based on open and axial coding [15]. To ensure validity, the transcriptions were shared with the respondents through email, WhatsApp, and Facebook. Each interview was coded into specific themes and the association between them was recorded. Moreover, this study followed the criteria for verifying interpretative research by Guba and Lincoln [16] to ensure the validity and reliability of the study. The findings of the interview sessions will be discussed later in this paper.

2.2 Rapid Application Development (RAD)

Based on the empirical results of the qualitative study, the prototype of the application was developed based on Martin's [17] Rapid Application Development (RAD) methodology. RAD consists of four stages: (1) requirement planning, (2) user design, (3) development, and (4) cutover. The following figure shows the steps in the RAD:

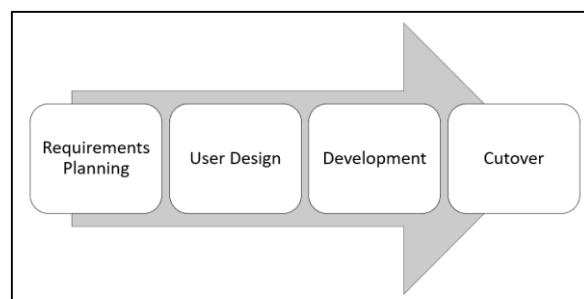


Fig. 1. Rapid Application Development (RAD) methodology [17]

Figure 1 shows the steps in the RAD methodology. The first step is the requirement planning phase. During this phase, the findings from the qualitative study were used to generate the information system requirements of the project. Common problems were grouped into categories; then, a final list of system requirements was generated. To validate the system's requirements, an extended interview was conducted, and adjustments were made to the system requirements based on respondents' comments and recommendations. During the second phase, a working model or prototype was developed based on the Joint Application Development (JAD) and Computer-aided software engineering (CASE) tools. The project team also developed a contextual diagram, data flow diagram, and entity relationship diagram to guide the development of the proposed system. End users were involved in the JAD session to further refine and improve the information system.

The third phase was the construction phase. Based on the previous phase, the coding and design of the application was developed based on PHP web programming, while MySQL database was used as data storage. Moreover, the information system also utilizes other programming languages such as jQuery, JavaScript, Cascading Style Sheet (CSS), and Hypertext Markup Language (HTML5). A complete system testing was also conducted based on [18] heuristic usability test. Based on the results, some improvements were made to the information system to improve its capability. Finally, the last phase which is the cutover was carried out. In this phase, a user acceptance test (UAT) was conducted. Five respondents were selected to participate during the UAT. Guided UAT documents were used on all respondents. Further improvements were made to the information system based on the outcome of the UAT.

3. Results

The findings of the study will be discussed in two sections. The first section will discuss the results of the qualitative study, while the second section will discuss the result of the RAD process.

3.1 Qualitative Findings

Every academic institute has certain criteria for students regarding their attendance in class. That is why keeping accurate record of attendance is very important. At present, attendance is usually noted using paper sheets and the old file system; this approach has been used for a long time. It becomes difficult for the management to regularly update the records and manually calculate the percentage of classes attended. Keeping these issues in mind, a system was designed to overcome the problems associated with attendance. In this section, the findings from the need's assessment are discussed. Basically, there are four main problems identified by participants. A summary of the problems show that participants mostly have similar problems. Solutions to some of the problems have been identified by experts, and recommendations and some research possibilities have been found. Table 1 shows a summary of the problems identified during the interview sessions:

Table 1
Types of problem associated with Absenteeism Management

Problem Type 1: Personal	Problem Type 2: Technological
Missing student attendance	Difficulty to monitor and track student attendance
Difficulty to bring the attendance sheets	Difficulty to download attendance sheet

3.1.1 Problem Type 1: Personal

Personal or individual factors are the most mentioned problems among the participants. All respondents agreed that the cause of attendance havoc starts within oneself. For example, one respondent mentioned that, *"...sometimes I did not even care where I put the attendance sheet after the class. When it[s] time for another class, sometimes it's hard to find the attendance sheet, so I just get another one from the web"*. Another respondent quote *"We don't have a centralized system to monitor students' attendance. All those attendance sheet will go inside the file after the class. Sometimes you remember where you put it, but most [of] times the lecturers are too busy with other work that you tend to forget where you put it last"*. From the interviews, it can be concluded that respondents agree that they always misplace the manual copy of the student attendance form. The problem happens because most respondents carry many attendance sheets for different classes. Consequently, it is quite hard for them to manage and keep the student attendance forms manually.

