Integrated Information System for Radio Frequency Identification Based Administration and Academic Activities on Higher Education

B Kurniawan
Universitas Komputer Indonesia (UNIKOM), Jl. Dipatiukur No.112-116, Bandung, Jawa Barat, Indonesia

bobi@email.unikom.ac.id

Abstract. The purpose of the study was to integrated information system for radio frequency identification based administration and academic activities on higher education. Technology based on Radio Frequency Identification (RFID) in the environment industry and in the environment of education has been widely applied. In, using the RFID system has penetrated many sectors, from manufacturing, distribution, retail goods storage, hospitals and education. RFID system in Environmental Education has been widely used for Student ID Card, library, attendance and for control of the room automatically. However in the application/usage of RFID system is still designed/design separately which can lead to instability of the interbank data system built. To fix the issue, conducted a study on the use of RFID technology is integrated to academic and administrative services that are required. System academic administration and service that will enhance any RFID functions used in the transaction. With many RFID data from each service, an integrated RFID information systems needed to manage and monitor any data services. The data used in any transaction using the academic administration and service system will increase every time the RFID is used in the transaction. The RFID data with quite a lot of any services, either for absences, the student, library services and parking service system, integrated RFID information systems needed to manage and monitor each data service. This integrated information system serves to academic and administrative services under the RFID platform. With this information system, data processing as well as academic and administrative services into a more effective and efficient. In addition to the data management, integrated information system can help in making the report and provide the necessary information to other systems that need to support specific strategic decisions related to administrative services and the academic.

1. Introduction

The existence of information technology has supported the progress of the application of technology in various fields, particularly in the field of Education. Administrative and academic activities in the field of education range from vehicle parking data, student data, lecture attendance, library book borrowing and student administration.

In general the data of students who are in a university is managed using information systems that are separated from each other or stand alone on each part. Therefore, managing data becomes longer and inaccurate. Each university of course has an increasing number of students every year and also decreases every year. With the rapid growth of student data in a university, every university should have a very...
capable system in managing student data in order to be easily processed by the administration. Looking at those needs, I then intend to create an integrated information system using the aid of Radio Frequency Identification (RFID) technology.

Radio Frequency Identification (RFID) is an object identification method that uses radio waves by means of a device called an RFID label or transponder (tag) to store and retrieve remote data [1]. The identification process is done by RFID reader and RFID transponder (RFID tag). RFID tags are attached to an object or an object to be identified. Each RFID tag has unique identification number data (ID number), so no RFID tags have the same ID number. RFID is used to describe a system capable of transmitting identity data of an object wirelessly using radio waves. RFID is included in Automatic Identification (Auto ID) technology. Currently the automatic identification system is becoming very popular in a variety of industries such as services, purchasing, manufacturing, and so forth. Other technologies included in the Auto ID are barcodes, optical character readers, and biometric technologies. Thus, RFID is a data capture technology that can be used electronically to identify, track, and store information stored in RFID tags [2]. RFID technology has been widely implemented to support system performance. Several RFID-related studies have been done before [3-5].

The use of RFID systems for educational environments, particularly in University environments, has been widely used. One of which is the use of RFID system as a student ID card that has many functions, ranging from lecture attendance, library lending access, and even for automatic room control. In the use of RFID system, system information (software) that serves to support the hardware (hardware) RFID system is certainly required. But in its use, information systems for RFID system is still designed separately, so it can lead to data instability between the designed systems. To overcome this, a study was conducted on the use of integrated RFID technology for administrative and academic services that could be used for University level.

2. Research methodology
This research applies waterfall method because step by step method through which the data must be finished before moving to the next stage that runs in the sequence (linear). Research methodologies in this research include problem identification, formulation of research objectives, data collection and processing, system design, system development, testing, and improvement. The followings describe the stages in detail.

2.1. Identification of problems
At this stage, the problems are identified and determined on what are needed in making this integrated information system. In the implementation, problem identification concerns on how to create an integrated information system based on RFID technology for administration and academic services that can be used for University level.

2.2. Formulation of research objectives
This stage is to determine the formulation of research objectives based on the identification of existing problems, namely to create an integrated information system based on RFID technology for administrative and academic services that can be used for the University level.

2.3. Data collection and processing
At this stage the data is taken from the applications that will be made system integration, ranging from application usage for attendance lectures, access to borrow books in the library, and even for automatic room controlling.

