Web-Based Information System Portal With SMS Support For Aklan State University-Kalibo Campus

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Abstract: *This study aimed to develop a web-based information system portal with short messaging system (SMS) support for the students of Aklan State University-Kalibo Campus. A test case was used to test the functionality of the development of SMS and web-based inquiry portal of grades and accounts for the students, and web-based submission of grades for the faculty. The system was evaluated by the IT Experts using the ISO 9126 software quality characteristics which included functionality, reliability, usability, efficiency, maintainability, and portability. A questionnaire was used in the evaluation of the system's level of effectiveness. The respondents of the study were randomly chosen 300 students and 20 faculty members of Aklan State University-Kalibo Campus as well as five (5) IT Experts coming from different sectors. Mean and standard deviation were used as statistical tools. Results showed that the web-based with SMS support for grades and accounts inquiry system was very effective as per students' evaluation which means that the proposed system's performance was very effective because it served the purpose for which it was developed in order to meet the students' needs. Also, the web-based submission of grades was very effective as per teachers' evaluation which means that the newly developed system provides a very satisfactory quality of service to faculty members because it can facilitate the electronic submission of students' grades through internet facilities anywhere and anytime without necessarily having the teachers' physical presence in school.*

Index Terms: Efficiency, Functionality, Maintainability, Portability, Reliability, Security, SMS, Web Services.

I. INTRODUCTION

Mobile telecommunication has evolved and become popular during the past few years, since it provides anytime-anywhere communications. It also allows people to manage time more flexibly. With the increase in the number of wireless personal communications and the number of electronic services provided by the internet, people tend to prefer the use of mobile devices for achieving all their work. Such preference is because mobile devices are simple, light, small, easy-to-use and any-time-anywhere information providers [1]. Today's education scenario is rapidly changing and demanding. The system demands greater levels of communication between college students and faculty members to have optimum use of

the resources. Along with the growth in mobile and networking technologies, access to web data services from mobile devices has gained an ever-increasing popularity [2]. Aklan State University (ASU) stands as the hallmark of academic pillar of excellence for sustainable development in the Province of Aklan. True to its mission of providing quality Education, it continually answers to the relevant needs and aspirations of the new generation. Presently, the ASU-Kalibo Campus has a Computerized Collection and Enrollment System that cater to the needs of students from accounts to grades inquiry. Due to the increasing number of enrollment, the current system encounters difficulty in handling large amount of data especially on students' accounts, grades inquiry, and submission of grades by the faculty.

In view of the foregoing problem, the researcher has been motivated and inspired to propose and develop a Web-based information system portal with SMS support for Aklan State University-Kalibo Campus.

A. *Objectives of the Study*

This study aimed to develop a Web-based Information System Portal with SMS Support for Aklan State University. Specifically, this study aimed to:

Assess the problem existing in the university why you proposed this system

1. develop a system that enables SMS based inquiry of students' grades and accounts;
2. develop a system that enables Web based inquiry of students' grades and accounts;
3. develop a system that enables Web based submission of students' grades by the faculty;
4. evaluate the system using ISO 9126 criteria in terms of functionality, reliability, usability, efficiency, maintainability, and portability;

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B. *Conceptual Framework*

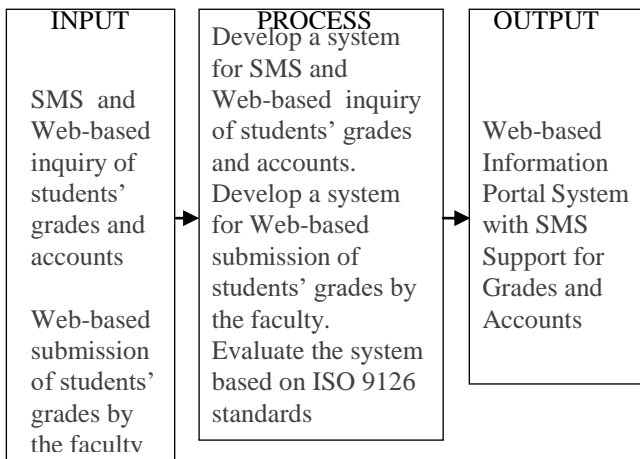| INPUT	PROCESS	OUTPUT
SMS and Web-based inquiry of students' grades and accounts Web-based submission of students' grades by the faculty	Develop a system for SMS and Web-based inquiry of students' grades and accounts. Develop a system for Web-based submission of students' grades by the faculty. Evaluate the system based on ISO 9126 standards	Web-based Information Portal System with SMS Support for Grades and Accounts