The second problem associated with the personal factor is the difficulty to bring attendance sheets. Under the conventional method, lecturers are expected to bring their course file to class for the whole semester. However, most respondents agreed that it is not possible to do so. For example, one respondent mentioned that *"I have many classes to attend, between the class I usually need to attend department meetings and student association meetings. Therefore, bringing those heavy course files (with the attendance sheets) is an extra burden to my life"*.

3.1.2 Problem Type 2: Technological

The technological factor is always one of the important factors in Information System (IS) research. Delone and McLene [19] mentioned that technological factors may contribute to two distinctive factors: positive or negative correlation with information system usage. Two problems were identified from the technological perspective. The first is the difficulty to download attendance sheets from the system, and the second problem is the difficulty to monitor and track student attendance. All respondents agreed that the technological factor plays an important role in absenteeism (attendance) management. Yet, the most intriguing problem among academicians is the inconsistency of the student registration, especially for the first 3 weeks. For example, one respondent said that *"...students are smarter nowadays. They knew the first 3 weeks will not be counted on the attendance sheets, so they skip those weeks with [a]lot of reasons. There is a need for a mechanism to prevent this kind of truancy"*. Another respondent quote that *"The information system sometimes can be quite troublesome. You need an access to the Internet to be able to download those attendance sheet"*.

The second problem associated with the technological factor is the difficulty to track and monitor student attendance. The manual attendance form does not have a specific mechanism to automatically calculate and monitor students' attendance. The lecturers themselves must take their own initiative to perform the calculation; thus, increasing the burden of their work. One respondent mentioned that *"I have to teach 6 classes per week, some classes even have more than 30 students. It is hard for me to manually calculate their attendance percentage, even by [when] using excel (Microsoft)"*. Another respondent mentioned that *"I never counted how many students in my class, but that one day, I suddenly have the urge to do it. To my surprise, the number of signature[s] did not match with the number of students attending the class"*. The lack of a monitoring mechanism is deemed as a surplus to the academician happiness index; thus, the lack of it does increase their workload as well as responsibilities.

3.2 Conceptual Design

Based on resultant findings from the qualitative study, the development of the information system was done according to the rapid application approach methodology. The subsequent section will discuss the resultant context diagram, data flow diagram, entity relationship diagram, and the interface design for the proposed information system.

3.2.1 Context Diagram

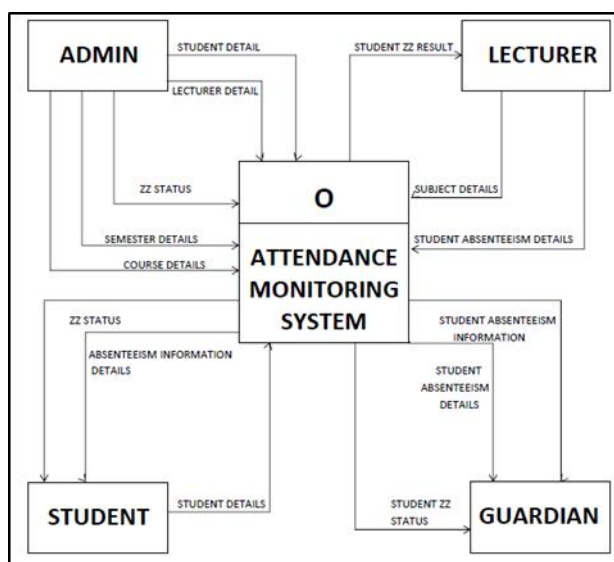


Fig. 2. Context diagram for the proposed system

Figure 2 shows the whole boundaries of the system. The proposed information system is called the Attendance Monitoring System or AMOS. There are four main entities or sources for the system; Admin, Student, Lecturer, and Guardian. Admin, Student, and Lecturer interact directly with the information system, while Guardian interacts indirectly by receiving notifications as output from other processes. The subsequent section will further explain the function of the information system.

