LCC - EGS : A PROPOSED SOFTWARE DESIGN FOR LIPA CITY COLLEGES MOBILE GRADING SYSTEM SOFTWARE

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ABSTRACT

Portability allows a teacher to bring his or her mobile phone whenever he or she may go particularly into a classroom, which would guide him/her to efficiently manage a class. Today, mobile phones can be used to increase students' organization, hastening collaboration, and maximizing portability of technology.
In this study, an attempt has been made to develop an Android- Based Class Record System which will focus on achieving mobility in managing and monitoring student class record of student information, assessment results and attendances stored in android- based mobile phones.
With the use of mobile phones, recording, searching, viewing and updating of a student's pertinent academic information will be faster, handy, and just a click away with the proposed software design.

Keyword: *mobile grading system, software design, online class management*

1. Introduction

In the era of globalization, developments in information technology played an essential role in various sectors of human life, and mobile phones are the main actors in today's era. Recently, mobile phones have started to be used in education and research. As an example, Motiwalla (2007) [1] discussed a framework for "m-learning" (mobile phone-based learning), a subset of e-learning, as a way of enhancing traditional classroom-based teaching. The widespread use of mobile phones in the field of education and classroom management becomes a great help to a teacher in particular and to the academic institution in general.

The case study conducted by I-Han Hsiao (2020)[2], the teacher, is one of the major sources of information, makes sure that the pieces of information they impart and handle are systematic and organized. They have to record attendance strictly and monitor the academic performances of their students. Thus, proper classroom management is, therefore, very vital. Not being able to do so will significantly affect the effectiveness and efficiency of a teacher, which would somehow impact the student's development.

Some faculty members claimed that the maintenance and management of student academic information, such as attendance and assessment results, is a tiring process. Traditionally, the attendance and grade entry of all the students are first recorded manually in a class record, and then again manually entered in a desktop application for computation and then write the computed grades again back to the class record. Such work as to record each student's assignment, quizzes, attendance, examinations, oral recitations, projects or reports, adds a heavy workload to a teacher. Many of them feel that the time they take in recording and computing for their students' grades is a time that could be better spent elsewhere, like in preparing for lessons, researching, or meeting with their students. The manual method employed by the teachers is recording, updating, and retrieving students' academic information, resulting in frequent errors in data manipulation, data entry, and sometimes a total loss of it.

Mobile computing is a versatile and potentially strategic technology that improves information quality and accessibility, increases operational efficiency, and enhances management effectiveness. This is because of its capability to enable users to remain connected while on the move. High end-users can opt for satellite-based networking, which provides wireless connectivity anywhere in the world.

According to Motiwalla(2007) [1], in today's fast-paced and technology-driven community, quality student's performance recording and monitoring with essential systems being used is a necessity. Lipa City Colleges,

Philippines already has an existing paper-based student class record in which teachers can only record students' final grades through LCC online grading system that can be accessed only on a specified period.

With this, the researchers looked into the workability of developing a mobile web-based grading system that would give students easy and speedy access through internet technology and the use of mobile phones to a range of handy and essential information about their school performance.

2 METHODS AND MATERIALS

The study has chosen the Rapid Application Development (RAD) methodology for this study. The proponent utilized the Rapid Application Development approach to ensure the proponent that the system is the users' need. Rapid Application Development (RAD) is a development lifecycle designed to give much faster development and higher-quality results than those achieved with the traditional lifecycle. It is designed to take the maximum advantage of powerful development software. This methodology is composed of four phases: requirements planning, system design, construction, and cutover (Rosenblatt, H. & Shelly, G., 2012) [3]. It helps the users to be involved, from planning to the development of the information system. It speeds up the development process as the users help in providing feedback and comments regarding the system being developed to know if the requirements of the users are considered.

The study will be conducted in Lipa City Colleges, which includes one academic and two service departments. The study participants are 5 CCS faculty and the dean of the college of computer studies, 3 staff of MIS department, and 2 staff of Registrar's Office. The researchers used purposive sampling to determine the participants of the study. These participants can already simulate the whole operation of the grading systems, which involves going from enrollment to academic operations to releasing grades.

This study collected information about the development of an effective and quality mobile-based grading system software for Lipa City Colleges. After the approval of the director for the research and development office, the researchers personally undertook the distribution of the evaluation sheets based on ISO IEC 9126. The data gathered were tallied, tabulated, and evaluated.