Figure 1. Research Paradigm Showing the Framework of the Study.

Figure 1 describes the research paradigm, illustrating and depicting the interaction and delivery of grades and accounts inquiry services as well as web-based submission of students' grades by the faculty. It consists of mobile services which cater to SMS inquiry and Web services which cater to website inquiry, and web-based submission of students' grades.

The system was evaluated using the ISO 9126 criteria in terms of functionality, reliability, usability, efficiency, maintainability, and portability to ensure its quality. The evaluation process served as basis for further development and improvement of the system [3].

II. RELATED LITERATURE

A. School Event Notification Through SMS (SENTSMS)

The School Event Notification through SMS is an application that stores contact details of students, guardian, faculty and staff; it also stores calendar of events. The application enables students, faculty, and school staff to subscribe/unsubscribe to school notifications through SMS and broadcast school events to students, guardians, faculty and staff through SMS [4].

B. SMS-Based Event Notification System

The system is an enterprise builds for class mass SMS mailing system that will cater users as well as multiple SMS gateways, providing a unified interface and common set of features across many SMS gateways which avoid vendor lock-in as users can choose among multiple SMS vendor gateways. Also there are some major feature provided by the system is the presentation of SMS message scheduling. This feature makes SMS message scheduling possible across all SMS gateways including those that do not internally support scheduling. Furthermore, users can also stop any scheduled message if the need be.[5]

C. WVCST Grades and Accounts Inquiry

The Western Visayas College of Science and Technology (WVCST) Grades and Account Inquiry System was developed by their MIS Department to cater students' inquiry on grades, account, and latest information about the school. The system can be accessed on the designated area installed, it uses touch screen technology where in students will have to enter their id number in order to access the information. The system is installed locally within the school campus only.

D. A Web-Based Student Support Services System Integrating Short Message Service Application Programming Interface

This system shows the integration of Short Message Service Application Programming Interface in a Web-Based Student Support Services System for a university would facilitate two-way communication between the students, faculty and other stakeholders. It aims to keep in contact with students and deliver significant information arising from the University using the system's SMS facility presenting auto-reply feature.[7]

E. University of San Agustin, Iloilo Management Information System

The Management Information System of the University of San Agustin has the following web-based online inquiry and assessment of fees. The student will provide their registration ID number to have an access in the assessment of fees online. It has also Schedule Offerings where the student will select the name of their department to view the summary of subjects offered online.

For the Grades inquiry, the student will provide their registration ID number to view online their subject list enrolled with corresponding grades. And lastly the account balance, the student will provide their registration ID number to get their current account balance online.

F. SMS-Based Information Systems

The Short Message Service (SMS) allows text-based messages to be sent to and from mobile telephones on a GSM network. Each message has a maximum length of 160 characters. The possibility of using SMS in Africa is growing rapidly high. It is mostly used for things such as medicine awareness and warning notifications. In Mozambique health workers can support diagnosis & treatment through Bulk SMS and even in Uganda, Malawi and Benin health education messages are sent by text messages. SMS based transactional alerts are SMS's sent each time a change occurs in a bank account, for example, or when your credit card is used then you will get an SMS on your mobile phone. Marketing on a mobile phone has become increasingly popular ever since the rise of SMS in the early 2000s in Europe and some parts of Asia when businesses started to collect mobile phone numbers and send off wanted (or unwanted) content. Many applications need the ability to do real-time notification when events occur. Often the people who need to be kept aware of events are in a remote location.[8]