3.2.2 Data Flow Diagram

Figure 3 is focused on presenting how the system will operate. It illustrates the processes and how data moves among them. During the analysis phase, the researcher created a data flow diagram to show the flow of data and external entities in the system. There are eight levels for this system which are Register New Student, Register Lecturer, Register New Course, Add New Semester, Register New Subject, Register Student Absenteeism, Scan Attendance, and Process ZZ Status.

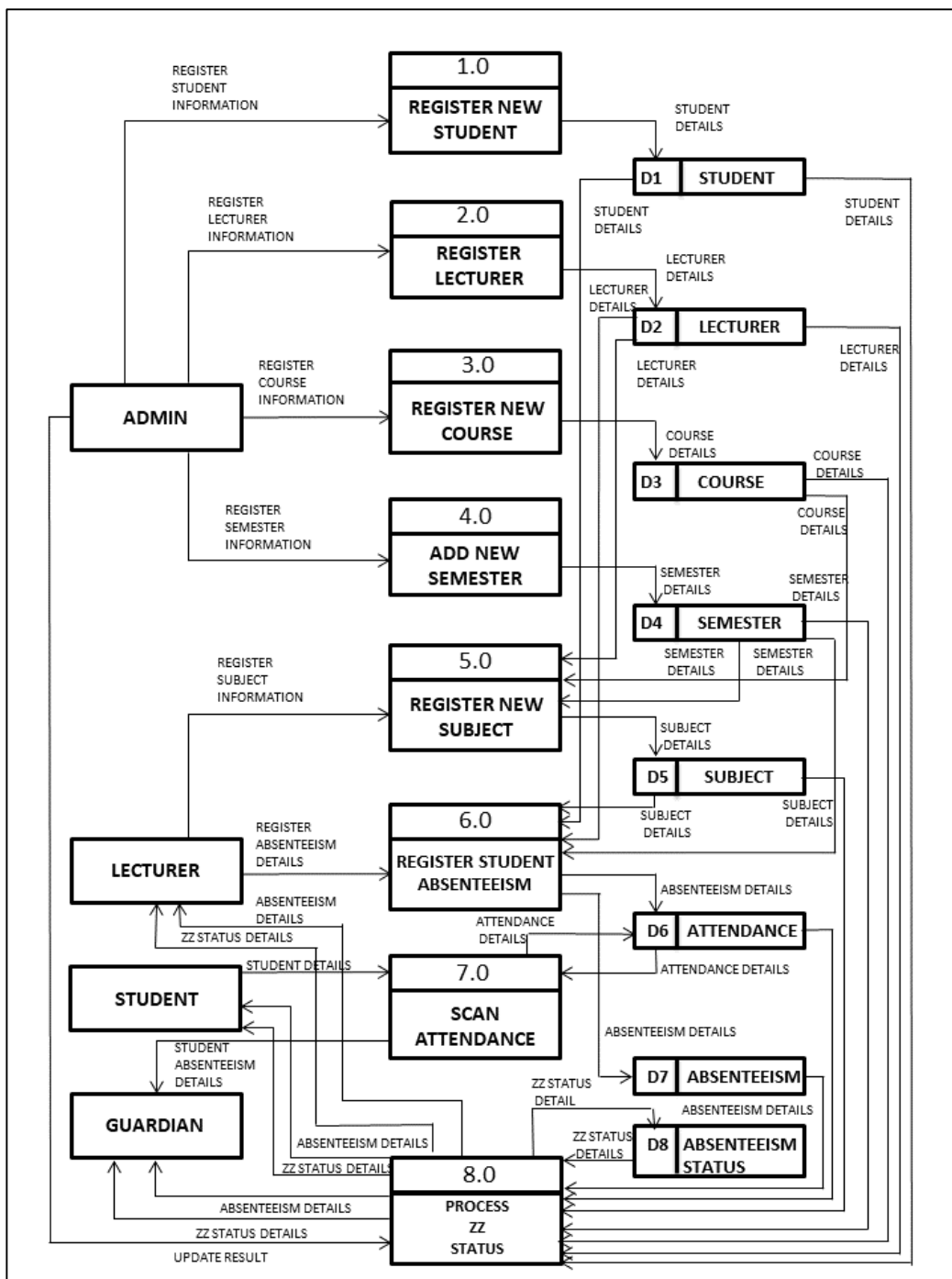


Fig. 3. Data flow diagram for the proposed system

3.3.3 Entity Relationship Diagram

Relationships are the glue that hold together the various components of the E-R Model. A relationship is an association between the instances of one or more entity types that is of interest to an organization. As shown in Figure 4, student, lecturer, semester, attendance, absenteeism, absenteeism status, subject and course are objects referred to as “entities”. As an explanation, it is possible for one student to record many attendances and absenteeism, and both entities for attendance and absenteeism can have many students to assess. One subject can have many

attendances, while many attendances can be updated by one subject. One lecturer can teach many subjects, while the subject can be accessed by many lecturers.

