Mobile-Based Student e-Handbook

Samson M. Lausa (PhD), Rolan O. Algara (MIT)
Northern Negros State College of Science and Technology, Sagay City, Negros Occidental, Philippines
migsam041205@yahoo.com.ph, algararolan@gmail.com

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Abstract – *This project is a mobile-based application as an alternative for the print version. The development of this application is due to the need of the college to intensify information dissemination ensuring understanding of the College's policies, rules and regulations thereby improve delivery of quality services. The respondents of the study were the faculty and students of the College of Information and Communication Technology and Engineering. The application can be installed on any android devices designed on an interface responsive to the users' preferred screen resolution. The main objective of the study is to develop an android-based student handbook application that runs on android devices in an offline setting. Specifically, the project aimed to evaluate the android-based student handbook application in terms of functionality, reliability, usability, efficiency, maintainability and portability using the International Organizations for Standardization/International Electro-technical Commission (ISO/IEC 25010, 2011). JQuery Mobile, Phonegap Build/Apache Cordova were utilized as a hybrid development method in developing the mobile application. The mobile-based student e-handbook application has also quiz and mini-dictionary feature that makes it more interactive to use. The application was rated very good during the user acceptance and expert testing noting that it meets the software quality standards that determines the system's conformance to the software quality measures. The future researchers may add some functionality to the system like dynamically modifying the contents of the handbook for future changes and integrating it to other applications such as student information system*

Keywords: *e-handbook, student handbook, mobile application*

INTRODUCTION

The student handbook is a book that gives useful information about the college. It covers the grading system, rules and regulations, enrolment requirements and other facts relevant to the institution. The distribution of the student handbook is done to every new hired faculty and enrolled students to keep them aware and understand policies, rules and regulations pertaining to the operation of the College. However, the usual problem with the current method is that they usually forget to bring the handbook; some lost it and noted that the hard copy handbook is somewhat boring and not interactive. Likewise, handbook is reprinted every time that there are changes or updates to the contents, with trees being cut down to produce paper and contributing to our problem in climate change.

Today's society characterized as the electronic era where almost everything is in digital format is the right time to address this concern. The rise of mobile application will not just answer the problems encountered in the current setting but will help the environment as well.

The development of technology applications that previously runs only in desktop computing can now be applied in mobile through applications compatible in mobile devices such as laptop, digital tablet with Wi-Fi capabilities or even the use of smart phones that can connect to the internet [1].

With the aforementioned reasons, the developers conducted a study on the development of mobile-based student handbook that can be installed on android devices making it possible for the students and the faculty of an educational institution to browse and read whenever possible. The e-handbook is user friendly with its plain and simple graphical user interface.

The Office of Student Affairs (OSA) of AdNU has developed a mobile application that help students to know important information, like options for boarding houses and dormitories which are near the campus and conducive to their studies, or the list and profile of recognized organizations that fit their talents or interests. Through this innovation, OSA hopes to increase the students' awareness of the office's programs and services, and to be more connected with them, wherever they may be.

Certain APP features for the Office of Student Affairs include the procedures and requirements of OSA's services and programs, like how to request for a Certificate of Good Moral Character, how to replace a dilapidated or lost ID, what to do if something gets lost on campus, or how to avail of blood through the Dugong Atenista program[2].

Others have implemented a Student Mobile Handbook. Envergan's through the use of Information Technology with their Handbook by using smartphones and/or tablets. This implementation helps every student to improve the use of their Handbook from manual to Mobile Handbook using their smartphones and/or tablets. All the features of the traditional Student handbook were featured to this implementation in order to improve the use of the Student handbook. Each and every student, faculty and also the parents/guardians can use this Student Mobile Handbook. This also includes interactive map of the University Campus that the student cannot find in the traditional student handbook [3].

The related works, studies and system confirmed the researchers' perspective on the significance and success of Mobile Based Student e-Handbook for an academic institution.

