

iNotified: An SMS and RFID-Based Notification System of Lipa City Colleges, Lipa City,  
Batangas, Philippines

**Mr. Philip Villamin Mojares**

*Lipa City Colleges, Lipa City, Batangas*

*No. 10 G.A. Solis St., Lipa City Colleges, Lipa City, Batangas, Philippines 4217*

phijuv@yahoo.com

**Abstract :**

In the advent of technology, communication becomes faster and easier in a tap of a fingertip. In an academic institution per se, communication between parents and school is very challenging and important one. It needs full effort to understand one another. One of the worries of the parents is that if their children are really attending or not in the school during their class period. This is one of the challenges that Lipa City Colleges is confronting, since at present, the school has no way of providing the immediate information to the parents if their children are in or out of the school premises in a particular time.

Hence, the researcher conducted this system development study which is considered a new technology which helped the school to solve the problem in monitoring the students' whereabouts. Specifically, it aimed to 1.) Design a system which will maximize the use of SMS module and RFID technology 2.) Develop a system which will guarantee the privacy and security of information saved in a database. 3.) Determine the benefits of using the SMS Module and RFID technology as a method of communication between the parents and the school 4.) Test and evaluate a system in terms of its performance, functionality, usability, reliability and extensibility.

This program was designed and developed using different programming languages and technologies such as Java (J2EE), Visual Basic 2010 (VB.Net), MySQL (DBMS), RFID and SMS Module. It also utilized descriptive research design which intends to present facts concerning the nature of status of a situation as it exists at the time of the study and to describe present conditions, events or systems based on the impressions or reactions of the respondents of the research. On the other hand, the Likert scale was used to test and evaluate the system in terms of its functionality, usability, reliability, extensibility and performance. The software process models used in this study were evolutionary prototyping and extreme programming (XP) since the phases of development were fast with focus on high software quality. After testing and evaluation, the system was found to be functional, usable, reliable, extensible and performed well.

**Keywords:** *communication, MD5, Notification system, Radio Frequency Identification (RFID), SMS module*

**INTRODUCTION**

Technologies emerged to introduce many different ways of advancement. Computers are of these examples that are now in existence that can do anything easily. Since communication technology has become an important part of modern society, it brings a security and assurance of information through the networks. As the world advances, technological development arises in the field of Information Technology. One of which is the computer application technologies which aid human for daily needs. Some applications tend to entertain, some reduces human effort, some reduces complexity and aid for decision making and some tend to automate manual system.

Automation becomes a part of the IT advancement; many developers create an application that automates manual system. Automating a manual system has many advantages. It speeds up the process of the system, it can perform more than one process at a time, and it also reduces the error. As humans tend to think then act, it consumes time. Tend to become tired, human rests and also tends to create errors, thus, inconsistencies will exist. Since that are a lot of advantages the computer automation has to offer, it has a huge influence the way people accomplishes task, it is used by different fields such as business, hospital, government, schools and the like.

The growing benefits of the technology are now on its full peak since more and more processes are being automated. With the increasing demand of automated system, establishments like school want to have its own system powered by the computer system. One system which plays an important role in the operation of the school is the so called attendance monitoring system which is designed basically to monitor the log-in and log-out of the students. Lipa City Colleges is one school in the Philippines which desires to fully automate its business transactions. Though, some of the processes of the said school are now automated such as students' record keeping, payroll, enrollment, grading and library management, the monitoring of the students are not yet developed. The school has no way of determining if the students are inside the school premises which is very important information on the side of the parents or guardians.

It is in the effect that the researcher has decided to design a system entitled *iNotified: An SMS and RFID-Based Parent Notification System of Lipa City Colleges, Lipa City, Batangas, Philippines*. This program evolves the needs of the parents of Lipa City Colleges in monitoring whether their children are in the school or not in specific time. It gives the parents to have information about the presence of their children in school. It tackles the time in and time out of every student as well as sending of SMS notification and generating the attendance report for the parents. Using RFID, a student requires to login in the system on a daily basis. The scanning of the ID is a must because it indicates students' data in the system. If the process is successful the student will be allowed to enter in the campus. Then the next process is sending SMS notification on students' guardian on what time their children come to school. If the student leaves the campus logging-out is required. In this case, there is also a text message sends to the parents in order to know if their children are really attending the class. Because logging out of every student is considered necessary it will also determine the time out of the student in the school.

