Design of employee presence system using Radio Frequency Identification technology

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Abstract. Employee attendance is important data at a college, because it is related to employee performance. Information technology for presence systems exists that uses magnetic cards and biometric measurements. Lately there is a technology of Radio Frequency Identification (RFID) devices that use radio signals to identify objects. Such RFID characteristics enable this technology to be used on employee cards connected to a computer-based presence system. Based on these conditions, this study aims to design a presence system using RFID technology. The system design uses the Rational Unified Process method, the Unified Model Language, with PHP and MySQL as builder software. The hardware used, in addition to a set of computers with specifications tailored to the needs, is also equipped with RFID devices. The presence system produced includes an RFID card reader, and a presence data processor. The presence system has a menu for adding employee data, employee attendance, delay identification, time management, monthly attendance recapitulation for each employee, and attendance recapitulation for all employees. This system has been trained by operators in the presence section with a very good absorption of 82% with a two hour training period. This shows that the system is relatively easy to implement.

1. Introduction
Higher education is an institution that has three human resources, first is educational staff, second is lecturer, third is student. The presence of students, lecturers, and education staff is important for higher education performance; therefore, attendance is used as a determinant of the value of courses for students, and salaries for lecturers and education staff. Among the three who are required to be present every day are educational staff. Educational staff are permanent employees who take care of the administration and technical education, because the presence system is generally applied at the earliest to them [1]. The design of the presence system is intended for university employees, especially educational staff and can also be for lecturers [2].

Presence systems have evolved from manual systems to computer-based systems, such as biometric readings with finger print and iris scanning [3]. In addition to using biometrics, a computer-based presence system can use other Information and Computer Technology (ICT) methods [4]. For example, using an electronic identity card based on Radio Frequency Identification (RFID). RFID is a technology that uses communication via electromagnetic waves to identify an object [5]. According to some studies, the use of RFID has advantages compared to the use of biometric data [6]. Collections include faster object readings and greater object data storage capacity [7]. Based on this, the design of
the presence system in higher education is carried out in higher education especially for education staff/employees. The presence system created has criteria including making it easier for employees to make a presence, making it easy for the recording of employee attendance data, and each employee can find out their respective attendance. The design of the RFID-based Presence System uses the Rational Unified Process (RUP) method [8]. RUP is one object-oriented method supported by devices and other methods [9].

2. Methodology

The RUP method is described using Work Breakdown Structure (WBS) so that each stage and activity can be detailed so as to facilitate the implementation of system design [10]. The WBS scheme for building this system is shown in Figure 1.

The first stage in the RUP method is Inception, in which at this stage an identification of current business processes is carried out. Identification is done using interviews, and see how the presence process is done. This first step produces an overview of how to turn a manual presence into a computer-based presence information system. The second stage is Elaboration, which is modelling the results of the analysis using UML Unified Modelling Language (UML), namely by making use case diagrams, activity diagrams, sequence diagrams, and class diagrams. Also made an interface design that will be used by each attendance system user. The third stage is Construction, the stage of making a presence system based on the generated UML. The construction phase begins with the installation of supporting devices namely RFID, followed by the construction, and finally testing. The Transition stage is the last stage of the RUP method. At this stage the user evaluates and evaluates the presence system that is made according to the needs that have been determined.

3. Result and discussion

The results of the Inception stage are in the form of the identification of business processes, system specifications and actors. The results of business process identification show that the admin enters employee data into the system. Employees who already have an account can make a presence every
working day. The results of data recording are recapitulated by the administrator. Employee attendance reports can be integrated with other systems in higher education, such as the payroll system. The employee attendance business process is shown in Figure 2.

![Figure 2. Business process of presence system.](image)

System requirements include hardware and software requirements. The hardware needed in the presence system is a computer and RFID reader [11]. The software used in building presence systems is the Code sublime text editor [12], XAMPP Local server [13], MYSQL Database [14], Bootstrap Frontend Framework. Actor identification results show that there are two actors who are directly involved in the presence of activities namely employees and administrators. Employees conduct attendance activities every workday and get a monthly attendance recapitulation. Administrator is an actor who manages the presence system in the form of entering employee data and recapitulating the attendance data of all employees.

![Figure 3. Activity diagram of presence process.](image)
The results of the Elaboration Phase are in the form of a system architecture design, including making use case, activity, and sequence diagrams. Activity diagram, used to describe activities that can be done by employees and admins. Activity diagram illustrates the workflow of administrators and employees in a presence system can be seen in Figure 3. The class diagram is in Figure 4. Class Diagram shows the classes involved in the system with attributes and methods.

![Class diagram of presence system.](image)

The result of the Construction phase is to build a system based on a design that has been made. There are several steps in building a presence system including the installation of RFID devices. The first step of the installation is done by configuring the RFID Reader so that it can connect to a laptop or PC and function normally during the process of building a web-based presence system. The next step is to create a graphic user interface in the presence system where this interface design can make it easier for admins and employees when using the presence system. Figure 5 shows the interface for reading RFID based employee cards. In this section employee identification cards must be affixed, until read by the system.

System development provides system programming weaknesses to the PHP programming language generating code from web-based presence systems. The results of the development are the results of the employee recapitulation which can be seen in Figure 6. In the picture, it is seen receiving employees from the time they come home, and whether there is an appropriate time or taken.
The Transition phase represented by testing using the black box method shows that the presence of the presence system has given results in accordance with the research objectives. This presence system has been able to be trained by university attendance system managers with very good absorption of 82% within 2 hours of training. This shows that the system is relatively easy to use, so that technology acceptance by users will be good [15].

This research successfully used RFID for the presence system as an alternative to biometrics, barcodes and magnetic cards. However, the benefits of RFID technology have not been utilized optimally. As stated in previous studies, RFID has the advantage of being able to store object data in more detail and card readings faster from longer distances [16]. Based on these facts the RFID-based Presence System needs to be developed further. Considering that each presence system technology has weaknesses, then to minimize the weaknesses of each in the future can be combined several technologies [17]. Likewise, the results of the attendance recapitulation can be used to complement the information system at the tertiary institution concerned [18].
4. Conclusion

Based on the results and discussion, it can be concluded that the development of RFID-based presence systems for universities has been successful. The RUP method used has directed the system design to the testing stage, where the system can be trained to the users of the system properly.

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