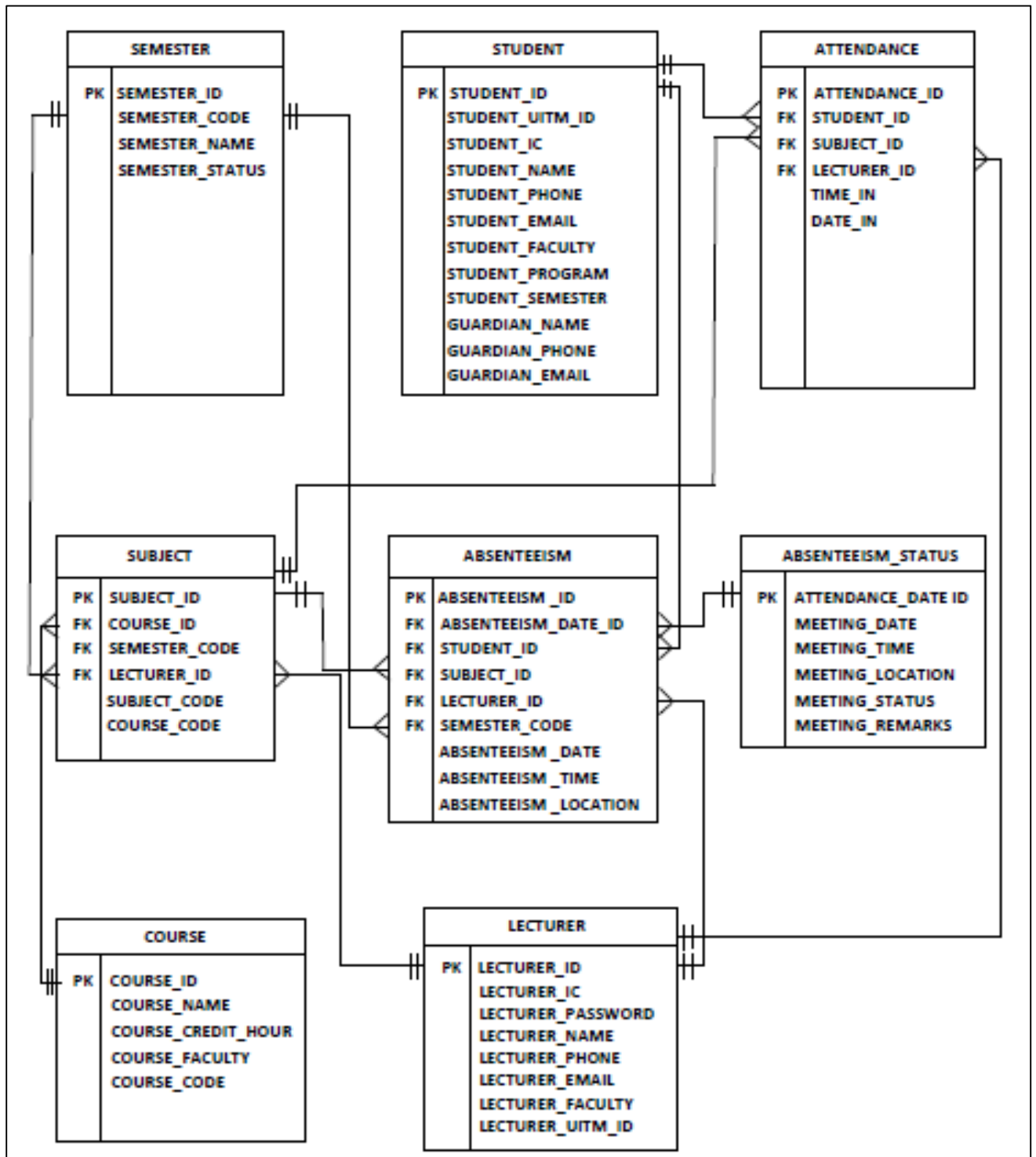


Fig. 4. Entity relationship diagram for the proposed system

3.3.4 Interface Design

Figure 5 shows AMoS' login access for admin, lecturer, and student. Lecturers' records can be created by the admin only, while students can register their records manually; however, their registration will be checked with the student database already embedded within the registration logic process. The users need to key in their username and password to proceed. The username is their