OBJECTIVES OF THE STUDY

The study aimed to design and develop a mobile-based student e-handbook application.

Specifically, the study pursued to design and develop an android-based student handbook that is responsive and adaptive to the screen resolution of the mobile device and runs in an offline setting and evaluate the application based on International Organizations for Standardization/International Electro-technical Commission (ISO/IEC 25010, 2011) in terms of functionality, reliability, usability, efficiency, maintainability and portability[4].

MATERIALS AND METHODS

This study used the Iterative Waterfall Model as the Software Development Life Cycle and as well as Descriptive Research method.

Data Gathering

The researchers gathered essential data in developing the system in this phase. Interview was conducted with the clients regarding the current status and the problems that they encountered with the current procedure. The proponents had also recognized the goals and objectives in developing the system by conducting an actual interview with some of the office personnel in Student Affairs Services office. The initial data gathered was used in designing the application.

System Design

At this phase, the researchers recognized the features and designs to be used in the development of the mobile-based student handbook suitable to the objectives of the study.

The user interface and the basic flow of the system were designed in this phase. The client's requirements are the bases of the proponents in designing the system.

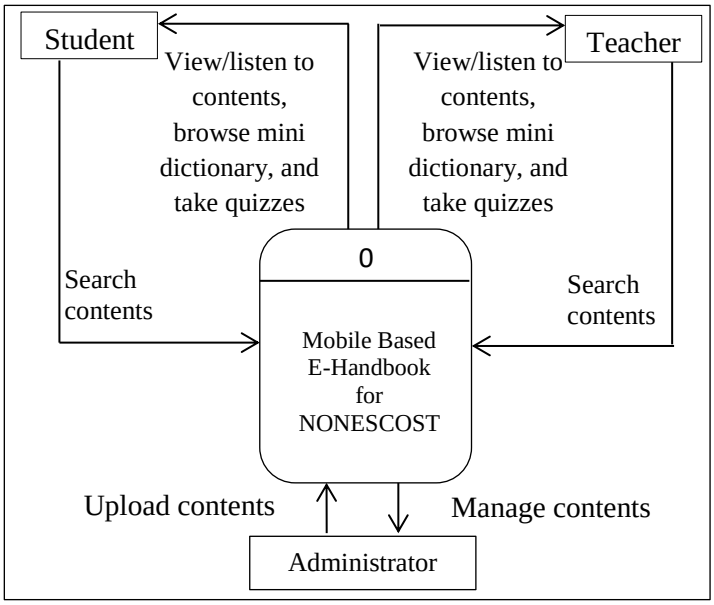

Figure 2.0 Context Data Flow Diagram of the Mobile Based Student e-Handbook for NONESCOST

Figure 2.0 illustrates the diagram of the processes and the flow of data among them. The student and the faculty members search for the contents they wanted to read and the app returns the result for the users to view. The administrator manages and updates the contents of the app and upload it back to the server.

Coding

The design specifications were converted into line of codes at this stage. The researchers evaluated the system design and the information gathered during the data gathering stage. With these information, the researchers made sure that the application met all the criteria as stated in the objectives of the study. The application was developed through HTML (Hypertext Markup Language), CSS (Cascading Style Sheet), and JavaScript that is converted to Android Application using Apache Cordova.

System Testing

In this phase, the application was installed and tested to android phones to ensure that it provides accurate and efficient output. Debugging was done for errors found in using the system during the testing activities.

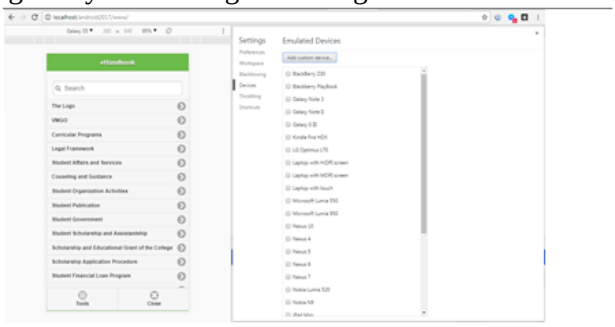

Figure 3.0 Inspect Element Tool of web browser

Figure 3.0 illustrates the Inspect Element Tool of the web browser.

