

The development of the web-based Attendance Register System (ARS) for higher academic institution: From feasibility study to the design phase

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Abstract

This study focuses on the development of a web-based Attendance Register System or formerly known as ARS. The development of this system is motivated due to the fact that the students' attendance records are one of the important elements that reflect their academic achievements in the higher academic institutions. However, the current practice implemented in most of the higher academic institutions in Malaysia is becoming more prone to human errors and frauds. Assisted by the System Development Life Cycle (SDLC) methodology, the ARS has been built using the web-based applications such as PHP, MySQL and Apache to cater the recording and reporting of the students' attendances. The development of this prototype system is inspired by the feasibility study done in Universiti Teknologi MARA, Malaysia where 550 respondents have taken part in answering the questionnaires. From the analysis done, it has revealed that a more systematic and revolutionary system is indeed needed to be reinforced in order to improve the process of recording and reporting the attendances in the higher academic institution. ARS can be easily accessed by the lecturers via the Web and most importantly, the reports can be generated in real-time processing, thus, providing invaluable information about the students' commitments in attending the classes. This paper will discuss in details the development of ARS from the feasibility study until the design phase.

Keywords:

Student attendance, Attendance Register System (ARS), Web-based application, higher academic institution

1. Introduction

Empirical evidences have shown that there is a significant correlation between students' attendances and their academic performances [8]. There was also a claim stated that the students who have poor attendance records will generally link to poor retention [6]. This is also agreed by Mazza and Dimitrova where they both claimed that the students' attendances to the course may indicate their behaviors towards the subject where it can be used to judge their tendency and commitment to the course [7].

However, even though arguably there are many other reasons that could explain why the students are poor academically such as lack of preparedness, financial

problems and poor accommodation, most of the previous studies agreed that the students who fail to attend the classes will inevitably engaged with difficulties in the future [8], [1]. Results taken from the study done by Newman-Ford, Lloyd and Thomas have shown that attendance was a significantly better predictor of grade than any other factors such as age, prior education background or even gender [9]. From the study, it had also revealed that retention rates were substantially better for students who were consistently attended classes than those more frequently absent. All of these findings have showed that attendance records have primarily become the proxy to determine the success of the students in most of the higher academic institutions.

However, traditionally, in most of the higher academic institutions in Malaysia, the recording of the students' attendances are mainly done by pen and papers. The attendance sheets will be distributed in the classes for the students to sign and this practice of course, will consume a lot of time. Nevertheless, this practice will also prone to human errors that could be happening during or after the process of attendance taking. With the manual system, the process will become more difficult for the management to regularly update the record and manually calculate the percentage of classes attended [12].

All of these limitations regarding the manual system indicate the needs to improve the process of attendance recording and reporting. Using papers are not just inefficient but it will require the management of the academic institution to provide a well-managed filing system to cater the attendance records. Therefore, it is crucial to reinforce the use of attendance register system in order to improve the process of recording and reporting students' attendances in the higher academic institutions.

2. Web-based Attendance System

Web-based applications have now become one of the preferable technologies that are used to ease the process of managing data and records. Some of the motivations that

contribute to the development of many web-based systems nowadays are because of its efficiency in handling rapid access of documents and its ability in supporting multi-users simultaneously, thus saving a lot of time and hassle free [4],[5].

Recording the students' attendances has also become the potential process to be automated by using the web-based system. Previous study done by Jonathan, Syahrul and Lau, has proposed the use of Interactive Student Attendance Management System (ISAMS) to record the students' attendance using barcode scanner [3]. The system can generate reports, view the students and lecturers' profiles, and provide the students' timetable. The system is also capable to generate the e-mail with user management functionality such as adding new user, deleting a user, registering a course and much other functionality. Marr and Lancaster have also proposed the use of Attendance System using web applications to improve the process of attendance recording and reporting [6]. Other researches involved more advanced technologies that are integrated with the online systems such as the used of biometric technology and Radio Frequency Identification (RFID) [12], [2].

3. Materials & Methods

3.1 Developing the Attendance Register System (ARS)

The system's development involves five phases using the System Development Life Cycle (SDLC) methodology where the phases are the preliminary investigation, analysis, design, implementation and maintenance phase [11]. Figure 1 depicts the phases that need to be implemented in order to produce the ARS.