## **LITERATURE REVIEW**

Short Message Service (SMS) is a text messaging service component of phone, web, or mobile communication systems, using standardized communications protocols that allow the exchange of short text messages between fixed line or mobile phone devices. SMS is the most widely used data application in the world, with 3.6 billion active users, or 78% of all mobile phone subscribers. The term "SMS" is used as an acronym for all types of short text messaging and the user activity itself in many parts of the world. SMS as used on modern handsets originated from radio telegraphy in radio memo pagers using standardized phone protocols. These were defined in 1985 as part of the Global System for Mobile Communications (GSM) series of standards as a means of sending messages of up to 160 characters to and from GSM mobile handsets. Though most SMS messages are mobile-to-mobile text messages, support for the service has expanded to include such other mobile technologies as ANSI CDMA networks and Digital AMPS, as well as satellite and landline networks.

Radio-frequency identification (RFID) is the wireless non-contact use of radio-frequency electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. Some tags require no battery and are powered and read at short ranges via magnetic fields (electromagnetic induction). Others use a local power source and emit radio waves (electromagnetic radiation at radio frequencies). The tag contains electronically stored information which may be read from up to several meters away. Unlike a bar code, the tag does not need to be within line of sight of the reader and may be embedded in the tracked object. RFID tags are used in many industries. An RFID tag attached to an automobile during production can be used to track its progress through the assembly line. Pharmaceuticals can be tracked through warehouses. Livestock and pets may have tags injected, allowing positive identification of the animal. Since RFID tags can be attached to clothing, possessions, or even implanted within people, the possibility of reading personally-linked information without consent has raised privacy concerns.

Aquilan (2004) made a comparable thesis on the automation of time attendance that records the time in and time out of every employee using key card system. It tends to eliminate the manual recording system of time and attendance and also includes salary computation of each employee based on the time and attendance reports. Faloran (2005) wrote in the article “The Computer Edge of the New Employment and Opportunities “in the Philippine Daily Inquirer. He stated that computer gives you a different feeling about what is happening in the company. Business will be highly competitive and innovative because the computer provides instant information.

According to Danao (2007), a computerized system that will facilitate faster and easier checking of student’s attendance during the implementation of departmental and/or institutional programs is now being utilized at the School of CSIT. The objectives in developing the system are the following: to make the checking of attendance easier and faster; to keep accurate records of students attendance; to eradicate or at least minimize complaints of students on erroneous data on attendance; and to inspire IT students to develop computerize systems that will make processes easier. The system is a two tiered client-server system developed in Visual Basic 6 with MySQL as its back-end. The system enables simultaneous work stations to function and perform the task of checking attendance. The system generates detailed and summarized reports of student’s attendance for a certain activity, list of activities during a semester or school year, percentage of attendance or participation for a certain activity; percentage of attendance or participation for all activities during a semester or for the whole school year and list of students officially enrolled in BSIT. The system can display details such as students name, gender, age, sex, course and year for access and validation. The system uses the ID number as its primary key used to input student’s attendance.

Far Eastern University (FEU) is one of the best educational institutions in the country located along the University Belt area, is a nonsectarian, private university in the Philippines. It was founded as a domestic educational institution in 1928 and incorporated in 1933, being the 6th oldest university in the Philippines and the 4th oldest private, non-sectarian university in the country based on its extant university charter. FEU also is the first to implement a University Wide Biometric Smart Card ID system aimed to enhance its security protocols. The FEU community is required to be fingerprinted and photographed for the generation of the FEU Biometric database that is integrated to gate computer terminals in which the Biometric ID is scanned prior to entry to the university. The study focuses on the different aspects in the University’s Gate Entry System which involve the Biometric Smart Card ID, Security

policies for students, employees, faculty members and visitors, dress code, fair treatment of the security guards. This research study is also in response to the Total Quality Management being implemented in the school.

According to Barredo (2011), time and attendance tracking are important for effective employee and organizational performance. Monitoring these important aspects through automation has made things better and simpler for managers. Rather than manually recording and updating time and attendance, automated tools enable managers to simply glance over a computer and know exactly when employees show up for work and how wisely they spend work hours. With the use of time and attendance tracking systems, organizations have been able to cut down costs on many different aspects. Through this system, the resources previously needed for the tracing, monitoring, and updating information on time and attendance are brought down. Since this system records to the exact last seconds, previous errors in recording have been stamped out. Clearly, the long-term benefits of time and attendance tracking system outweigh its cost. It is then prudent of organizations to do a one-time spending on this automated system.

Coutts (1998) suggests student attendance should be charted and monitored weekly, since high attendance rates are indicators of effective schools. The initial focus of this research study was to determine if there was a significant, positive relationship between student achievement in Ohio schools, as measured by the Ohio Proficiency Tests, and student attendance in grades 4,6,9, and 12. All data used for this study were taken directly from the ODE web site. The study is based on the most recent information available to the public (1999 data) for school building proficiency test and attendance averages.