2.4. System design and RFID reader
At this stage, the designing of software and hardware for the system is made. Software cropping is designing information systems using java and PHP programming languages, while for hardware design is to design a computer server and design RFID reader that will be used for the system.
2.5. Testing and repair
After the system is completed, simulation is done in line with the stages in the research methodology. Then, indicators of achievement at each stage are put forward. "An integrated information system based on Radio Frequency Identification (RFId) for academic and administrative activities of the University" The final version has been tested and improved.

System design on this research consists of explaining the system overview, explanation of the difference from the RFID tag RFID Reader, RFID frequency, system analysis and design of use case diagrams.

a. Illustration of the system
One of the important components of RFId based integrated Information System is a server computer that has installed server operating system with web services and database server. Here is the diagram block of RFId based integrated information system. (Figure 1)

b. RFId tag and RFId reader
The RFId tag consists of a series of chips integrated with an antenna. The electronic circuits of RFId tags generally have memory that allows RFId tags to have the ability to store data. There are two types of RFId tags: active tags and passive tags.

c. The frequency of RFId
Here are some of the frequencies contained in the RFId tag and Reader. (Table 1)

| Wave  | Frequency       | Distance     |
|-------|-----------------|--------------|
| LF    | 125 KHz         | 1.5 Feet     |
| HF    | 13.56 MHz       | 3 feet       |
| UHP   | 860-930 MHz     | Up to 15 feet|
| Micro Wave | 2.45/5.8 GHz | 3 feet       |

For RFId frequency used in RFId based integrated information system this is RFId with LF band wave having frequency 125 KHz.

d. System analysis framework
In the design of this information system, all RFId-based academic administration applications will be integrated with the information system server already installed with the web service and database server. Therefore, the user can access the data in all academic administration application (parking system, library system, attendance system, administration system, room control system and active student data
at University) through this RFID based integrated information system. For the design of RFID based integrated information system can be seen in Figure 2.

**Figure 2.** The design of RFID-based integrated information system.

e. **Use case diagram**

Use Case Diagram from RFID based integrated information system is from 8 use case and two actors. Of the 8 use cases in RFID based integrated information system consists of login menu, logout, and academic administration information system that will be integrated using RFID system, starting from; active student master database, parking system, library system, attendance system, administration system and room control system. As for the actor on the use case diagram of RFID based integrated information system is the officer / employee of the University as administrator and student as Users. Use case diagram of RFID integrated information system can be seen in Figure 3.

**Figure 3.** Use case diagram in RFID-based integrated information system.
3. Results and discussion

3.1. Mockup of the information system

Here are some views of RFID-based integrated information systems that can be performed by an administrator (University Administration Staff):

Figure 4 shows the login menu of integrated information system based on RFID from administrator side. In the login menu integrated information system based on RFID consists of username and password that can be used by the administrator. (Figure 4)

![Figure 4. Menu login of the RFID-based integrated information system.](image)

Figure 5 shows the main menu view of the RFID-based integrated information system from the administrator side. On the main menu displays an active student data menu, library system, parking system, administration system, attendance system and room control system. (Figure 5)

![Figure 5. Main menu of the RFID-based integrated information system.](image)
Figure 6 shows the menu view of the parking system application that exists on the RFId-based integrated information system from the administrator side. In this menu, administrators can access, add, delete & edit student data that exists on the parking system database. The tables in this parking system database consist of RFId Id, Name of student, description, Student’s ID number, balance for parking system, and department. (Figure 6)

4. Conclusion
On the basis of this research, can be drawn the conclusion that the integrated information system based RFId will help users and University officials to manage and monitor each student activities both academic or administrative are structured and centralized as well as data processing and the service on the application – application of RFId-based academic administration of the University be made efficient and effective with a RFId-based integrated information system (for the management can do enough data on one system only so that the data will automatically update on a server so as to minimize redundant data).

References
[1] Maryono 2005 “Basic Radio Frequency Identification That is Influential in The Library”, 16 (20).
[2] Saputra D, Cahyadi D and Awang K H 2010 “Library Autmation System Using Radio”, 2 (3), pp. 67-70.
[3] Murizah K, Hasbullah M, Norliza Z and Muhammad S K 2012 “Web-based student attendance system using RFId Technology,” Control and System Graduate Research Colloquium (ICSGRC).
[4] Kim C and Kang C 2005 “Design and Implementation of RFId Application System for Hospital Information System”, J Korean Soc Med Inform, pp. 399-407.
[5] Tan H 2008 “The Application of RFId Technology in the Warehouse Management Information System,” Electronic Commerce and Security, International Symposium.