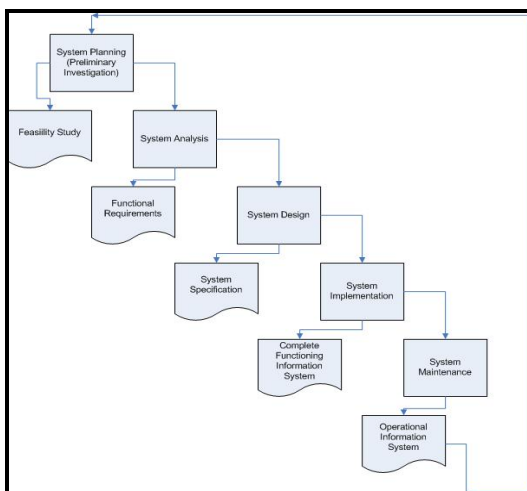


Figure 1: System Development Life Cycle (Shelly, et.al, 2001)

In the first phase which is the preliminary investigation phase, we conduct the feasibility study to determine whether a new or improved system is a feasible solution. In other words, in this phase we must understand the business problems or the opportunities [10]. Therefore, in this phase, one higher academic institution which is Universiti Teknologi MARA (UiTM), Malaysia has been selected to be the pilot study where series of interviews have been conducted with the management of the organization. Questionnaires are also being distributed to the sample group of 550 respondents ranging from the students, lecturers and the management. The results of the questionnaires will be used to compare the users' preferences between the manual system and the proposed online system. From the analysis, we then moved to the second phase of the SDLC.

In the second phase, we analyzed the information needs and develop the functional requirements of the online system that can meet the system's and the stakeholders' priorities. Here, the scope of ARS has also been identified. In the design phase, the development of the ARS will be done. Here, the design will be constructed in logical and physical view. However, because the ARS is still at the early stage of the development, the implementation and maintenance phase will be kept in view for future research and improvements.

4. Results & Discussion

Below are the results and discussion derived from each of the phases of the SDLC as described in Section 3 above.

4.1 Phase 1: Investigation of the systems' problems & requirements (Feasibility study)

Interview sessions and dissemination of questionnaires have been conducted to thoroughly understand the current situation and the problems that the academic institution is facing in recording and reporting the attendance records. Before the problems are recognized, the flow of the current process in recording the attendances in classes has been constructed. Figure 2 depicts the flowchart of the current process where the attendances are manually recorded using the paper sheets.

Later, the interview sessions that had been conducted with the management of UiTM has revealed few problems regarding the manual system. The main problem is regarding the use of papers where the risk of losing the records is high. The current practice in UiTM requires the lecturers to fill in the reports in four separated forms in order for them to report an absent student. They are required to fill up four forms per student for per class.

The hassle to fill up too many forms will cause the lecturers to sometimes ignore the requirements to report the absentee to the management. This act will be misjudged by the students where they will assume that there will be no actions taken to punish them even if they are absent for so many days. This will also send a wrongful message about the law and enforcement in the academic institution thus, affecting the integrity of the academic institution itself.

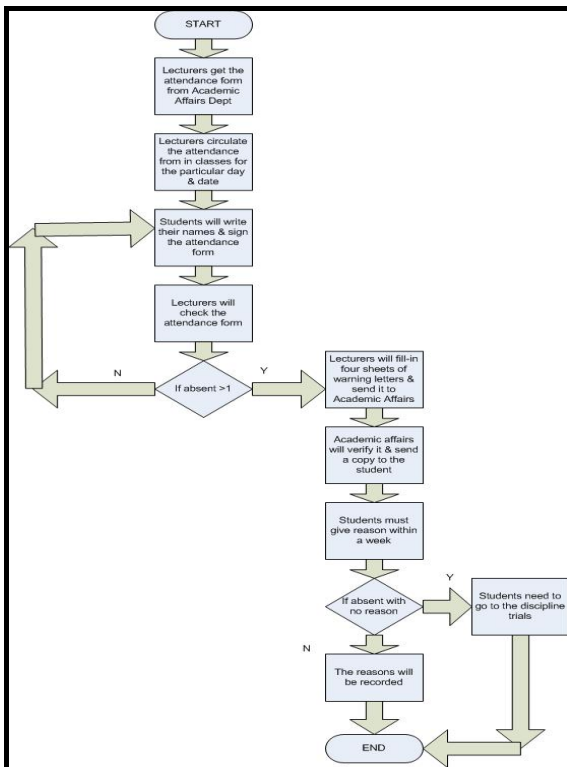


Figure 2: The flowchart of the current process of manually recording and reporting the attendances