The proposed Android-based Class Record System will be installed in the faculty member's mobile phone. It will be used to take attendance, record grade entry, and update students' academic information even in an offline mode, which is also when there is no network connectivity. The application fetches the details of the subjects allotted to the respective faculty and the list of students enrolled in a subject using a Local Area Network (LAN) connection from the server. Once the information has been fetched, the application stores it in the mobile phone's internal database, the faculty member can now record, view, and update student's attendance and grade entries wherever and whenever required.

The submission of grades to the registrar's office will still be using the current policy, which is the office will set the timeline schedule for submission of grades.

Grade submission will tap the submit grades button to submit the grades sheet to registrar's office server automatically. For late submission, the teacher will need to report to registrar's office to encode their grade sheet manually.

3. RESULTS AND DISCUSSION
A.1 System Architecture
Android-Based Class Record System, as shown in Figure 1, was designed based on a three-tier architecture. Three-tier architecture is known as client-server architecture, where the client is the consumer or requester of services, whereas the server-side is the provider of services. The third layer, which is the middle layer, converts the user request into an understandable server form.
This chapter contains the presentation of the Mobile Grading System's proposed software design for Lipa City Colleges, as well as the presentation and software evaluation of the software and interpretation of data of the distributed program testing evaluation sheets.

Figure- 1System Architecture of Android-based Class Record System

The figure above shows the client-side of the system, which composes of an android application written in Java programming language and will serve as its front end. The middle layer, which connects the client-side to the server-side, is a web service developed in Visual C# language and will be used in fetching the necessary data from the server. The server side is the university's computerized system and its database server. Data communication between the client to the web service and the web service to the server will be established with the presence and connectivity of a local area network.

A.2　Functional Modules
A.2.1 Create New Module
The function "take new attendance" allows the faculty to get and record the attendance of the students in a particular day. Upon opening the application, the faculty can select the class list option, which brings up the list of subjects handled by the faculty. As the faculty selects a certain subject, the system displays the number of enrolled students in that subject. To mark a student as a present, the faculty selects the name of the student resulting in a change in its font color. "New grade entry" function, on the other hand, enables the user to record earned scores of the student in a particular activity. However, the system does not allow raw scores; therefore, it should be in its percentage equivalent. After opening the application, the faculty selects a subject in which a particular activity was performed and selects "new grade entry" option to initialize the function. The system will require the faculty to input the name of the activity and the score earned by a student. "New grade group" function is used to create student performance evaluation criteria. This function is a prerequisite action of the function "compute final grade". The "take picture" function resolves the difficulty of memorizing students' faces due to the enormous number of students in a class. These student pictures are stored in a file folder created by Android Developers Tool.

The "update" function involves processes that bring new data and information on the system. These processes include addition, modification, and deletion of existing data to make the system current or up to date. In this study, data that may need to be updated are the student attendance, grade entries, and grade group.

A.2.3 View/ Search Module
This module shows the data and information that can be accessed, viewed, and searched by the faculty user. These data are the subjects handled by the faculty, the students who are officially enrolled in those subjects, the attendance and grade entries earned by these students, the student evaluation criteria and its percentage, and lastly, the school calendar currently stored in the mobile phone.

A.2.4 Utilities Module
This module contains sub-functions which allow the faculty members and the proposed application to access the database server. Does it include the download? Fetching necessary data such as subject and student lists and checking new school calendar year; upload actual submission of final student grades to the database server with the use of mobile phone; and lastly, restores backed-up class record.
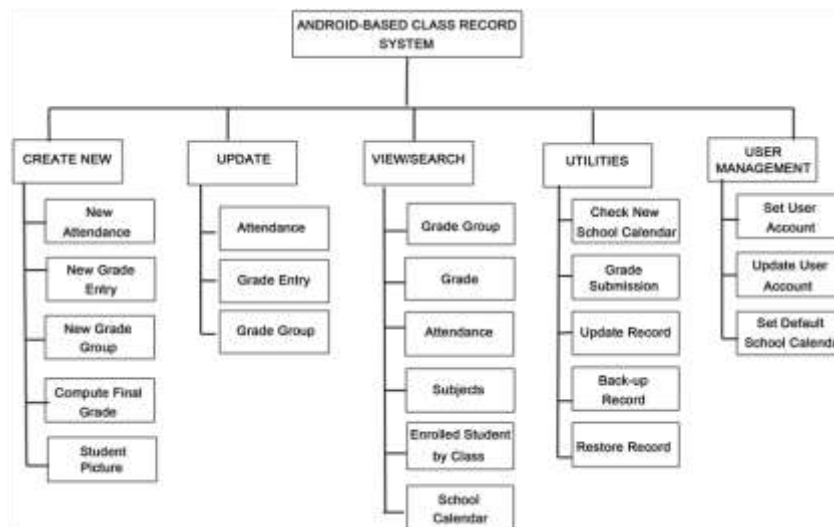
Figure- 2 Functional Decomposition Diagram of Android-Based Class Record System

A.2.5 User Management Module

Setting up a member account after installation is required to validate if the user is a legitimate faculty of the university. The system checks if the inputted account matches an existing valid account in the school's databases. Moreover, if there is a necessary change in the accounts, the system allows its resetting and updating. Every semester of each school year, a faculty member usually handles new subjects; thus, to facilitate the download of new class lists, an update record function is provided. But first, a user checks if a new school calendar is available. A new school calendar means a new set of subjects for that current semester and school year. The user selects a default school calendar before hitting the update record function.