Before compiling into an android package kit (apk), the researchers used the Inspect Element tool of the browser to test the JavaScript components of the project and to preview the interface of the app to different mobile phones.

Three IT Experts tested the application; they measure whether the system meets the user requirements and the functionalities utilizing the system's criteria based on McCall's Software Quality Model [6]. The application was also evaluated by the respondents of the study based on their experience in using the mobile application utilizing a standardized questionnaire the ISO/IEC 9126-1:25010 Software Quality Model where the app was evaluated in terms of functionality, reliability, usability, efficiency, maintainability, and portability.

Maintenance

In this phase, monitoring of the application was conducted to make sure it runs on latest version of Android OS and to make improvements, changes and add other functionalities to the project.

The app is downloadable from the Phonegap Build website where the researchers had setup a public download area. Likewise, it is transferrable from one device to another device without internet connection using a file transfer application such as Shareit.

Respondents of the Study

The respondents of the study are the Faculty and the students of the College of ICT and Engineering who evaluated the Mobile-Based Student Handbook as the expected end-users of the system. The selection of the respondents was on the bases that they are the common technology users that understand easily the flow of the IT system and can relate to and answer the survey questionnaire. Their opinions, inputs, and insights to enhance the features and functions of the application were also sought during interviews and focus group discussions. Table 1.0 showed the summary of the respondents.

Table 1.0 Summary of Respondents

Categories	Population	Sample
IT Faculty	15	15
1st year	57	24
2nd year	93	39
3rd year	223	94
4th year	176	74
Total	**564**	**246**

Sampling Procedure/Technique

The respondents of the study are divided into two categories, the faculty members and the students of CICTE. Slovin's formula was used to determine the sample size while stratified random sampling and total population were used to determine the sample per students' stratum and for the faculty members, respectively.

Research Instrument

The survey instrument used in evaluating the Mobile-Based Student Handbook is a standardized questionnaire. This software evaluation instrument is criteria-based assessment questionnaire that measures quantitatively the software in terms of operability, sustainability and maintainability in a number of areas derived from International Organizations for Standardization/International Electro-technical Commission (ISO/IEC 25010, 2011). The questionnaire uses a five-point scale where 5 as the highest and 1 as the lowest.

Table 2.0 Five-point Likert Scale

Mean Score	Verbal Interpretation
4.21 – 5.00	Very Good
3.41 – 4.20	Good
2.61 – 3.40	Average
1.81 – 2.60	Poor
1.00 – 1.80	Very Poor

Data Gathering Procedures

A request letter was sent to the Student Affairs Services Office to allow the researchers to conduct the study. The researchers conducted an interview with some

of the personnel in the Student Affairs Services office to gather important details about the study.

The researchers also conducted field desk data gathering from other researches, studies and related literature. The research comprises of mobile app development designs and best practices on mobile application. The related literature includes the findings, existing systems created, and articles by other schools and apps. This study provides the researchers information and support for developing the mobile application.

The researchers encoded the contents of the handbook then transferred or converted the documents in the form of HTML in order for the researchers to convert that into a mobile application. The compiled project is in a form of apk or android package kit which can be installed on android devices, the package was then uploaded to the sub-domain of the NONESCOST website (http://ehandbook.nonescost.edu.ph/). The researchers then created a link that will redirect to the download page of the application, through that the respondents downloaded, installed and tested the app on their android devices. The respondents of the study tested the components of the application from the contents, audio, dictionary and quiz feature.

The application was tested from several types of android devices with different screen resolutions and android OS versions.