Furthermore, Table 1 shows the results from the questionnaires given to the respondents, who in this case study are the target users. 550 respondents have taken part in this study where 319 of them are the students, 203 lecturers and 28 of them are representing the management of UiTM. Thirteen factors from two parts from the questionnaire have been questioned to the respondents that will determine the need of an online attendance system. The first part is about their opinions towards the current practice of using paper sheets to record the attendances. The second part is about their opinions towards using the online attendance system to cater the recording and reporting of the students' attendances. This questionnaire is using the Likert scale from 1 as being Strongly Disagreed and 5 as being Strongly Agreed. Table 1 below shows the results of the descriptive analysis for Strongly Agreed opinions.

Table 1: Comparisons between using the manual system or the online system in recording and reporting attendances among respondents

	Factors	Strongly Agreed	
		Manual System	Online System
1	Attendance system needs	8.4%	32.9%
2	Attendance system is efficient & effective	5.8%	33.8%
3	Attendance sheets are easy to allocate	12.5%	27.8%
4	Record keeping is more organized	5.1%	38.9%
5	The potential of losing attendance sheets is low	4.5%	40.2%
6	Easy to track students' absences	10.4%	36.2%
7	The format of the report for students' absences is consistent	6.2%	34.9%
8	Delivery of reports for students' absences are easy to produce	5.8%	34.4%
9	The process to report students' absences is easy	6.7%	36.9%
10	Students are not difficult to contact to attend the discipline trials via emails	8.2%	27.3%
11	The process to inform student's status to parents are effective	12%	26.2%
12	Cost to develop, manage & maintain the attendance system is low	13.8%	34.9%
13	The attendance system process is fast	7.1%	40.2%
Average		8.2%	34.2%

Table 1 depicted the differences of percentages among the respondents' regarding the use of the manual system or the online attendance system. It shows that in total average, 32.9% of the respondents strongly agreed that an online system is essential to be used in recording and reporting the students' attendances. The highest percentage which is 40.2% shows that the respondents agreed that the potential of losing the attendance sheets is low by using the online system. Furthermore, the respondents also agreed that the process of recording the attendances will become easier and faster with the percentage of 40.2%. Meanwhile,

33.8% of the respondents strongly agreed that the online system is more effective and efficient compared to the manual process. 27.8% of them also agreed that the attendance forms will be easier to access using the system. Moreover, 38.8% of them agreed that the records keeping will be more organized by using the database system and 36.2% of them decided it will be easier to track students' absences by using the system. Meanwhile, 34.4% of the respondents also agreed that the reports of the students' absences will be easier to produce by using the system where data can be easily retrieved. Furthermore, 27.3 % of the respondents strongly agreed that the students will not be too difficult to contact to attend the discipline trials via emails and the process to inform their parents will be much more effective. Lastly, about 34.9% of the respondents strongly agreed that the cost to develop, manage and maintain the attendance system will be much lower as it will reduce the paper usage.

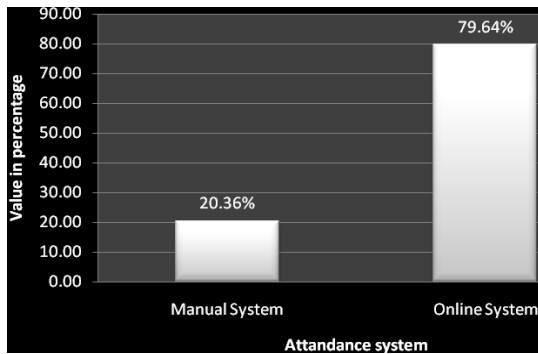


Figure 3: Percentages of the preferred system to record & report students' attendances in UiTM Pahang

To summarize the results, Figure 3 above shows the percentages of the preferred system among the respondents in UiTM. From the chart, it has revealed that 79.64% of the respondents preferred to use the online attendance system whereas only 20.36% of them still preferred to use the manual system. These results have shown that a revolutionary and systematic system is indeed needed in the higher academic institution in order to make the process of recording and reporting the students' attendances more efficient, reliable and viable.