1. Development of LCC Mobile Grading System

The development and implementation of the Android-Based Class Record System require technical resources and requirements such as hardware and software resources. Hardware requirement refers to computer and device specifications used both in system design and system implementation. These requirements are necessary to provide enough processing power for the system effectively. The following are tables that show the hardware and software resource specifications for the system.

B.1 Hardware Specification

Table 1 shows the hardware requirements for smartphones to be used in the implementation phase. The faculty/teacher is encouraged to use a quad-core mobile phone with 2 gigabytes of RAM and 4 gigabytes storage capacity to ensure the best performance from the system. It is also recommended that the device have at least 5 inches of LCD and a camera to take student pictures.

Table 1: Deployment (mobile device) Hardware Specifications for Android-Based Class Record system

HARDWARE	RECOMMENDED
Processor	Quad Core ARM Cortex-A53
Random Access Memory (RAM)	2 GB
Storage	At least 4 GB available space
Wireless Local Area Network (WLAN)/Data	Any compatible WLAN/Data Connectivity
Display	5' Super Liquid Crystal Display (LCD)

Table 2 presents the required specifications of the computer device to be used in system development and coding.

Table 2: Development Phase Hardware Specifications for Android-Based Class Record System

HARDWARE	RECOMMENDED
Processor	Intel i3-4790 @ 3.60 GHz
RAM	16 Gigabytes (GB)
Hard Disk	400 Gigabytes (GB)
LAN Card	100 Mbps Ethernet
Mouse	QWERTY mouse
Keyboard	Ergonomic keyboard
Monitor	1280 00 screen resolution

Table 2 shows the hardware requirements used in the actual coding and development of the Android-Based Class Record System. A computer with these requirements is where the application will be built, designed, and hardcoded. The device should have 400-gigabyte disk space for the Android Software Development Kit (SDK) emulator and Java Development Kit. This requirement guarantees a faster and more reliable system development and data processing.

B.2 Software Specifications

Software requirement refers to programming and application languages used as a platform and tool of the Android-Based Class Record System. Following is the software and tools to be used in the development and implementation stage.

Table 3
Mobile Device Software Specifications for Android-Based Class Record System

SOFTWARE	RECOMMENDED
Operating System	Android OS v4.4 (Kitkat) or higher
Database Software	SQLite

As shown in Table 3, the mobile device used in the implementation and deployment is a "Kitkat" version of an Android mobile operating system. Since Android apps require enough processing power, mobile devices below recommended specifications may still use the application but may encounter some hang-ups or lags. Moreover, all the data and information fetched from the server will be stored in the mobile internal database using its pre-installed SQLite.

Table 4
Development Phase Software Specification for Android-Based Class Record System

SOFTWARE	RECOMMENDED
Operating System	Windows 10 64-bit
Programming Language	Visual C#, Java and XML
Development Toolkit Software	Java Development Kit (JDK), Android SDK with Android Debug Bridge (ADB) plug-in, Android Studio Integrated Development Environment (IDE)

The table above (table 4) shows the list of software requirements throughout the development of the Android-Based Class Record System. Visual C# is used in creating a web service because of its flexibility, ease in user interface development, and the ability to access databases from applications. A web service is a program or method to fetch and download the required data from the school's database server.
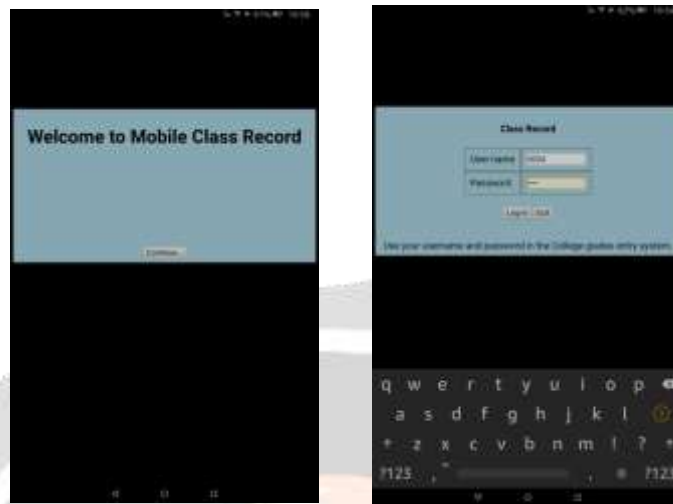
Figure- 3 Welcome/ Login Screen