III. METHODOLOGY

A. Project Development

In this study, the researcher used the spiral model for the systems development. The phases in the spiral model are planning, risk analysis, engineering, construction and release, and system Evaluation. These phases are iteratively followed one after other during the system's development. Iterating the phases helps in understating the problems associated with a phase and dealing with those problems when the same phase is repeated next time, planning and developing strategies to be followed while iterating through the phases [9].
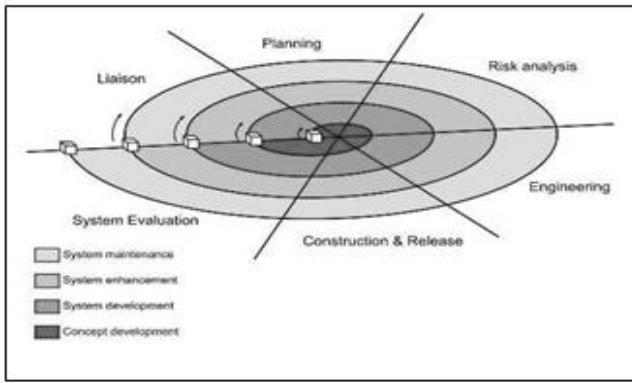
Figure 1 illustrates the spiral model.

Figure 1. Spiral Model [9].

B. *Mobile Web Architecture*

This study is anchored on the Mobile Web Architecture, which comprises with different devices. Each device plays a vital role to achieve the objective of the system. User inquiries would be received by the portal, and same portal sends back desired information to the user and the role of the portal may be described as the gateway of information. Figure 3 shows the Mobile Web Architecture.
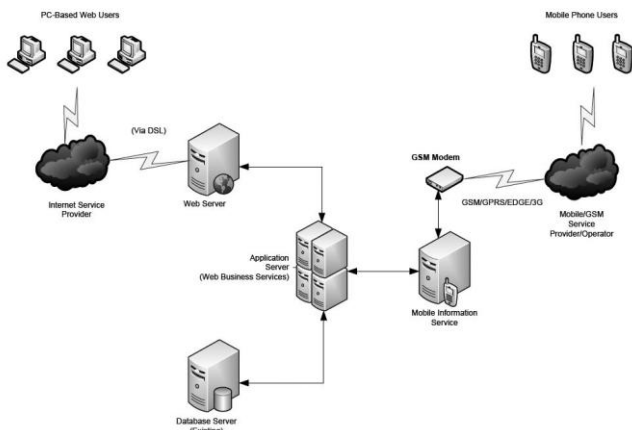

Figure 2. Mobile Web Architecture

In this architecture, mobile phone serves as a portal that bridges the gap between the system user and the system itself. The system was developed to receive inquiries as well as to send responses using mobile phones.

A Database Server played important roles in the system. All of the desired information needed to be retrieved could be found in this device. Aside from being a database server, a web server is responsible for accepting HTTP request from clients, which are known as web browsers, and serving them HTTP responses along with optional data contents. A Mobile Information Service will cater all queries coming from a mobile device; it is connected to a GSM Modem that will interact between the mobile phone and the Mobile Information Service.

An Application server is developed which will serve as an intermediary and will determine if the query comes from a web or from a mobile device. After determining, it will access the data from the database server and pass the request to the web in a web format, and to a mobile in a mobile application format.

C. *Operation and Testing*

After the development, an initial and final test was conducted to test the functionality of the proposed system. A Test Case was developed and group testing was conducted to test the full functionality of the system. In the initial test, the researcher gathered small group of students and faculty to test the system and recorded the test procedure using the test case. Some errors were found out during the initial test, and the researcher corrected them and conducted a final test.

D. *Respondents of the Study*

The respondents of the study were five (5) IT professionals coming from different sectors who have extensive knowledge in software development as well as 300 students and 20 faculty members of Aklan State University-Kalibo Campus. The students were randomly chosen from a total population of 3,000 while the faculty were taken from a total population of 200.

E. *Data Gathering Instrument*

In this study, three sets of questionnaire were used to gather the needed data from the respondents.

