Development and Implementation of Grade Inquiry System using Short Messaging Service

Geraldine B. Mangmang
Southern Leyte State University
Sogod, Southern Leyte, Philippines

Abstract
Grade inquiry with short messaging service is a way to improve the mode of inquiring information. This study aimed to develop and implement a grade inquiry system using short messaging services. The study was conducted through a developmental-evaluative design. The performance of the existing and the developed system were compared based on the effectiveness, satisfaction, functional suitability and security. This comparison was assumed based on a metrics of quality of use model (i.e., effectiveness, satisfaction) and product quality model (i.e., functional suitability, security), according to the ISO/IEC 205010:2011 standard. The software was developed in a Microsoft Visual Studio 2012 application and Microsoft SQL Server 2005 database system which permits students to use the Smart and Globe telecommunication networks. This system allows students to inquire of their grades through Short Message Service (SMS) using a code, ID number, and password through their mobile phones. Proportionate sampling was applied to the graduate students who served as respondents, to gather the needed data. Wilcoxon Matched Pairs Signed-Rank Test was used to determine the significant difference between the existing and developed system. Results showed that the developed system was very effective and the students very satisfied. However, there was no significant difference regarding to functional suitability between the existing and developed system. Modernized innovation that will focus on the design and the use of computer technology pertaining to grade inquiry should be developed, to cater to students’ grade inquiries. These outcomes will help the university in fulfilling the needs of the students and their expectations.

Keywords: Effectiveness; Inquiry system; ISO/IEC 205010:2011 standard; Satisfaction; Text Messaging

Introduction
Academic grades are important information for students. It is one way of giving them feedback regarding their academic performance. According to the study of Day et al. (2018), giving feedback give beneficial results in an assessment. Although technical improvement plays a vital role, inquiry systems of students’ grades in a convenient way is often not taken into consideration. This study attempts to develop and implement an inquiry system that will suit the needs of the Philippine college students.

Short Message Service (SMS) is a text messaging application using consistent messaging protocols that allow the exchange of brief information between static lines and devices. It is also often configured to ensure secure communication. Using this type of communication, technological advancement is being integrated (Moshir et al., 2017; Konkle, 2015). SMS is a method supporting multiple users that can be incorporated in practically any innovation due to its capability in prompting notification
messages to any user, enhancing practical and economical utility (Lee, 2018; Househ, 2016). However, actual application depends on users’ acceptance and motivation (Nikou & Economides, 2017). In fact, integration and adaptation of e-learning system bid perceptions into different advances, accomplishments, and challenges in the field (Truong, 2016).

According to Rotman (2013), technological progress in the environment is fast. Technology can be applied and used in different ways, among them is students’ grade inquiry system. Since text messaging is one of the most commonly used communication tools today, integrating it to the system can satisfy the students’ need in acquiring their grades.

Grade inquiry system through text messaging service is a stepping stone of technological transformation that may lead to another innovation. This study intended to develop and implement a grade inquiry system using short messaging service. Specifically, this study aimed the following; (1) describe the performance of the existing grade inquiry system, (2) identify the features to be included in the grade inquiry system using short messaging service, and (3) develop and implement a grade inquiry system using short messaging service.

Materials and Methods

Research Design

This study utilized developmental-evaluative design, an approach to understand the activities of a program. It focuses on innovation and strategic learning rather than standard outcomes and is much a way of thinking about programs-in-context and the feedback they produce. According to Conklin et al. (2015), developmental evaluation design is appropriate as a method for handling implementation research. Results were further proven in the study of Lam & Shulha (2015) which stated that the research design improved innovation by classifying and immersing data into the study and iterating the invention with the clients and the evolving evaluator. The design is practically suited to research and innovation that applies the integration of computer technology.

Research Respondents

Research respondents of the study included 50% of the total population of students in the graduate school in a rural State University in the Philippines enrolled during the first semester of Academic Year 2013 – 2014 who already had their grades from the previous semesters. A letter was secured requesting the approval to use the needed data and consent from the concerned students which was consequently approved by the University President Proportionate sampling was applied. Table 1 provides the distribution of respondents.

