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Malang, November 27, 2014

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Sekolah Tinggi Informatika dan Komputer Indonesia

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The 1st International Conference on Information Technology and Security (IC-ITechs) November 27, 2014

Editors & Reviewers:

Tri Y. Evelina, SE, MM Daniel
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F. Palandi, M.Kom

Layout Editor:

Eka Widya Sari

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GREETINGS

Head of Committee IC-Itechs

For all delegation participants and invited guest, welcome to International Conference on Information Technology and Security (IC-Itechs) 2014 in Malang, Indonesia.

This conference is part of the framework of ICT development and security system that became one of the activities in STIKI and STTAR. this forum resulted in some references on the application of ICT. This activity is related to the movement of ICT development for Indonesia.

IC-Itechs aims to be a forum for communication between researchers, activists, system developers, industrial players and all communications ICT Indonesia and abroad.

The forum is expected to continue to be held continuously and periodically, so we hope this conference give real contribution and direct impact for ICT development.

Finally, we would like to say thanks for all participant and event organizer who involved in the held of the IC-Itechs 2014. We hope all participant and keynote speakers got benefit from this conference.

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on Information Technology and Security

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Functional Model of RFID-Based Students Attendance Management System In Higher Education Institution

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ABSTRACT

The need of developing student attendance management system is driven due to the fact that the students' attendance records are one of the most important factors of their academic achievement. The conventional practice of managing the student attendance manually by pens and papers is considered as challenging tasks for most of the higher education institutions. This paper will propose a system functional model to manage the student attendance in a more efficient way by utilizing the RFID tags technology. The RFID technology is an automated identification and data collection technology. The ability of RFID tags to deliver accurate information in quicker way shall improve the efficiency to manage the students attendance data. The system model proposed in this paper will also consider the need of the academic administrative staff to have an integrated reporting function which are related to the student and the lecturer attendance records. The system functional models presented in this paper are developed in UML based on the approach of object-oriented system analysis and design.

Keywords*: system modeling, UML, functional model, attendance system, RFID tags*

INTRODUCTION

One of the main concerns of any academic organization is the improvement of students' academic performance in their respective classes, along with their extra co-curricular activities. Various researches have concluded that students' attendance records are one of the most important factors of their academic performance.

There is a tendency for students who attend classes more regularly to achieve better academic achievements[6]. Better attendance leads to higher retention rates, better academic marks, and more satisfying educational experience. It is generally found that some students do very well in their academic examinations, and some students do not. Students who do well are those who come to the class regularly, attend their classes properly, and are punctual in their sessions[5]. Results taken from another study have shown that attendance was a significantly better predictor of grade than any other factors such as age, prior education background or even gender [8].

Most lecturers and academic administrators have to come up with ideas to ensure a good participation from students, and make sure that the student-lecturer interaction is kept intact. The ideas may come in formats like surprise quizzes or extra credit in class[1].

In addition to those challenges, the attendances are often recorded manually by the lecturer and therefore may leads to personal errors. Using paper-based procedures are inefficient not only in attendance recording but also in administrative reporting. It will also require the management of the academic institution to provide a well-managed filing system to contain the attendance records[9]. This indicates the need for a more efficient and effective method of solving the problem. One of technology implementation that can help to solve this

problem is by combining attendance management system and the RFID (Radio Frequency Identification) technology.

RFID is an automated identification and data collection technology which ensures more accurate and timely data entry. It gains more attention recently because of its current low cost and advanced uses in other computing fields[1]. RFID combines radio frequency and microchip technologies to create a system that can be used to identify, monitor, and secure objects. RFID systems use tiny chips called tags which can contain and transmit some identifying information to an RFID reader or scanner. It can be used for retrieving from or storing data on to RFID tags without any physical contact[7].

The ability of RFID systems to deliver precise and accurate data about tagged items will improve efficiency and bring other benefits to business community and consumers alike[2].

METHOD

Object-oriented approaches to developing information systems can use any of the traditional methodologies. However, the object-oriented approaches are most associated with a phased development methodology. The primary difference between a traditional approach like structured design and an object-oriented approach is how a problem is decomposed[4].

In traditional approaches, the problem decomposition process is either process centric or data centric. However, processes and data are so closely related that it is difficult to pick one or the other as the primary focus. Based on this lack of clarity, object-oriented methodologies attempt to balance the emphasis between process and data by focusing the decomposition of problems on objects that contain both data and processes[3].