The first set of questionnaire was intended for IT professionals. The questionnaire sought to evaluate the system using the standards set by ISO 9126 otherwise known as the Software Quality Model in terms of six main characteristics of good software (functionality, reliability, usability, efficiency, maintainability and portability).

The questionnaire consisted of 20 items. In each item the evaluators were asked to rate the system using the following response categories:

4.21 – 5.00 -- Excellent
3.41 – 4.20 -- Very Good
2.61 – 3.40 -- Good
1.81 – 2.60 -- Fair
1.00 – 1.80 -- Poor

The second set of the questionnaire was intended for the students. The questionnaire sought to measure the level of effectiveness of the system being developed. The questionnaire was divided into two sections. The first section contained questions about the effectiveness of the SMS Based Application and the second section contained questions about the Web Based Application.

The students were asked to rate each item using the following response categories:

4.21 – 5.00 -- Very Effective
3.41 – 4.20 -- Effective
2.61 – 3.40 -- Moderately Effective
1.81 – 2.60 -- Ineffective
1.00 – 1.80 -- Very Ineffective

The third set of the instrument was intended for the faculty. The questionnaire contained questions about the level of effectiveness of the web based submission of grades.

The faculties were asked to rate each item using the following response categories:

4.21 – 5.00 -- Very Effective
3.41 – 4.20 -- Effective
2.61 – 3.40 -- Moderately Effective
1.81 – 2.60 -- Ineffective
1.00 – 1.80 -- Very Ineffective

F. *Reliability of the Instrument.*

The instrument was pretested among 30 students and 15 faculty members of Aklan State University-Kalibo Campus. Reliability analysis using SPSS was used to determine the reliability of the instrument. The Chronbach Alpha for the questionnaires given to the students was 0.72 which was considered reliable since it exceeded the 0.70 standard and Chronbach's Alpha value of about 0.70 for the questionnaires given to the faculty. According to Fraenkel and Wallen (2006) a reliability coefficient between .70 to 1.0 is considered reliable. [10]

G. *Validity of the Instrument.*

To determine the validity of the instrument used in this study, it was submitted to the panel of jurors for content validation. Content validity refers to the degree to which the content of the items reflects the content domain of interest. Content Validity is based on the extent to which a measurement reflects the specific intended domain of content (Carmines and Zeller, 1991) [11].
The researcher requested the Vice President for Administration and the Director of the Institute of ICT of West Visayas State University, Department Head of the Information Technology of Western Institute of Technology, IT Instructor of the Information System and Management of University of the Philippines Visayas, and the owner of Software Solutions Company to comprise the panel of jurors. Recommendations and suggestions of the jurors were incorporated in the final questionnaire.

H. *Data Analysis Procedure and Statistical Treatment of Data*

To determine the effectiveness of the system, the responses of the respondents were analyzed using the Statistical Package for Social Sciences (SPSS) software. The following Statistical Tools were used:

1) Mean was used to determine the level of effectiveness of the system. It is computed by adding up all the values in the series and dividing them by their count. The mean was used in this paper for sample sizes that were 15 or more.

2) Standard Deviation gives an idea of how close the entire set of data is to the average value. Data sets with a small standard deviation have tightly grouped, precise data. Data sets with large standard deviations have data spread out over a wide range of values (MacMillan, et. Al. 2006).

IV. EVALUATION

Development of a System for SMS-Based Inquiry of Grades and Accounts for the Students.

Table 1 shows the final test result of SMS based Grades and Accounts Inquiry.

Test ID	Test Name	Pass	Fail
SMS Test 001	Inquire Keyword	5	0
SMS Test 002	Change Password	5	0
SMS Test 003	Inquire Grades	5	0
SMS Test 004	Inquire Accounts	5	0
SMS Test 005	Invalid Keyword	5	0

The table shows that the SMS Based Grades and Accounts Inquiry was presented to five (5) IT Professionals for Final Testing which revealed that all functions got the evaluation rating of "pass" during the final testing. This means that the SMS Based Grades and Accounts Inquiry functioned correctly and accurately. This implies that the development of a system for SMS inquiry of grades and accounts for students was error-free. With this, Software Testing Life Cycle, as Admin (2011) pointed out that we have to execute the remaining stress and performance test cases and documentation for testing is completed, updated, and provide complete different matrices for testing. Acceptance, load and recovery testing will also be conducted and the application needs to be verified under production conditions. In so doing, the researcher would be able to recommend for its implementation.