The second part of data gathering was the distribution of questionnaires to the respective respondents personally distributed and administered by the researchers. Instructions were stated in the questionnaire for the respondents to completely and thoroughly answer each item. The researchers opted to wait until the respondents finished answering the questionnaire. Finally, the accomplished questionnaires were collected and the data were tabulated, treated, analyzed and interpreted.

Data Analysis Procedure

To determine and evaluate the mobile-based student handbook in terms of functionality, reliability, usability, efficiency, maintainability, portability, the researchers used the mean. The researchers used a spreadsheet program to encode the evaluation rating and to compute for the mean.

RESULTS AND DISCUSSION

Based on the data gathered from the respondents shown in Table 3.0, the overall result was 4.50 interpreted as very good and revealed that the app was stable, efficient, compatible, usable, reliable, secured, maintainable, and portable to be used.

A total of 246 respondents evaluated the application using the ISO/IEC 9126-1:25010 standards. ISO/IEC 9126-1:25010 consists of eight (8) software quality standards namely: Functional Stability, Performance Efficiency, Compatibility, Usability, Reliability, Security, Maintainability, and Portability.

Table 3.0 Evaluation of the Respondents of the Mobile Based Student Handbook

Areas	Mean	Verbal Interpretation
Functional Stability	4.38	Very Good
Performance Efficiency	4.76	Very Good
Compatibility	4.21	Very Good
Usability	4.71	Very Good
Reliability	4.46	Very Good
Security	4.40	Very Good
Maintainability	4.46	Very Good
Portability	4.57	Very Good
Overall	**4.50**	**Very Good**

Table 3.0 shows the result of the evaluation of the respondents using the ISO/IEC 9126-1:25010 Software Quality Model Characteristics.

On the Functional Stability

The app was rated very good. This was because the app works fine on mobile phones especially on android devices and the app automatically adjusts based on the user's device resolution.

On the Performance Efficiency

The result revealed that the app is efficient when it comes to time behaviour and resource utilization when performing its functions, thus the result was very good.

On the Compatibility

The app runs on any mobile device as long as the operating system is android regardless of its version. For that, the app was rated very good.

On the Usability

With its simple user interface and straightforward approach, the app is very easy to install and use. The result showed that the app was rated very good.

On the Reliability

The app was rated very good. This was because the project uses the latest version of apache Cordova/phonegap build that converts HTML5 into a mobile app.

On the Security

The app can be considered as secure for it will be uploaded to the Google Playstore. It is a secure place

where to download and install android app on mobile phone. The contents of the app can only be change if you have a copy of the source code, otherwise the app cannot be modified. The results revealed that in terms of security, the app was very good.

On the Maintainability

With its simple approach, the app can be modified, revised and deployed within a short period. The app can be rebuilt in just a few minutes and an update of the app can be installed on Android devices. For that, the app was rated very good.

On the Portability

The app was rated very good. This was because Android apps are in a form of APK or android packages, with the advent of file sharing applications files are transferrable from one device to another without internet connection.

Expert Testing

Likewise, expert testing was also conducted to ensure adherence of the application to Software Quality Standards. Three IT experts rated the application very good. Table 4 showed the summary of experts' evaluation of the Mobile-Based Students Handbook application using the McCall's Software Quality Model.

Table 4.0 Evaluation of IT Experts of the Mobile Based Student Handbook using the McCall's Software Evaluation Criteria for Software Quality Model.

Criteria	Mean	VI
Auditability	4.67	Very Good
Accuracy	4.67	Very Good
Completeness	4.67	Very Good
Communication Commonality	5.00	Very Good
Conciseness	4.67	Very Good
Consistency	4.67	Very Good
Operability	4.67	Very Good
Security	4.67	Very Good
Documentation	5.00	Very Good
Simplicity	4.67	Very Good
Software System Independence	4.67	Very Good
Traceability	5.00	Very Good
Training	4.67	Very Good
Controllability	4.67	Very Good
Data Commonality	4.33	Very Good
Error Tolerance	4.67	Very Good
Execution Efficiency	4.67	Very Good
Expandability	5.00	Very Good
Hardware Independence	5.00	Very Good
Instrumentation	4.33	Very Good
Modularity	5.00	Very Good
TOTAL MEAN	**4.73**	**Very Good**

Table 4.0 showed that the developed application in terms of auditability that measured the ease with which conformance to standards can be checked; experts rated it as 4.67 interpreted as very good. In terms of accuracy that referred to the precision of computations and control, the evaluators rated 4.67 that means very good.