4.2 Phase 2: Analysis of the current situation (Functional requirements)

From the feasibility study done in Phase 1, a proposed solution for a more systematic system has been done. Some functional requirements have been identified in this phase where the proposed system will not only be a stand-alone system, but it will be built on a web-based platform. Meaning that; the system should be able to cater the access of multi-users from anywhere within the

institution's intranet. Thus, provides rapid access and facilitates quick responses to any inquiries and reports of the students' attendances.

4.3 Phase 3: Design Phase for ARS (System Specifications)

In this phase, the logical and physical designs are being developed to satisfy the functional requirements of the proposed online system. The logical design of the system is designed in the form of use-case view as depicted in Figure

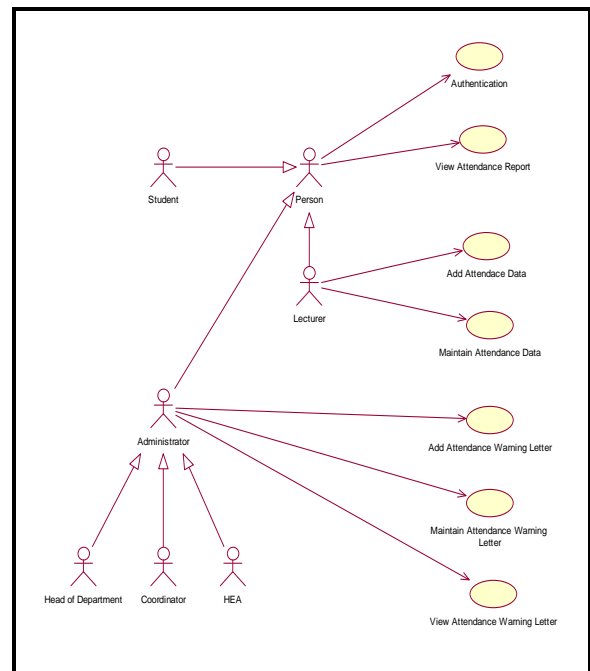


Figure 4: The logical design for ARS: Use Case View

Figure 4 shows the main actors for ARS, which are the lecturers, students and administrator. Each actor will involve in some of the processes that have been identified as described below:

a) Lecturer

Lecturers will have the authority to add the attendance via the Web. Each lecturer will be assigned to a few classes and the attendances will be recorded on daily basis. The records will be stored in the database. All the records can be printed as reports or updated by the lecturer for that particular class only providing full security measures for the attendance records.

b) Student

Students can only view their attendance records. If they happen to be absent but later on they provide some proofs for their absences, requests can be made to the lecturers to update the records in the system. However, if they fail to present the proofs, they will be receiving warning letters from the Department of Academic Affairs, UiTM. The warning letters will also be generated by the ARS.

c) Administrator

The administrator, in this case will be the Department of Academic Affairs of UiTM. The administrator will be granted the full access to the records in the ARS. Other than issuing the warning letters that can be generated by ARS as mentioned above, the administrator can also update any lecturers' and students' records via ARS. They can also view the attendance records on daily or monthly basis and print the reports in real-time processing.

For the physical design phase, ARS is built using the web-based platforms which require the use of PHP programming language, MySQL database and the Apache web server. The interfaces of the ARS are designed based on the processes that have been identified in the logical design. Some of the ARS interfaces are illustrated in Figure 5.

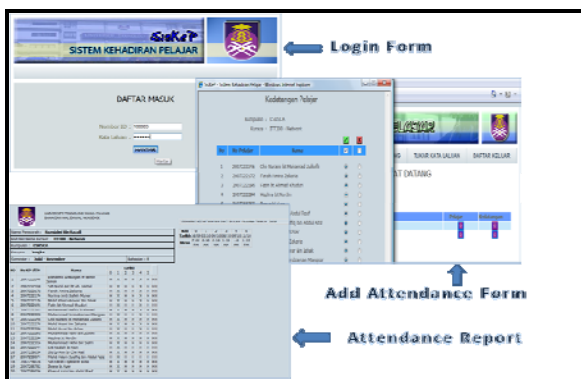


Figure 5: Some examples of ARS physical design (interfaces)

5. Conclusion

From the results and discussions, it has revealed that an online system for recording and reporting students' attendances is indeed a needed application in order to make the process more efficient and time-saving where more than 70% of the sample group agreed to that matter. The high-end technologies used to develop this system will provide users with rapid access to any information regarding the students' attendances. Furthermore, the system can be easily accessed via the Internet where it

provides full support for simultaneous access of multi-users from dispersed locations. Other than that, the use of the database will also provide secured and controlled data management system, thus increasing the reliability of the attendance reports.