According to Jain (2000), Biometrics is used in many places and there is a bright future for them. Coca Cola has recently replaced time card system with hand scanning machines. Finger print scanners are being used in many states of the US. They have been used to trace social welfare fraud. An iris pattern identification system is being used in cook company, Illinois to ensure that right people are released from jail. ATM machines have been installed with finger scanner to prevent theft and fraud in Indiana”

## **METHODOLOGY**

Building and designing software can be a long complicated process. The researcher employed three methods of research; the first one is the use of descriptive research design which aims to verify formulated hypothesis that refers to the present situation in order to elucidate it, the second is the application of the systems development life cycle (SDLC) specifically the prototyping and extreme programming and the last is the software testing techniques such as unit, integration, beta and system testing.

The random sampling technique was used and in order to gather data, evaluate and test the system; researcher used different data gathering instruments namely interview, survey and site observation.

## **RESEARCH RESULTS**

This section refers to the analysis of results of the distributed questionnaire to the thirty (30) respondents. The results of the study were computed using the weighted mean. The researcher reassured the respondents that their answers on each of set of questions on the questionnaire will be treated confidentially. In determining how the system achieved the software quality characteristics, the researcher adopted Hewlett-Packard methods namely, (1) functionality, (2) usability, (3) reliability, (4) performance and (5) supportability. It is wherein randomly chosen

respondents will be having their mere analysis on the questionnaires distributed as well as researcher’s interpretation on each of the data based on the 5-point Likert-scale questionnaire. The answers are rated accordingly as, (4.20-5.00)-Strongly Agree, (3.40-4.19)-Agree, (2.60-3.39)-Neither Agree nor Disagree, (1.80-2.59)-Disagree and (1.00-1.79)-Strongly Disagree.

TABLE 1. FUNCTIONALITY OF THE DEVELOPED SYSTEM

Functionality	Weighted Mean	Verbal Interpretation
1. The system works properly all controls used are responsive and expected outcomes are delivered.	4.63	SA
2. The system exhibits the actual attendance monitoring system properly.	4.23	SA
3. The flow of the system is logically organized.	4.33	SA
4. The system functions meet the expectations of users.	4.40	SA
5. The system produces the required reports.	4.10	SA
<b>Composite Weighted Mean</b>	4.34	SA

Table 1 shows the views the respondent regarding the functionality of the developed system. Most respondents answered strongly agree to all characteristics of the functionality of the system and the overall composite weighted mean is 4.34. Summarily, this indicates that the evaluated system works properly, exhibits the actual attendance monitoring system properly, system’s flow is logically organized, users’ expectations have been met and the required reports were produced.

TABLE 2. USABILITY OF THE DEVELOPED SYSTEM

Usability	Weighted Mean	Verbal Interpretation
1. The system contains a user-friendly interface.	4.57	SA
2. The system provides proper, understandable and complete documentation that will serve as reference to users.	4.33	SA
3. The system can attract the attention of the target end-users.	4.23	SA
4. The system is designed with a certain degree of consistency.	4.00	A

5. The system makes users easily navigate the candidate system which results to the latter's efficiency.	4.43	SA
<b>Composite Weighted Mean</b>	4.31	SA

Table 2 above shows the answers of the respondents regarding the Usability of the developed system. The table above indicates that most of the respondents Strongly Agree and Agree to all the attributes of the usability of the developed system. The computed average weighted mean is 4.31 which mean that the system contains a user-friendly interface, provides proper, understandable and complete documentation that will serve as reference to users, attracts attention the attention of the target users, designs with certain degree of consistency and the user can easily navigate it.

TABLE 3. RELIABILITY OF THE DEVELOPED SYSTEM

Reliability	Weighted Mean	Verbal Interpretation
1. The system lessens the processing time in which responds immediately to the users' need.	4.43	SA
2. The system processes well all inputted data that results to the first usefulness	4.27	SA
3. When users input the data, desirable output is expected.	4.23	SA
4. The system checks and validates first the data being entered before the next transaction happens	4.03	A
5. During the testing phase, bugs and errors are comprehensively exposed which makes the system be failure-free somehow	4.10	A
<b>Composite Weighted Mean</b>	4.21	SA

Table 3 above shows the answers of the respondents regarding the reliability of the developed system which has a composite mean of 4.21 or a Verbal Interpretation of Strongly Agree. Based on the computed composite mean, the developed system is said to be reliable.

