

# PEAS: Portable Examination Attendance System: A Proposal

Hafizul Fahri Hanafi, Cassidy Meyer Joe Meyer, Mohd Helmy Abd Wahab  
and Herdawatie Abdul Kadir

**Abstract** – This paper describes the development of Portable Examination Attendance System (PEAS) based on RFID technology. With these devices, we hope we can reduce the risks of attendance losses due to traditional procedures that required each of students to write the personal and subject information on a sheet of paper. Unfortunately, the problem might occurred during the examination officers collect the attendance paper especially when there are more than one section and different subject attended to take the final examination at the respective time. The purpose of Portable Examination Attendance System is to assist the examination officer to perform and validate the student attendance status when required at anytime and everywhere. The main aim of this project is track record the student attendance using the contactless student card ID through RFID readers that operates at 13.56 Mhz. This paper also describe on previous research and the developing process which involves 5 main phase including preliminary investigation, analysis, designation, implementation, maintenance and testing. The database system is designed using the Microsoft Access containing the student information and installed in the Portable Digital Assistant (PDA) that directly connected from the card reader. The system is also providing a Graphical User Interface (GUI) as the interface between user and database system.

**Keyword** : *RFID, PDA, attendance system, Microsoft Access*

**R**ecent year, smart card has been used widely in our daily life such for identification, network access, network security, electronic purses or other special application. The small, paper less, to read data directly and processed electronically by a PC, PDA or mobile devices are among the advantages of this card (Scheuermann, 2002). Therefore, it offers significant benefits for individual, businesses and governments due to greater satisfaction through quicker and more secure access to information and services.

Usually, the contact card must be inserted into a smart card reader. It has a small gold plate on the front of the card. When the card is inserted into a smart card reader, the reader makes a contact with electrical connectors allowing the transfer of data to and from the chip. On the other hand, the contactless card only needs to be passed within 10 cm of the reader to perform a transaction by using the RFID (Radio Frequency Identification) method. An RFID technology is a non-touch recognition system that transmits and processes the information on events and environments using a wireless frequency and small chips (Lim et. al., 2006; Hahnel et. al., 2004).

The smart cards are becoming more and more ubiquitous and the trend is to integrate a card reader in all kind of equipment such in PCs, PDAs or even mobile phones (Yang et. al., 2002). Due to this, the universities, colleagues, even school nowadays are using the contactless card as their student identification card. With the increase number of student using the smart card, the development on tracking student attendance increased extremely especially in education field. Therefore, this project intends to store and track student attendance during the examination day by using the PDA as the storage element. A PDA can now provide more potential applications to our daily life (Abriel et. al., 2001). Much of the popularity of mobile computing devices and PDAs can be attributed on the ability to deliver information to users on a seamless basis (Starobinski, 2003). The PDA interface is a small, portable devices that is available everywhere but computer based interfaces are not convenient while laptop computers are cumbersome to carry and are not always appropriate for all environment (Keskinpala, 2003).

### 1.1 Problem statement

Generally, the most educational institutions are performing the final examination for each student before end of each semester in order to determine the performance in current subject taken. Thus, student will need to attend the examination day and fill the attendance sheet on a piece of paper before the examination begins. Within this conventional method, the examination officers then come to each student and collect the attendance paper manually. However, within the large hall full with student in different section and subjects, the attendance sheet tends to lost due to inefficient handling during the collection.

This project therefore intends to reduce the risks of attendance losses by record the data attendance through PDA. This method, allow officer to verify the student attendance in database system during final examination day. The PDA facilitated with the Graphic User Interface (GUI) as the interface between user and the data storage.

## 1.2 Objectives

The objectives of this project are as follows:

- i. To design a portable examination attendance system.
- ii. To communicate the PDA with smart card reader.
- iii. To make a system database and graphic user interface on the PDA.
- iv. To track student attendance based on RFID technology and present in PDA system database.

## 1.3 System architecture

This project consists of software and hardware as shown in Fig. 1 the contactless card using the Radio Frequency Identification (RFID) is a method of identifying unique items using radio waves. The RFID system is made up with two major components which are the transponder and the reader.