UML (Unified Modeling Language) is made up of a variety of modeling techniques, dealing with various aspects of the system development. Following UML's popularity and widespread adoption, many object-oriented development methodologies which utilize its techniques have been developed in recent years. This paper use a methodology proposed by Whitten and Bentley[11] which deals with the system analysis and design phases.

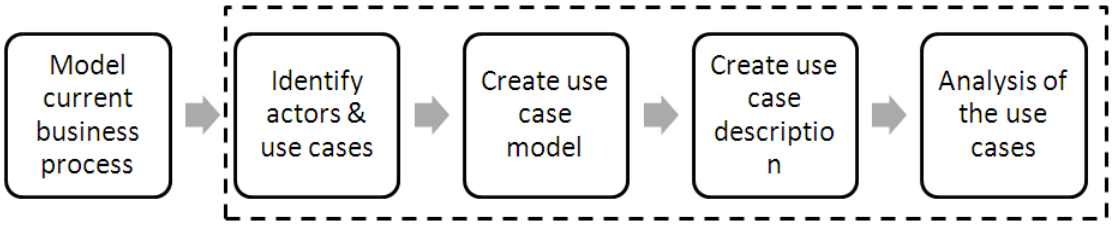

Figure 1: Steps to create system functional models

The first step in the methodology is modeling the current business processes. After then, the current business process model is used to facilitate functional model creation. The functional model is created with use cases models which describe the system's functions from the users' point of view. Functional model creation involves four sub-steps[10]: identifying actors and use cases, creating a use case model, creating the use case description, and analysis of the use cases.

This research uses STIKI Malang as the observation object. STIKI is a private IT college located in Malang, Indonesia,. The system models presented in this article are based on analysis and design of the organization's business processes.

RESULTS

The students' attendance management activity of the organization is currently performed manually by paper forms. This practice consumes a lot of time and also prone to human errors that could be happening during or after the process of attendance recording. The process becomes more complicated for the academic administrators to summarize the attendance records and deliver the reports required by management board.

Figure 2: Manual attendance management activity model

Potential actors and use-cases for the new attendance management system could now be analyzed from the current attendance management activity model produced in the first step. The identified main actors based on the current process are lecturers, students, and academic administrators.

Table 1: Identified actors and use-cases

Potential actors	Potential use-cases
Lecturers	Open the class session. In some cases, students can also act as lecturer-assistant
	Validate the attendance report forms and mark any invalid attendances
	Close the class session and submit the class session report
	Sign the lecturer attendance form
Students	Sign the class attendance form
Academic administrator	Re-validate and authorize the class attendance report forms
	Summarize students attendance and produce reports
	Summarize lecturers attendance and produce reports

The identified actors and use-cases are then used to produce the use-case model of the proposed system. Additional actor is introduced to deal with administrative tasks of the proposed system, such as system users and privileges management.