The completeness of the system or the degree to which full implementation of the required functions has been achieved got a mean score of 4.67 interpreted as very good.

In line with communication commonality or the degree to which standards interfaces and protocols are understood, the system was rated as 5.0 which is interpreted as very good. For the conciseness of the system or the compactness of the program in terms of lines of code, it got a mean score of 4.67 which is interpreted as very good. The system's consistency or the use of uniform design and documentation techniques throughout the software development project got a mean of 4.67 which is very good.

In line with the system's security or the availability of the system's mechanisms that control or protect the programs and data, the developed system got a mean of 4.67 interpreted as very good. Whereas in the system's self-documentation, a mean of 5.0 was achieve and interpreted as very good.

With the degree to which the program can be understood without difficulty or the simplicity of the software, got 4.67 as the derived mean and interpreted as very good. On the software system independence or the degree to which the program is independent of non-standard programming language features, operating system characteristics, and other environmental constraints, the evaluators rated it with a mean of 4.67 or very good. In line with the ability to trace a design representation or actual program component back to requirements or the traceability of the system, it was evaluated by the evaluators very good at 5.0.

In terms of training or the degree to which the software assists in enabling new users to apply the system, the app gained a rating of 4.67 that means very good. For the controllability or where the system can be easily controlled and manipulated in terms of execution, program structure and design, the evaluators gave a score of 4.67 or very good. The data commonality of the system or the use of standard data structures and types throughout the program got a mean of 4.33 or very good.

Likewise, when evaluated in terms of error tolerance or the damage that occurs when the program encounters an error, the evaluators rated the developed software as 4.67 interpreted very good. On the run-time performance of the program or the execution efficiency of the software, the developed software got a rating of 4.67

interpreted as very good. For the degree to which architectural, data, or procedural design can be extended or the expandability of the system, the developed software was rated as 5.0 that means very good.

For the generality of the system or the breadth of potential application of the program components, the mean score of 4.0 was obtained which means good. On the degree to which the software is decoupled from the hardware on which it operates or the hardware independence of the system, the app was graded as 5.0 or very good. In terms of instrumentation of the system or the degree to which the program monitors its own operation and identifies errors that do occur, evaluators gave a rating of 4.33 as a mean interpreted as very good. Finally, in terms of modularity of the system or the functional independence of program components, the software got a mean score of 5.0 that means very good.

Based from the results of the experts' system evaluation, the Mobile-Based Student Handbook application got a total mean of 4.73 that means very good.

CONCLUSION AND RECOMMENDATION

Based on the responses of the respondents as well as in the system evaluation results both of the IT experts and the end-users, the overall result was very good. It implies that the mobile-based student e-handbook meets the criteria for the software quality standards and on the requirements of the end-users.

The mobile-based handbook encourages the students to read its contents making them aware and understand the policies, rules and regulations of the College while enjoying its other features as provided for. This research study provided the avenue of the development of a mobile-based application, which is a product of continuous research for improvement and innovation in furtherance of quality academic and non-academic services.

The researchers stress out based on the findings and conclusions to further enhance the study: future researchers may add some functionality to the system like dynamically modifying the contents of the handbook for future changes and integrating it to other applications such as student information system; future researchers may design a separate user interface for every mobile operating system to enhance the user experience; and the results of evaluation from the end-users and from the panel of IT experts were very good which means that the mobile-based student handbook should be implemented in NONESCOST, for it will have a great impact not just for the community of NONESCOST but also in our mother nature. The less paper we used, the less trees are cut.

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