Development of a System for Web Based Inquiry of Grades and Account for the Students

Table 2. Final Test Result Web Based Grades and Accounts Inquiry

Test ID	Test Name	Pass	Fail
Web Test 001	Access School website	5	0
Web Test 002	Invalid Student Log in	5	0
Web Test 003	Valid Student Log in	5	0
Web Test 004	Change Password	5	0
Web Test 005	Student Grades	5	0
Web Test 006	School Account	5	0
Web Test 007	Student Logout	5	0

Development of a System for Web Based Submission of Grades for the Faculty

Table 3. Final Test Result for Faculty Web based Submission of Grades

Test ID	Test Name	Pass	Fail
Web Test 001	Access School website	5	0
Web Test 002	Invalid Faculty Log in	5	0
Web Test 003	Valid Faculty Log in	5	0
Web Test 004	Faculty Profile	5	0
Web Test 005	Faculty Password	5	0

Web Test 006	Class Schedule	5	0
Web Test 007	Faculty Gradebook	5	0
Web Test 008	Faculty Logout	5	0

The table shows that all functions in the Faculty Web based Submission of Grades passed the final test which means that the module had no errors. This implies that the developed system for Faculty Web based Submission of Grades functioned correctly and accurately. With this, Software Testing Life Cycle, as Admin (2011) pointed out that we have to execute the remaining stress and performance test cases, and documentation for testing is completed, updated, and provide complete different matrices for testing. Acceptance, load and recovery testing will also be conducted and the application needs to be verified under production conditions. In so doing, the researcher would be able to recommend for its implementation.

Table 4. Expert's Evaluation of the System Using the ISO 9126

ISO 9126 Software Quality Criteria	Mean	Std. Dev.	Desc.
A. Functionality	4.15	0	Very Good
B. Reliability	3.73	0.480	Very Good
C. Usability	4.73	0.480	Excellent
D. Efficiency	3.70	0.497	Very Good
E. Maintainability	4.10	0.313	Very Good
F. Portability	4.00	0.400	Very Good
Over-all Mean	4.06	0.398	Very Good

The table shows that the overall result of the expert's evaluation on the system based on ISO 9126 criteria was very good with the mean score of 4.06. This means that the system met the software quality characteristics set by ISO 9126 standards. This implies that the software was of good quality and it could provide quality service to its clientele. To determine the level of effectiveness of the system, it was presented to 289 students, and 20 faculty. The students evaluated the SMS and Web-based Grades and Accounts Inquiry, while the faculty evaluated the web based submission of grades. Table 5 shows the result of the evaluation on SMS based Grades and Account Inquiry as evaluated by the students.

Table 5 Students Evaluation on the SMS Based Grades and Accounts Inquiry

Student			
SMS Based Grades and Accounts Inquiry	Mean	Std. Dev	Desc.
1. The keywords for SMS are clear and easy to remember.	4.43	0.64	Very Effective
2. The request for change of PIN is convenient.	4.73	0.45	Very Effective
3. The waiting time for the system response to an inquiry is tolerable.	4.11	0.73	Effective
4. The Information provided is accurate.	4.80	0.40	Very Effective
5. The system can validate and invalid keywords.	4.77	0.42	Very Effective
6. The system is stable.	4.58	0.50	Very Effective
7. The system is reliable.	4.77	0.42	Very Effective
8. The system is convenient to use.	4.62	0.49	Very Effective
TOTAL	**4.60**	**0.51**	Very Effective