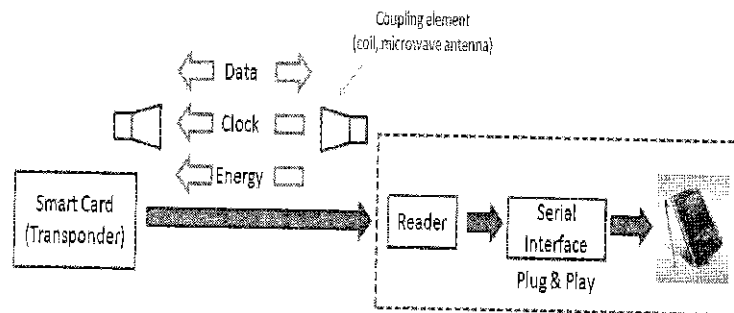


Fig. 1. Overview on Portable Examination Attendance System (PEAS).

The RFID tags or transponder located on the object to be identified which represents the actual data carrying devices of an RFID system, normally consists of a coupling element and an electronic microchip. RFID tags come in three general varieties passive, active, or semi-passive. Passive tags require no internal power source, thus being pure passive devices and activate when a reader is nearby to power them, whereas semi-passive and active tags require a power source usually a small battery. To communicate, tags respond to queries generating signals that must not create interference with the readers, as arriving signals can be very weak and must be told apart. Besides backscattering, load modulation techniques can be used to manipulate the reader's field. Typically, backscatter is used in the far field whereas load modulation applies in the near field within a few wavelengths from the reader. Remotely powered fully passive tags have to be operated in the near field region of the reader antenna and are used therefore only for short transmission distances (Carrez et.al., 1998).

The reader which is refers to data captured that is able to read data or is also capable of writing. A reader typically contains a radio frequency module (transmitter and receiver) a control unit and a coupling element to the transponder. To enable them to forward the data received to other system (PC or PDA), many readers are fitted with an additional interface such as RS 232, RS 485.

## RELATED WORK

Attendance records are necessary to determine and validate student eligibility during the class or examination day. Thus, many researches have been discovered on this area to improve and replace the traditional way using paper with the current RFID technology.

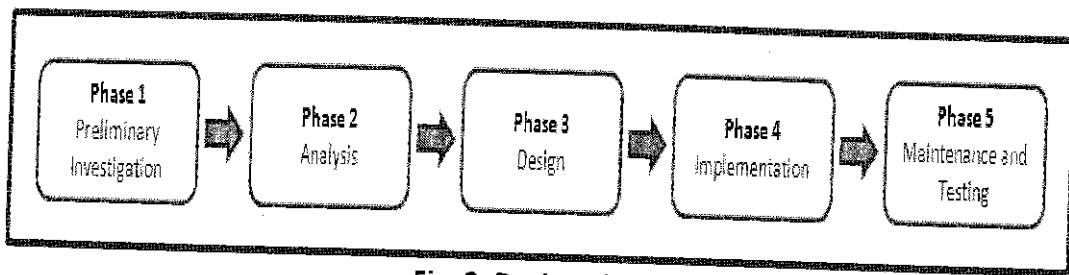
With the rapid advancement in RFID technology, most of systems today the ease on tracking of various objects simultaneously from a distance that made the RFID technology become so prevalent. Also, the fact that access control can be enforced caused numerous business establishments to implement this technology in one way or the other, either for supply chain management or to keep a track of the employees or student by embedding an RFID tag in their ID cards (Kim et. al., 2006). Through this, there are development on attendances tracking using finger print establishes by Zhang Yongqiang and Liu Ji (2006). The more advanced effort was done by Yeswanth kumar and Sakthi Ganesh (2005) by using Fingercodes Gabor filters to capture both local and global details in a fingerprint as a compact fixed length findexcode. The findexcode is stored in the smart card significantly improved the overall performance of the biometric verification system.

As the Malaysian becomes one of the world first user national ID card programs, MyKad reduce the public's burden of having to carry several different cards at the same time. Through this, Mustafa Man and Law Yoke Kyng developed a monitoring student attendance using Mykad Touch n Go features (TITO) (Man and Kyng, 2007). The system could be access by teachers, headmaster and parents via internet and intranet facilities. In order to manage the entire data on system, ISAMS Tracking Student Attendance using Interactive Student Attendance Management System proposed by Jonathan Sidi, Syahrul N. Junaini and Lau S. Ling has the ability to count students attendances easily and quickly (Sidi et. al., 2007).