Figure 3 shows the welcome screen that will be displayed when the application is activated. The faculty/teacher clicks the "Continue" button to display the validation interface of the system. It is a user's log-in screen that enables the application to connect to the LCC's database server. Concurrently, this also validates if a user is a legitimate faculty member of the said school. Hitting the "Login" button stores the data in the internal database of the mobile phone, which will be used later on to check the new school calendar and updates of the record.

List of Handled Subjects   **Student List**   **Grade Entry**
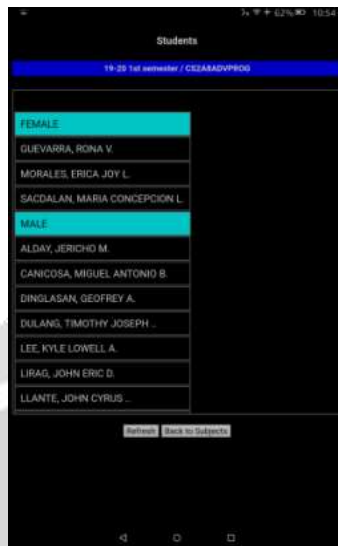
Raw Score

Figure- 4 Semester and Subject Lists

A.   Evaluation of Mobile Class Record

Table 5.0 shows that the software testers have a "Very Satisfactory" level of functionality, as indicated in the overall average mean of 3.46. It is an indication that all software features and processes are all functioning well based on its purpose.

Table 5: System Quality Attributes in Terms of Functionality

I. Functionality	4	3	2	1	W	R	VI
1. The application exhibits the actual archiving process.	7	3	0	0	3.70	1	VS
2. The application works properly – all controls used are responsive and expected outcomes are delivered.	6	4	0	0	3.60	2	VS
3. The application functions as intended – the expectations of the users are met.	5	2	3	0	3.20	5	S
4. The application is easy to operate.	3	7	0	0	3.30	4	VS
5. The application produces the needed reports.	5	5	0	0	3.50	3	VS
Overall Average		3.46					VS

Legend: WM – Weighted Mean,   R- Rank,   VI - Verbal Interpretation

The tests' results indicate that the application exhibits the actual storing of grades based on the class list downloaded from the server (3.70), and it is at a very satisfactory level. All part of the program and its sub-program works properly that all controls, buttons, and menus that was used in the software are all responsive (3.60). All its

expected outcomes and reports were delivered during the testing period (3.50). They agreed that it was easy to operate (3.30); however, some of their expectations in terms of additional functionality (3.20) when invoked, should also be available. It means that aside from the basic functionality of each item of the program, it should have a ready and available additional functionality based on different kind of input devices should be expected.

Table 6: System Quality Attributes in terms of Usability

II. Usability	4	3	2	1	WM	R	VI
The system software can attract the attention of the target end users.	1	5	4	0	**2.70**	2	S
The system software has a user-friendly interface.	2	2	3	0	**2.0**	5	DS
The system software is easy to use.	1	5	4	0	**2.70**	3	S
The system software provides proper, understandable complete documentation that will serve as a reference.	2	2	6	0	**2.60**	4	S
The application is designed with a certain degree of consistency.	3	2	5	0	**2.80**	1	S
Overall Average					2.80		S

Legend: WM – Weighted Mean,   R- Rank,   VI - Verbal Interpretation

The tests' results indicate that the application was designed with a certain degree of consistency (3.70), and it is at a satisfactory level. Due to the limited time of development, the researchers were unable to include some of the software documentation (2.60) as well as available help and tutorial features of the software. Although the software has the ability to attract users (2.70), it was also designed to be easy to use (2.70); it still needs to be designed visually that any user can adapt to the proposed software (2.0). It means that aside from the basic functionality of each program's visual interface, it should have a proper label, instructions, and documentation and help available.

In developing software application especially for those users that are not technically inclined with computers or some are senior citizens with less experience in using software applications, it is a must that proper designing such are availability of labels, instructions, user manual and other documentation are very important. Sometimes it becomes the factor of the success and failure of a software project.