As shown in Table 5, the following items were evaluated as "Very Effective": item 1, "the keywords for SMS are clear and easy to remember" with a mean score of 4.43; item 2, "the request for change of PIN is convenient" with mean of 4.73; item 4, " the Information provided is accurate" with the highest mean of 4.80; item 5, "the system can validate and invalid keywords" with the mean of 4.77; item 6,"the system is stable" with the mean of 4.58; item 7, "the system is reliable" with the mean of 4.77, and item 8, "the system is convenient to use" with the mean of 4.62 while Item 3, "the waiting time for the system response to an inquiry" showed an "effective" evaluation rating with a mean of 4.11. This meant that the result was tolerable due to telecommunication signals.The overall result of the system's level of effectiveness showed an evaluation rating of 4.60, described as "Very Effective." This may imply that the SMS based inquiry is very effective in delivering its service.

Table 6 Students Evaluation on the Web Based Grades and Accounts Inquiry

Student			
WEB Based Grades and Accounts Inquiry Test Account	Mean	Std. Dev	Description
1. The school website is accessible.	4.41	0.66	Very Effective
2. The interface is user friendly.	4.75	0.43	Very Effective
3. There is validation of Login information.	5.00	0.00	Very Effective
4. Inquiry of grades can be easily facilitated.	4.88	0.33	Very Effective
5. Students' financial status could be accessed.	5.00	0.00	Very Effective
6. Retrieval of data is faster.	4.23	0.66	Very Effective
7. The information generated is valuable to the students.	5.00	0.00	Very Effective
8. Information displayed on screen is accurate.	4.84	0.36	Very Effective
9. Requested data could be retrieved only by the person who requested it.	5.00	0.00	Very Effective
10. Information retrieved from website is printable.	5.00	0.00	Very Effective
11. The system is stable.	4.63	0.48	Very Effective
12. The system is secure.	4.79	0.41	Very Effective
TOTAL	**4.79**	**0.28**	Very Effective

Table 6 shows the results of the evaluation on Web based Grades and Account Inquiry as evaluated by the students which revealed that all the items evaluated by the students were "Very Effective". Item 1, "the school website is accessible" with the mean score of 4.41; item 2, "the interface is user friendly" with a mean of 4.75; item 3, "there is validation of Login information" with a mean of 5.00; item 4, "inquiry of grades can be easily facilitated" with a mean of 4.88; item 5, "Students' financial status could be accessed" with a mean of 5.00; item 6, "retrieval of data is faster" with a mean of M=4.23; item 7, "the information generated is valuable to the students" with a mean of 5.00; item 8, "information displayed on screen is accurate" with a mean of 4,84; item 9, "requested data could be

retrieved only by the person who requested it" with a mean of M=5.00; item 10, "information retrieved from website is printable" with a mean of 5.00; item 11, "the system is stable (M=4.63), and item 12 the system is secure" with a mean of 4.79.

The overall results of the evaluation revealed a "Very Effective" evaluation rating with a overall mean score of 4.79. This meant that the Web based Application was very effective in delivering online services to the students.

Table 7 Faculty Evaluation on the Web Based Submission of Grades

Faculty			
Web Based Submission of Grades	Mean	Std. Dev	Description
1. The school website is accessible.	4.37	0.701	Very Effective
2. The interface is user friendly.	4.72	0.451	Very Effective
3. There is validation of Login information.	5.00	0	Very Effective
4. The profile information can be modified or updated	5.00	0	Very Effective
5. Grades can be easily submitted and viewed by faculty.	4.70	0.463	Very Effective
6. The official list of students enrolled in the course can be retrieved from the website	4.76	0.43	Very Effective
7. Retrieval of official list of student enrolled in the course is fast and easy.	4.42	0.496	Very Effective
8. Generated information is accurate.	4.85	0.361	Very Effective
9. Accessing and submitting of grades online is secured.	4.77	0.422	Very Effective
10. Grading sheets is printable.	5.00	0	Very Effective
11. The online system is stable.	4.63	0.485	Very Effective
TOTAL	4.75	0.346	Very Effective

Table 7 shows the result of the evaluation on Web based Submission of Grades as evaluated by the faculty.