TABLE 4. PERFORMANCE OF THE DEVELOPED SYSTEM

Table 4 shows that the developed system performed well with a composite mean of 4.33 and a verbal interpretation of Strongly Agree. Based on the results, the developed system manages the processing time effectively, responds immediately to every action performed by the end-user, transaction processing is being sped the up by the system, operates at the maximum level of accuracy and preciseness at all times and lessens the tasks done by the user.

<b>Performance</b>	<b>Weighted Mean</b>	<b>Verbal Interpretation</b>
1. The system manages time effectively	4.47	SA
2. The system responds immediately to every action performed by the end-user	4.37	SA
3. Transaction processing is being sped up by the system	4.27	SA
4. The system operates at the maximum level of accuracy and preciseness at all times	4.10	SA
5. The system lessens the tasks to be done by the user.	4.33	SA
<b>Composite Weighted Mean</b>	4.33	SA

TABLE 5. EXTENSIBILITY OF THE DEVELOPED SYSTEM

<b>Extensibility</b>	<b>Weighted Mean</b>	<b>Verbal Interpretation</b>
1. The system supports adaptability-it copes the needs of the end-users	4.00	A
2. The system maintains future expansion-the scalability	4.00	A
3. The system supports serviceability	4.10	A
4. It supports maintainability	4.13	A
5. The system is portable-it can run in any platform	4.23	SA
<b>Composite Weighted Mean</b>	4.09	A

Table 5 shows the views of the respondents regarding the extensibility of the developed system. Most respondents answered agree to all characteristics of the extensibility of the system and the overall composite weighted mean is 4.09. Summarily, this indicates that the evaluated system supports adaptability, maintains the future extension, supports serviceability, supports maintainability and is portable.

### ANALYSIS AND DISCUSSION

Taking a look with the generated composite weighted mean per table above, or attribute about software quality the developed system got an over-all weighted mean of 4.26 or a verbal interpretation of Strongly Agree. It simply means that the developed system complied with the Hewlett-Packard's method of developing quality software.

### LIMITATIONS

The developed system is a client-server system developed in Visual Basic.Net and Java with MySQL as its back-end. The system can send text message in any cellphone network. The system needs the following devices to fully operate such SMS module, RFID Reader and id. For the student, the first method is to scan the id then the system

will automatically send an SMS notification to the parents on that particular time. In terms of the security measure, each student has a unique ID encrypted using MD5 and secured contact number of the parents stored in the database.

The program has the limitation not to send any information to the parents if the user failed to sign in or sign out. The placement of the SMS device should be situated in area which is a hot spot because if there is no signal in the place where it is located the system will not be able to send SMS. The number of text messages will depend on the network's capability of sending and receiving SMS. The weak signal of networks in the place of receiver is not also covered by the study and also the success of the system requires accurate records of mobile phone numbers. One thing more is that this system is only for parents who have a mobile phone. Lastly, the system is for sending text message only. There is no transaction made if the receiver replies to the system.

Since the developed system has some limitations, the researcher recommends to the future researchers to re-design the system to be more flexible. If possible, the system must be improved in terms of the following aspects: 1.) The capability of the system to reply to the parents' queries, 2.) The system to be developed must have the ability to reset the SMS module if no network signal is detected, 3.) The future system must also fully functional in terms of the use of the RFID, meaning the system must be intelligent enough to identify the exact location of the holder of the ID.

## **CONCLUSION AND SUGGESTIONS**

After the system has been studied, designed, developed and tested. The following conclusions were drawn

- 1.) The designed system maximized the use of SMS module and RFID technology in which gave the researcher the opportunity to study in details on how SMS module and RFID technology work
- 2.) The developed system guaranteed the privacy and security of information saved in a database using the MD5 encrypted technique
- 3.) The researcher have determined the benefits of using the SMS Module and RFID technology as a method of communication between the parents and the school and found out that SMS and RFID if studied properly have a lot of applications
- 4.) The developed system was tested and evaluated and found to perform well, functional, usable, reliable and extensible which proved that the system developed was of great help to the need of the school in having a system capable of monitoring the students' whereabouts.

After having concluded the recommendations are as follows:

- 1.) The system must be implemented by Lipa City Colleges because this is another way for the school to embrace the power that the technology has to offer.
- 2.) The system must be used not only by the students but also by the employees for the HR to know their exact time in and time out in a day.
- 3.) The school must offer this technology to other business establishments as for the proper monitoring of all people entering and leaving their establishment.
- 4.) It is also recommended to future researchers to improve the system by adding other functionalities that make the system more attractive to the users.