staff or student number, while the password is automatically generated during the registration process.

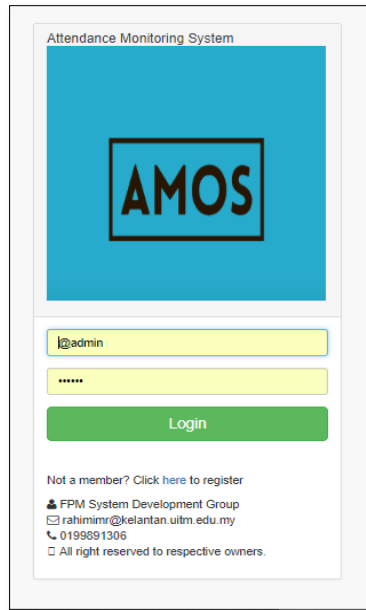
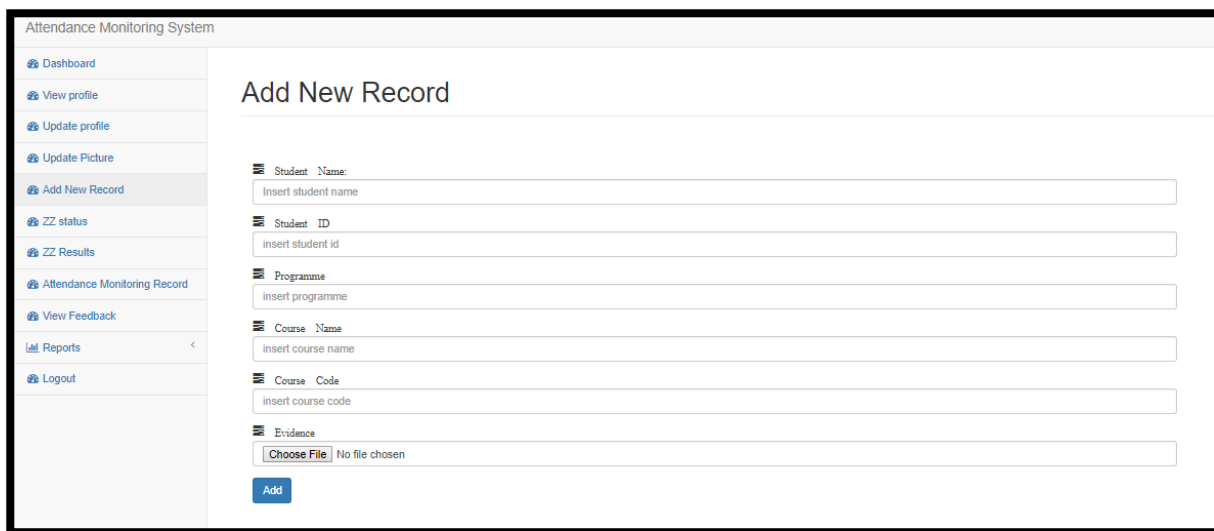


Fig. 5. AMoS login access



Fig. 6. AMoS main interface – for lecturer

Figure 6 shows the main interface for AMOS. Within the system, lecturers can update their profile picture, and have access to the student absenteeism records, ZZ status, ZZ result, performance feedback, absenteeism report and record performance index.