As shown above, the result of the faculty evaluation on the web based submission of grades was very effective. Item 1, "the school website is accessible" with a mean of 4.37; item 2, "the interface is user friendly" with a mean of 4.72; item 3, "there is validation of Login information" with a mean of 5.00; item 4, "the profile information can be modified or updated" with a mean of 5.00; item 5, "grades can be easily submitted and viewed by faculty" with a mean of 4.70; item 6, "the official list of students enrolled in the course can be retrieved from the website" with a mean score of 4.76; item 7, "retrieval of official list of student enrolled in the course is fast and easy" with a mean of 4.42; item 8, "generated information is accurate" with a mean of 4.85; item 9, "accessing and submitting of grades online is secured" with a mean of 4.77; item 10, "grading sheets is printable (M=5.00), and item 11 the online system is stable" with a mean of 4.63.

The overall result of the evaluation was "Very Effective" with overall mean score of 4.75. This meant that that the web based submission of grades was very effective in delivering online service to the faculty.

Implementation of the System

Based on the overall evaluation of the system, the IT Professionals, faculty and students involved in this study, found the newly developed system as "very effective" which means that it met the software quality characteristics as defined by ISO 9126 standard and therefore it is recommended for implementation because it provides quality service and convenience to the users.

V. CONCLUSIONS

Based on the findings of the study, the following conclusions are drawn: The SMS based grades and accounts inquiry, web-based grades and accounts inquiry, and web-based submission of grades were error-free which means that the system is functioning correctly which implies, therefore, the reliability and integrity of the data. The proposed system was very good as evaluated by the IT Professionals in terms of functionality, reliability, efficiency, maintainability, and portability which revealed that it therefore, met the ISO 9126 criteria for the software quality. The SMS and web-based grades and accounts inquiry system was very effective as per students' evaluation which means that the proposed system's performance was very effective because it effectively serves the purpose for which it was developed in order to meet the students' needs. The web-based submission of grades was very effective as per teachers' evaluation which means that the newly developed system provides a very satisfactory quality of service to faculty members because it can facilitate the electronic submission of students' grades through internet facilities anywhere and anytime without necessarily having teachers' physical presence in school. Based on the results of the evaluation, the study achieve its objectives because the newly developed system showed that it is error-free as evaluated by the IT Professionals during the final testing and conformed to the ISO 9126 standards in terms of functionality, reliability, efficiency, maintainability, usability, and portability. Likewise, the system was very effective as per the evaluation of both the faculty and students, indicating that it is beneficial, doable and practicable because it could facilitate virtual inquiry of students' accounts and grades as well as electronic submission of students' grades.

RECOMMENDATIONs

Based on the foregoing findings and conclusions, the following courses of action are hereby recommended:
To maintain the performance of the system and to ensure that it functions correctly and accurately, proper monitoring must be ensured by way of logging in the transactions in order to trace the history as basis for an audit trail of transactions future checking and verification.

Since the rating of the students in the level of effectiveness based on the waiting time for the system response using SMS was effective, it is recommended that in order to

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become very effective, there is a need to find a better location for the GSM modem to ensure full signal of the telecommunication mobile network provider so that the school GSM modem can receive and send requests in a fast and efficient manner.

Since the result of the evaluation of the web-based submission of grades was very effective, it is recommended that in order to maintain the effectiveness of the system, there must be an Internet load-balancing system to provide a single internet service from multiple internet service provider so that the system stays connected online.

An orientation must be conducted to the students and faculty of Aklan State University on how to use the system once it is implemented to ensure that the target users who are the faculty and students are properly oriented about the benefits of the newly developed system and to equip them with the technical knowhow about how the system operates.

Since the system met the criteria for software quality characteristics, the researcher recommends the full implementation of the system to Aklan State University-Kalibo Campus.

It is further recommended that similar and related studies be conducted in the future, particularly in other areas of SMS and web-based Inquiry in order to constantly search for new knowledge in order to make the system relevant to the needs of modern times.

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