Table 7: System Quality Attributes in terms of Reliability

III. Reliability	4	3	2	1	WM	R	VI
The systems software checks the data being entered before the next process occurs.	5	5	0	0	**3.50**	2	VS
The systems software lessens the processing time thereby it responds immediately to the user's need.	2	7	1	0	**2.90**	5	S
The systems software produces accurate result – all inputted entries are well-processed which result to the usefulness of the system.	4	5	0	0	**3.10**	4	S
The application is failure-free and errors are thoroughly uncovered during the testing phase.	7	2	1	0	**3.60**	1	VS
When users input data, desirable output is expected.	5	4	1	0	**3.40**	3	VS
Overall Average					3.30		VS

Legend: WM – Weighted Mean,   R- Rank,   VI - Verbal Interpretation

The tests' results indicate that the application was failure-free, and errors are thoroughly uncovered during the testing phase (3.60). Through the entire process of creating a subject topic outline to the generation of a complete examination sheet, the systems software checks the data being entered before the next process occurs and consistency (3.50). However, one tester noticed that the user account that he created doesn't match with the load that he previously creates, but on the second try, an accurate result was given by the software (3.10) that's why he gave a low score on this category.

Table 8: System Quality Attributes in terms of Performance

Performance	4	3	2	1	WM	R	VI
The systems software responds immediately to every action performed by the end-user.	4	4	2	0	**3.20**	**5**	**VS**
The systems software manages time effectively – it executes fast.	5	5	0	0	**3.50**	**1.5**	**VS**
The systems software results in the reduction of work – it lessens the tasks of the end user.	4	5	1	0	**3.30**	**4**	**VS**
The systems software speeds up record processing.	5	5	0	0	**3.50**	**1.5**	**VS**
The systems software at all times operates at the maximum level of accuracy.	7	2	0	0	**3.40**	**3**	**VS**
Overall Average					**3.80**		**VS**

Legend: WM – Weighted Mean,   R- Rank,   VI - Verbal Interpretation

The tests' results indicate that the application manages the time of processing data manipulation, and the generation of reports was fast and with quality (3.50). It speeds up the record processing (3.50), and all expected outcomes were met as well as with the maximum level of accuracy (3.40). In the generation of exams as well as a table of specifications, it was fast, hassle-free, and it gives a lot of satisfaction to the program testers as well as its intended users (3.0), and this is the major objective of this research that met.

Table 9: System Quality Attributes in terms of Supportability

V. Scalability	4	3	2	1	WM	R	VI
The systems software supports scalability – it can support future expansion.	3	5	2	0	**3.10**	**5**	**S**
The systems software supports adaptability – it copes the needs of the end users.	5	3	2	0	**3.30**	**2**	**VS**
The systems software supports serviceability – it can support updating of subject outline.	5	5	0	0	**3.50**	**1**	**VS**
The systems software supports portability – it can run in any platform.	1	9	0	0	**3.10**	**4**	**S**
The systems software supports maintainability.	4	5	1	0	**3.30**	**3**	**VS**
Overall Average					**3.26**		**VS**

Legend: WM – Weighted Mean,   R- Rank,   VI - Verbal Interpretation

The tests' results indicate that the application can support serviceability that can be updated any time without restarting the server and the whole system itself (3.50). Since it follows a distributed systems approach on systems deployment, it is easy to service and implement the entire system. It means that it is easy to maintain (3.30) and can be adopted easily on specific operating system platforms. It can run from the lowest version of the Android up to the latest version of the same product. The system does not need additional software that would add cost to the deployment (3.30). However, the system doesn't support other IOS based operating systems (3.10). It is merely dependent on Google products that the software testers found it frustrating. New and modern software should be developed across all platforms. That it may affect future scalability and expansion (3.10).

4. CONCLUSIONS

The researchers discussed the current problems encountered in traditional approaches to class record management. Further, they offered a solution With the Mobile Class Record System, mobility in recording student attendance, assessment results, and grade computation was attained. The system simplified the process of taking student attendance and handling their academic records. It further caters to the faculty's need for an efficient tool in managing class records, thus providing an accurate source of student academic information. The system adopted all of the usual processes and activities in maintaining a class record from the input of data to the output of information. The level of Usability in the evaluation of the software prototype that was presented to the target user is not that significant. Without the assistance of the software programmer to the target user, the use of the software output cannot be maximized.

Thus, to address the Usability issue, it is imperative for the Human Resource department to require a training session for all the possible users of the software and to form a technical support team that will assist the users during their

learning curve.

The Mobile Class Record System may be considered as an alternative system for users who do not have a mobile phone as recommended, but one thing is for sure. This application will be a productive tool if used in a classroom setting.

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