Attendance Monitoring System

Dashboard
 View profile
 Update profile
 Update Picture
 Add New Record
 ZZ status
 ZZ Results
 Attendance Monitoring Record
 View Feedback
 Reports
 Logout

Add New Record

Student Name:

Student ID:

Programme:

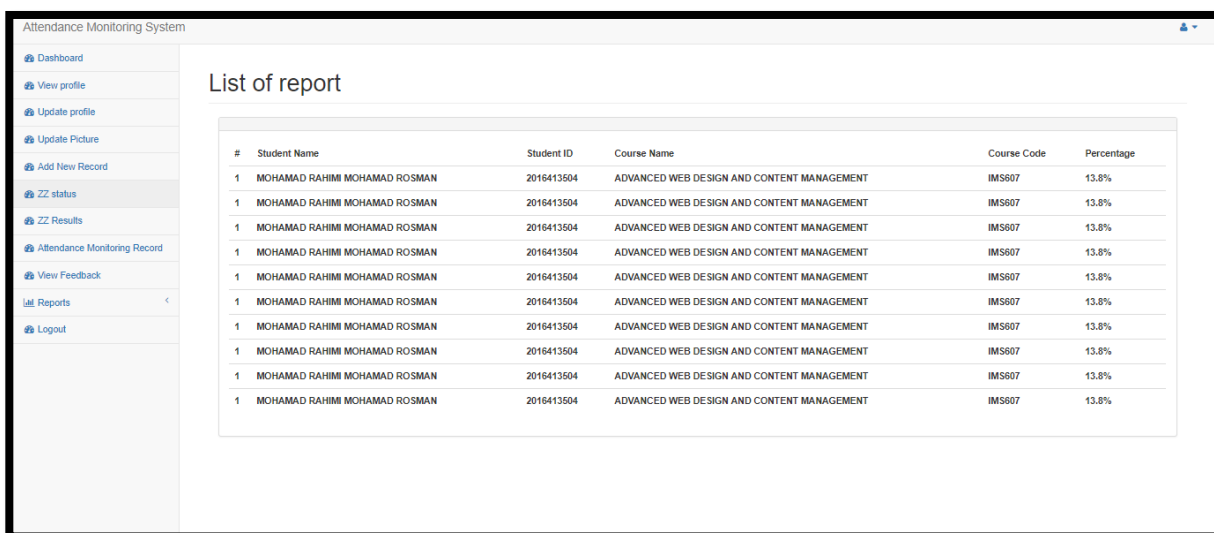
Course Name:

Course Code:

Evidence: No file chosen

Fig. 7. AMoS monitoring report

Figure 7 shows the absenteeism monitoring report which lecturers can use to update student absenteeism records. Scanning student cards during attendance taking will produce a new absenteeism code: XYZ. Students who received this code needs to provide evidence in the form of a sick certificate within a week. After the deadline, the status will automatically change into YY (absenteeism without permission) and counted for the ZZ process (barring student from examinations).



Attendance Monitoring System

Dashboard
 View profile
 Update profile
 Update Picture
 Add New Record
 ZZ status
 ZZ Results
 Attendance Monitoring Record
 View Feedback
 Reports
 Logout