Apart from that, there are also developments on Inferring Calendar Event Attendance that proposed by Mynatt and Tullio (2001) to assist in accurate determination of user whereabouts and availability by present Ambush. Similarly hospitals also keep trying to collect information and transfer it to the patient's record (Rodriguez et. al., 2003). As stated earlier, the RFID systems are a part of the AIDC technologies which also consists of other systems like the optical character recognition including barcodes and magnetic stripe. This relatively shows the ubiquity of the RFID devices. These devices are controlled by corresponding computer, PDA or even mobile devices infrastructure. In most cases a database exists to contain the individual details of the tags.

## METHODOLOGY

The section described about how the project should be designed based on a few requirements. In order to complete the design requirements, there are 5 main phase involved as shown in Fig. 2.



**Fig. 2. Design phase**

### **3.1 Phase 1: Preliminary Investigation**

For the first phase, the project requirement need to be determined based on the problem statements, objectives and scope that have been let earlier. The preliminary investigation phase determines the worthiness of the project and creates a plan to complete those projects deemed worthy of a detailed study and analysis. To accomplish the preliminary investigation phase involves on:

- i. List problems, opportunities and directives
- ii. Negotiate preliminary scope
- iii. Assess project worth
- iv. Plan the project

### **3.2 Phase 2: Analysis**

The problem analysis phase provides the designer with more thorough understanding of the problems that triggered the project. The goal of the problem analysis is to study and understand of the problem domain well enough to thoroughly analyze problems, opportunities and constraints. To complete the problem analysis phase involves on ;

- i. Study the problem domain
- ii. Thoroughly analyze problems and opportunities
- iii. Optionally
- iv. Establish system improvement objectives and constraints
- v. Update the project plan

The deliverables for the problem analysis phase are the system improvements objectives. The system therefore will be divided with 2 parts consists of combination between hardware and software as shown in Fig. 3.

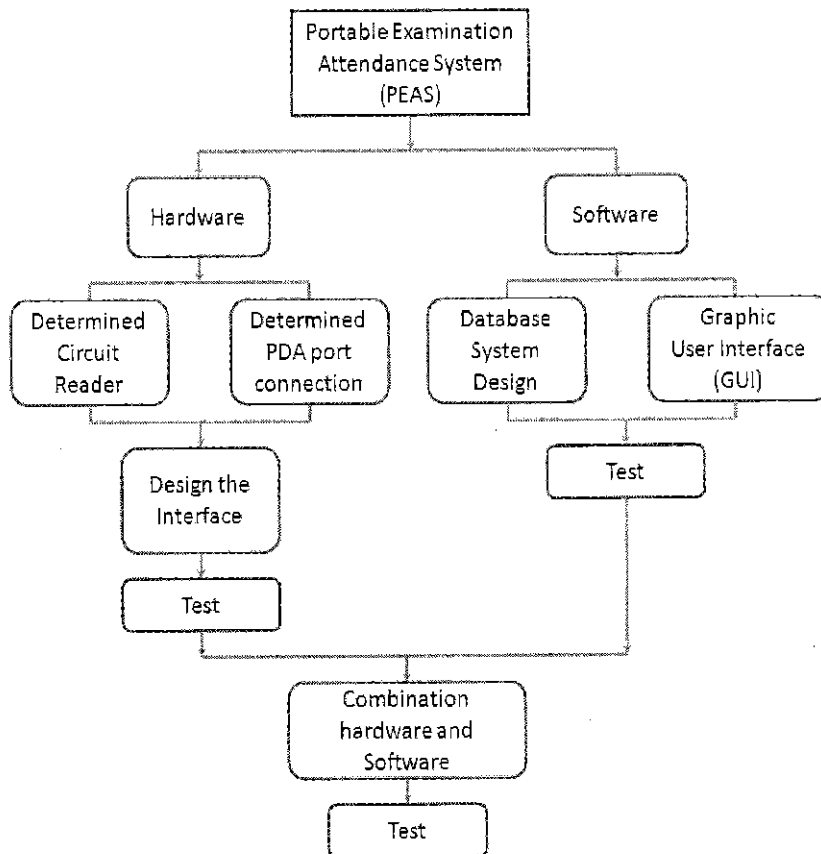


Fig. 3. Block diagram on project development

### 3.2.1 Hardware

#### 3.2.1.1 RFID Tags

RFID Tags are the basic building blocks of RFID system which is integrated circuit devices containing the RF circuitry and information to be transmitted via air interface when interrogated.