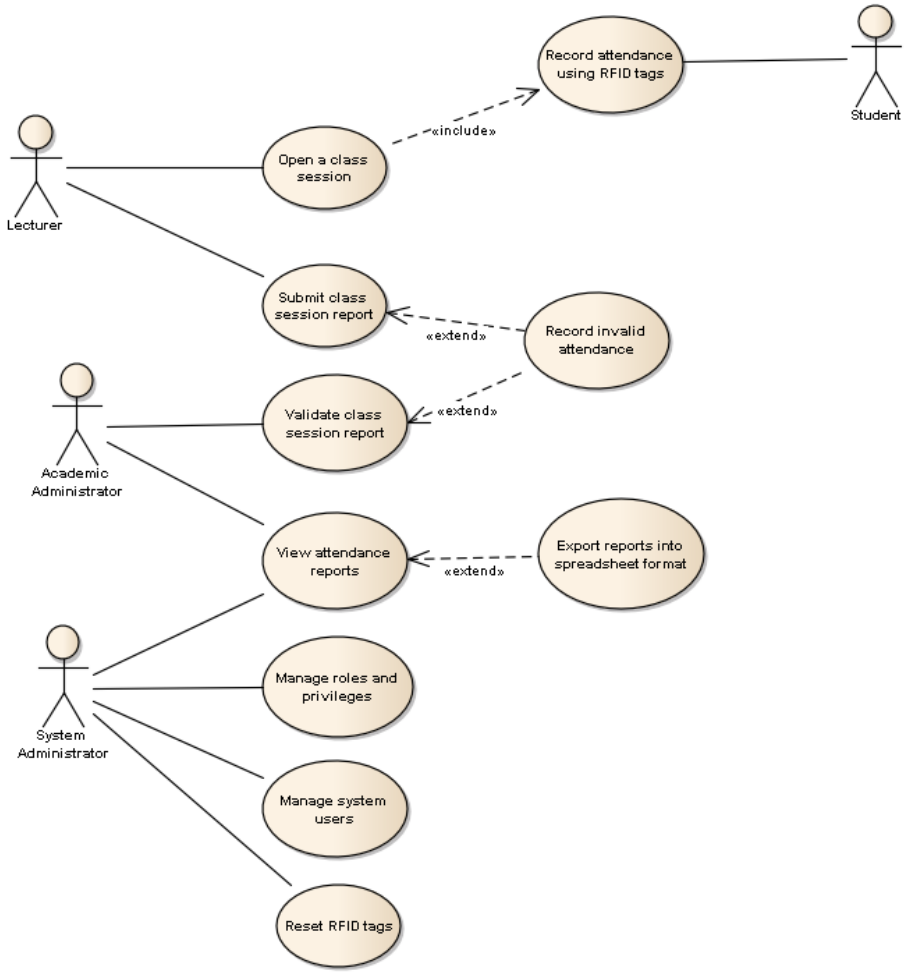

Figure 3: Attendance management system use-cases model

The use-cases presented in the model are then analyzed to produce brief description on how the use-cases will be implemented for the proposed system. The use-case analysis results are presented in use-case description format. Use-case description contains the additional information to allow users understand the model in a simpler way. Use case description has

three basic parts: overview information, relationships, and the flow of events. This article presents every use-case descriptions which are considered to have high level of importance.

Table 2: Use-case description - recording the attendance

Use-case Name	Record attendance by using RFID tags
Primary actor	Student
Level of importance	High
Brief description	Student is able to record his attendance by using his own RFID tag. System reads the RFID tag to populate the student identity and the attendance time into the database.
Relationship	Association: Student
	Includes: none
	Extends: none
Trigger	Class session has been opened by lecturer
Flow of events	1. Lecturer opens the class 2. System will populate class session record 3. Each of students record their attendance by using RFID tags 4. System will populate student's identity and time stamp

Table 3: Use-case description - submit session report

Use-case Name	Submit class session report
Primary actor	Lecturer
Level of importance	High
Brief description	After closing the class session, the lecturer must submit the class session report. The report contains the session description, the teaching methods, and any additional notes related to the teaching activities.
Relationship	Association: Lecturer
	Includes: none
	Extends: none
Trigger	Class session has been closed by lecturer
Flow of events	1. Lecturer closes the class 2. Lecturer fill in the session report form 3. System store the class session records 4. System records lecturer's identity and time stamp

Table 4: Use-case description - view class attendance report

Use-case Name	View class attendance report
Primary actor	Academic administrator
Level of importance	High
Brief description	Academic administrator is able to view the attendance reports. The reports are produced from session attendance records that have been validated and authorized. Academic administrator could also view customized reports based on provided filters and criterias.
Relationship	Association: Academic administrator
	Includes: none
	Extends: Export reports into spreadsheet format
Trigger	Attendance report and session report have been authorized
Flow of events	1. Academic administrator provides required filters and criterias 2. System displays the report based on provided criterias 3. Academic administrator can export the report into spreadsheet format

Table 5: Use-case description - manage roles and privileges

Use-case Name	Manage roles and privileges
Primary actor	System administrator
Level of importance	High
Brief description	System administrator is able to manage assign roles and privileges to the users recorded in the system. Any users can be assigned into 4 different roles as defined in use-case actors.
Relationship	Association: System administrator
	Includes: none
	Extends: none
Trigger	-
Flow of events	1. System administrator activate the administration module 2. System displays every available users 3. System administrator assign a role to selected users 4. System grants defined privileges for the assigned users

The produced use-cases and their descriptions can then be used as foundation for upcoming design phase. The use-case communicates what the system needs to do at a high level, and all the subsequent modeling techniques are built on this. The use-case model and its descriptions are the building blocks by which the system is designed and built.

CONCLUSION

This article presents the functional model of an attendance management system based on higher education institution's business process. The system allows lecturers and students to simply record their attendance just by moving their RFID tags near the scanner device. The

primary actors identified for the system are lecturers, students, academic administrators, and system administrators.

The main benefit of the proposed RFID-based attendance management system is to shorten the attendance recording activities and also reduce the hassle of managing attendance records. The system is also aiming to help the academic administrators and management boards to provide any attendance reports based on certain set of criterias.

The set of functional models presented in this article can be next used to produce the behavioral model and structural model of a RFID-based attendance management system. The models can then be implemented by using any programming language that endorse the object-oriented programming approach.

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