List of report

#	Student Name	Student ID	Course Name	Course Code	Percentage
1	MOHAMAD RAHIMI MOHAMAD ROSMAN	2016413504	ADVANCED WEB DESIGN AND CONTENT MANAGEMENT	IMS607	13.8%
1	MOHAMAD RAHIMI MOHAMAD ROSMAN	2016413504	ADVANCED WEB DESIGN AND CONTENT MANAGEMENT	IMS607	13.8%
1	MOHAMAD RAHIMI MOHAMAD ROSMAN	2016413504	ADVANCED WEB DESIGN AND CONTENT MANAGEMENT	IMS607	13.8%
1	MOHAMAD RAHIMI MOHAMAD ROSMAN	2016413504	ADVANCED WEB DESIGN AND CONTENT MANAGEMENT	IMS607	13.8%
1	MOHAMAD RAHIMI MOHAMAD ROSMAN	2016413504	ADVANCED WEB DESIGN AND CONTENT MANAGEMENT	IMS607	13.8%
1	MOHAMAD RAHIMI MOHAMAD ROSMAN	2016413504	ADVANCED WEB DESIGN AND CONTENT MANAGEMENT	IMS607	13.8%
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1	MOHAMAD RAHIMI MOHAMAD ROSMAN	2016413504	ADVANCED WEB DESIGN AND CONTENT MANAGEMENT	IMS607	13.8%
1	MOHAMAD RAHIMI MOHAMAD ROSMAN	2016413504	ADVANCED WEB DESIGN AND CONTENT MANAGEMENT	IMS607	13.8%

Fig. 8. AMoS record performance index

Figure 8 shows the record performance index (RPI) for student attendance. RPI is a new mechanism used to automatically monitor student class attendance. During each class, students need to verify their attendance by using a specialized barcode reader. A special logic embedded into

the system will automatically notify administrator, lecturer, and guardian when the total percentage of absenteeism exceeds the parameters.

4. Discussion

Information system implementation and adoption has become a mainstream topic among IS researchers over the years. However, it can be pointed out that most studies employed the quantitative research design in conducting research. Therefore, there exists a scarcity of research that employ the qualitative methods due to its rigorosity to achieve saturation process. Therefore, this study adds to the scarce literature of IS implementation and adoption based on the qualitative method. Additionally, the lack of in-depth studies on the problems associated with absenteeism management within the context of Malaysian educational institutions is intriguing; most studies have only focused on technical implementation (i.e. development of the information system) rather than identifying the actual cause of the problem. Therefore, this study has addressed the limitations of past literature.

The results from the study are also consistent with the literature. The two types of problems found which are personal and technological are consistent with the findings of other researchers [3,5,6,20,21,22,23]. The technological factor has also been found as an important predictor based on previous theories on IS such as the Technology Acceptance Model [24], the Unified Theory of Acceptance and Use of Technology [25], and the IS Success Model [19]. Similarly, the individual factor is also a contributing factor towards IS implementation and adoption.

In terms of application, the results from the RAD methodology show that unlike other methodologies, the RAD can reduce the development time significantly. However, strict control must be imposed throughout the process to ensure that it is on the right track. This study also added new literature on RAD implementation to address the lack of studies from the academic perspective [26]. The results of the RAD methodology are also consistent with a previous study by Coleman and Verbruggen [27] which found that RAD adoption helps developers become empowered, as well as substantially reduce time to market a software product.

The results of the study will be of interest to practitioners, academicians, government policymakers, and software developers. Practitioners may use the result of the study to plan for appropriate training in order to improve their lack of technological and individual competencies. Academicians can use the results of the study to further enhance knowledge on IS implementation and adoption. Government policymakers can use the result to develop a proper method for the management of student absenteeism. Software developers may use the result to improve their service delivery based on the list of problems identified throughout the study.

5. Conclusions

In this paper, a qualitative analysis was carried out to determine the problems associated with absenteeism management in the context of Malaysian educational institutions. Then, the RAD methodology was adopted to develop the proposed information system.

The contributions of this paper are as follows: first, the paper provides insight on the problems associated with absenteeism management in the context of Malaysian educational institutions; second, the paper proposes an integrated platform for absenteeism monitoring process; finally, the implications of the study and future directions for research are outlined.

This study is not without limitations. First, the respondents of the study were from the same institution. Therefore, it may cause some bias and generalization problems in the study. However,

this study is only interested in theory generalization rather than population generalization. Second, this study adopted the RAD methodology for the development of the proposed information system rather than other more popular methodologies such as the System Development Life Cycle (SDLC). Therefore, adopting a different methodology may produce different results. Future studies should be carried out to include a more diverse sampling frame. For example, a multiple case study can be conducted on universities across Malaysia. Moreover, a quantitative survey can be conducted to further validate the results from the qualitative study.

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