#### 3.2.1.2 RFID readers

Mobile RFID readers are user-friendly devices which are capable of being interrogators to transmit radio energy to tags and to listen to the tags' responses. Using produced energy in an electro-magnetic coupling, tags would be able to compute pre-defined processing logics and to response pre-defined data containing tag's identification code and add initial information. Mobile readers can be designed to read in the mode of either only a particular kind of tags or different kinds of tags at a single time. The tag and the reader must comply with the same standard in order to communicate.

#### 3.2.1.3 Personal Digital Assistant (PDA)

PDA that selected is the HP iPAQ hx2000 series Pocket PC. The PDA will act as the storage element and the application user. It will use charger port to communicate with the card reader directly without cable. In addition, the database system will be design to read and show the content of the reader at the screen.

### 3.2.1.4 PDA port serial connection

The most critical part in this project is to make a connection between the reader and the PDA port directly with each other. The PDA serial interface uses the special Himalaya connector which contains 22 pin male.

## 3.2.2 Personal Digital Assistant Software

### 3.2.2.1 Database Element

A software application designed to read from a contactless card (transponder) or write data to a contactless data carrier using the reader as an interface. The software is developed using Microsoft Access that is available in Microsoft Office 2007.

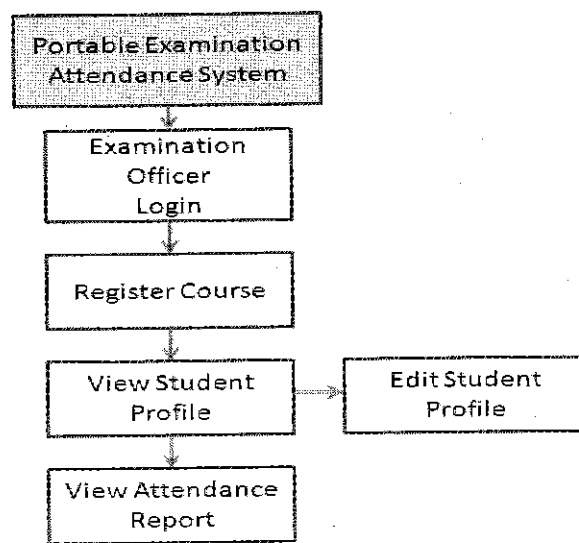


Fig. 4. System Module

### 3.2.2.2 Visual Basic and Graphic User Interface (GUI)

Visual Basic was designed to be easy to learn and use. The language not only allows programmers to create simple GUI applications, but can also develop complex applications as well. Programming in VB is a combination of visually arranging components or controls on a form, specifying attributes and actions of those components and writing additional lines of code for more functionality.

The GUI is the Graphic User Interface which may contains devices or components that enable a user to perform interactive tasks. The GUI components can be menus, toolbars, push buttons, radio buttons, list boxes, and slider just to name a few.

### 3.3 Phase 3: Design

The principle of the design phase is to transform the requirements statements from the requirements analysis phase into design specifications for construction. The design requires soliciting ideas and opinions from users, vendors, or other technical specialist. Also, design requires adherence to internal technical design standards that ensure completeness, usability, reliability, performance and quality. The flow diagrams are explained according to Fig. 5.