However, despite the facts that ARS can contribute to the improvements of recording students' attendances in higher academic institution, the prototype system is still in needs for future enhancement. The development of this system is still at the early stage where further modifications are needed to meet other scopes of the system's processes. Other tests are also needed such as the users' acceptance and satisfactions tests in order to upgrade the system according to the users' future requirements. This system will also be upgraded using Radio Frequency IDentification (RFID) technology in order to make it fully-automated thus making it more efficient in recording the attendances. Therefore, the advancement of this system will be kept in view for future implementation and improvement.

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References

- [1] Bowen, E., Price, Trevor, Llyod, S. & Thomas, S., "Using Electronic Attendance Registers to Aid Adult Learner Success", Abstract published in the Proceedings of the 11th International Literacy and Education Research Network Conference on Learning, Cuba: Havana, 2004. Retrieved October 4th, 2009 from <http://lc04.commongroundconferences.com/ProposalSystem/Presentations/P000637.html>
- [2] Hornback, G., Alex Babu, Martin, B., Ben Zoghi, Madhav Papu & Rohit Singhal. (n.d.). "AAS: Automatic Attendance System", Retrieved October 4th, 2009 from http://rfid.ctu.edu.tw/8_lab/WP1-Attendance.pdf
- [3] Jonathan Sidi, Syahrul N. Junaini & Lau S. Ling, "ISAMS: Tracking Student Attendance using Interactive Student Attendance Management System", Proceedings of the 3rd Malaysian Software Engineering Conference, pp. 218-223, Selangor: Malaysia, 2007.
- [4] Mahfudzah Othman, Zainab Othman & Mohd. Norafizal A.Aziz, "Student Management System in schools: The use of web-based applications", J. GADING, 10 (1), pp. 87-98, 2006.
- [5] Mahfudzah Othman, Zainab Othman. & Mohd. Norafizal A.Aziz, "Implementing the web-based student management system in schools: A study of system usability and its contribution to the school community", Proceedings of the National Seminar on Science, Technology & Social Sciences (STSS) 2008, pp. 577-586, Pahang: Malaysia, 2008.
- [6] Marr, Liz & Lancaster, Guy, "Attendance System", Learning and Teaching in Action, 4 (1), pp. 21-26, 2005.
- [7] Mazza, R. & Dimitrova, V., "Visualising student tracking data to support instructors in web-based distance education", Proceedings of the 13th International World Wide Web Conference on Alternate Track Papers & Posters Press, pp.154-161, New York: USA, 2004.
- [8] Newman-Ford, L.E., Fitzgibbon, K., Llyod, S. & Thomas, S.L., "A Large-Scale Investigation into the Relationship between Attendance and Attainment: A Study Using an Innovative, Electronic Attendance Monitoring System", Studies in Higher Education, 33(6), pp. 699-717, 2008.
- [9] Newman-Ford, L.E., Lloyd, S. & Thomas, S.L., "An investigation into the effects of gender, A-level points, place of residence, age and attendance on first year undergraduate attainment", Journal of Applied Research in Higher Education, 1 (1), pp. 13-28, 2009.
- [10] O'Brien, James A., "Introduction to Information Systems: Essentials for the e-Business Enterprise", Mc Graw Hill, New York, 2003.
- [11] Shelly, G.B., Cashman, T.J., & Rosenblatt, H.J. (2001), "System Analysis and Design", 4th edition, Thompson Course Technology, New York, 2001.
- [12] Tabassam Nawaz, Saim Pervaiz, Arash Korrani & Azhar-Ud-Din, "Development of Academic Attendance Monitoring System using fingerprint identification", International Journal of Computer Science and Network Security, 9 (5), pp. 164-168, 2009.



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