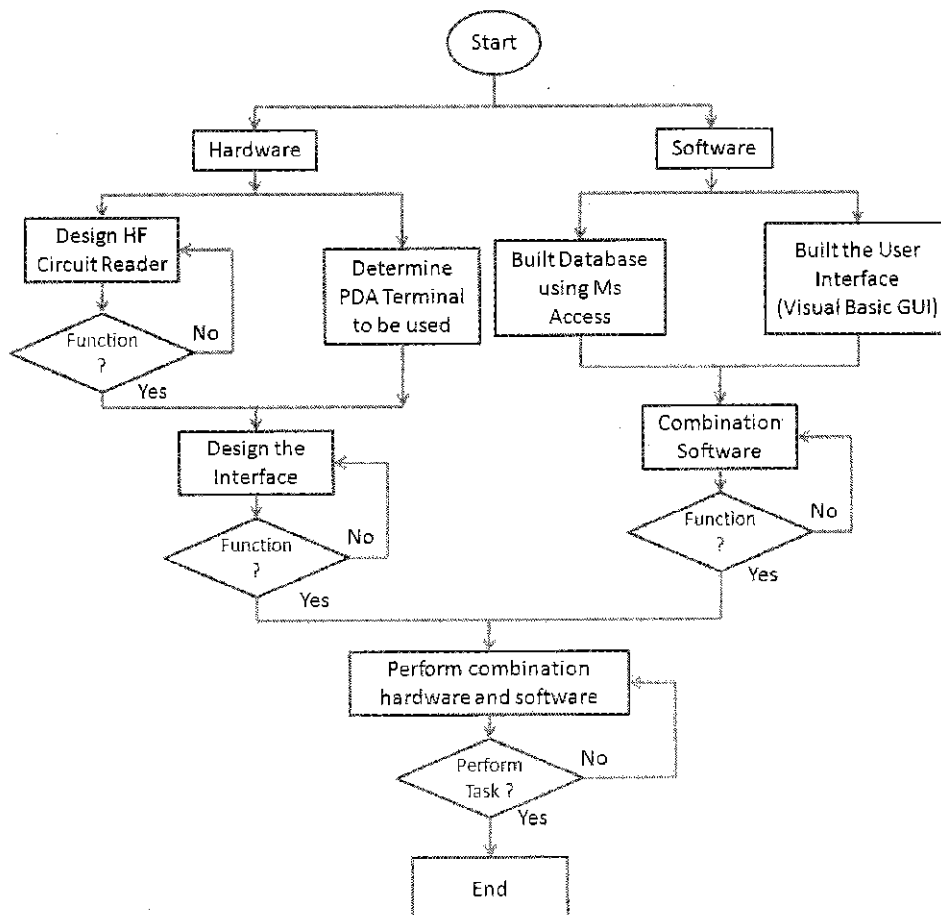


Fig. 5. Flow chart on system development

### 3.4 Phase 4: Implementation

Implementation phase delivers the production system into operation. Therefore, the functional system from the construction phase is the key input to the implementation phase. Analysts must also train users, write various manuals, load files and database, and perform final testing. Systems users provide continuous feedback as new problems and issues arise. To provide a smooth transition to the new system, a conversion plan should be prepared. This plan may call for an abrupt switch where the old system is terminated and replaced by the new system on a specific date. The deliverable of the implementation phase is the operational systems that enter the operation and support stage of the life cycle. Therefore, this part will be focused more on combining the hardware and software through the system. The implementation takes part after analysis and system design phase. Relationship between function is an important part that can make system more efficient.



### 3.5 Phase 5: Maintenance and testing

The last process involved on testing and check the availability of the overall system include the reader, architecture design, and the performance of the whole database system to response when required and fulfill the objective requirement.

#### EXPECTED RESULT

This project is predictable to minimize the risks of attendance lost during the examination day and improved the current system by handling the student information more efficiently and effective through the PDA. Student smart card ID will be able to communicate directly from reader circuit through the PDA port without any cable required. Thus, perform the status of attendance examination in PDA by utilize the data storage that will be design using the Microsoft Access. The Graphic User Interface (GUI) is obtained to perform the user friendly application between user and database system.

#### CONCLUSION

The real innovation in RFID is not in the technology itself, but in its application in real-world situations. Radio frequency identification devices may offers a flexible technology that is convenient, easy to use and well suited for tracking student attendance on the examination day with supported PDA as the portable storage devices. The system may be upgrade to communicate with the central database by using the internet facilities. This offer a great potential on tracking student attendance without having problem on limited memory usage in PDA.

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