Data Collection Procedure

The identified respondents voluntarily participated in the study. Two sets of questionnaires were made, patterned according to ISO/IEC 205010:2011 standards which focused on the metrics of the quality of use model i.e. effectiveness, satisfaction) and the product quality model i.e. functional suitability, security. The questionnaire was validated by an Information Technology expert to ensure reliability and validity. The first set of the questionnaire was administered to the respondents to assess the existing technology. It contains information about the existing system, the problems encountered by the students in the existing system, and the student’s expectations to be integrated into the developed system. Results from the assessment were the basis for designing the process of the system’s innovation. The new system was then implemented on the same University. Respondents were informed of the flow of the new grade inquiry procedure as shown in Fig. 1. A password was
Table 1. Respondents of the study

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Number of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master in Management (MM)</td>
<td>20</td>
<td>37%</td>
</tr>
<tr>
<td>Master in Technology Education (MTE)</td>
<td>8</td>
<td>15%</td>
</tr>
<tr>
<td>Master of Science in Information Technology (MSIT)</td>
<td>4</td>
<td>7%</td>
</tr>
<tr>
<td>Master of Arts in Teaching (MAT)</td>
<td>22</td>
<td>41%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>54</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Figure 1. Architectural design of the study

Figure 2. Text schema

given to every respondent to maintain data confidentiality. Text schema that is shown in Fig. 2 was then introduced to the respondents. The second set of questionnaires were then administered to determine the performance of the developed grade inquiry system.

**Developed System**

The study used and followed the step-by-step process of the Waterfall Model (figure 3) for the innovation, one of the oldest and widely used models. Waterfall Model separates the phases of specification and development. In the Waterfall Model, every stage needs to be done first before moving to the next level. The study of Jacobs & Graham (2016) averred that the waterfall model gives beneficial effects to the process as it shows the entire tasks in advance. Moreover, in the study of Alshamrani and Bahattab (2015), it was revealed that this model functions well terms of output where accuracy is a significant factor due to its in-depth manifestation and organization. In this study, the conception phase was the identification of the problem involving the existing grade inquiry system. Initiation phase was the time when this study was proposed. Analysis phase took place after the respondents answered the first set of questionnaires. The system was then designed based on the proposed
features for the developed system. The fifth step was the construction of the developed system. It was then tested to ensure system functionality and effectiveness. The final stage was deployment wherein the software was formally introduced to the respondents and the University's Management Information System.

Microsoft Visual Studio 2012 was utilized to develop the frontend while Microsoft SQL Server 2005 served as the backend database system. The students can use either Smart or Globe networks in accessing the university's system.

**Data Analysis**

Percentage, frequency count, weighted mean and Wilcoxon matched pairs signed-rank test were used to determine the performance of the existing and the developed grade inquiry system.

**Results and Discussion**

**Performance of the existing system**

Results revealed that the existing grades inquiry system of graduate studies of the University was already computerized. The study of Pult & Riede-Pult (2013), stated that intra-observer and inter-observer agreement was better in the computerized grading system. Work conducted by Maron & Howe (2013) showed that the computerized grading of formula-based multi-step problems is utilized to enable and facilitate assessment of the correctness of the information.

Results also revealed that the performance of the existing grade inquiry system (Table 2) is not as effective and that the respondents are relatively dissatisfied. However, they agreed that the existing system has some functional suitability regarding posting, sending, and acquisition of grades and that the software is very secure. Moreover, the system was insufficient due to its performance and storage capacity. Librea et al. (2014), stated that technology enhancement of complex machines such as computers made it viable for the existence of a database whose common purpose is to preserve information and make that accessible on demand. Barreno et al. (2016) further stated that grade system plays a significant role in the management system of any school, but such systems do not often relate expectations, outcomes, and performance of the individual students. In the study of Chiang et al. (2014), it was affirmed that educators indicated the importance of engaging students in knowledge sharing activities during the inquiry learning process. Results have been proven in the study of Maron & Howe (2013) that computerized grading system involves the steps of delivering a memory for keeping problems and data to permit and ease assessment of the correctness of the data.

**Features and Design of the Developed System**

Features included in the proposed grades inquiry system were ranked. The features that allow students to inquire grades anytime and anywhere and allows grades inquiry via SMS were first on the list. Additional features like releasing accurate information/grades,
Table 2. Performance of the existing grade inquiry system of SLSU-Main Graduate Studies

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Average</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effectiveness</td>
<td>2.15</td>
<td>1.008807</td>
<td>0.000807</td>
<td>Less Effective</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>2.05</td>
<td>0.696296</td>
<td>0.061237</td>
<td>Dissatisfied</td>
</tr>
<tr>
<td>Functional suitability</td>
<td>3.25</td>
<td>0.174356</td>
<td>0.000567</td>
<td>Agree</td>
</tr>
<tr>
<td>Security</td>
<td>3.5</td>
<td>0.061237</td>
<td>0.000567</td>
<td>Very Secure</td>
</tr>
</tbody>
</table>

Note:
1.00-1.75 – Not Effective; Very Dissatisfied; Strongly Disagree; Not Secure
1.76-2.50 – Less Effective; Dissatisfied; Disagree; Less Secure
2.51-3.25 – Effective; Satisfied; Agree; Secure
3.26-4.0 – Very Effective; Very Satisfied; Strongly Agree; Very Secure

permiting students to use any type of device, user-friendly interface, providing security of data, and the ability to send grades automatically (Table 3). Barreno et al. (2016), averred that grading systems is the most commonly used means to provide incentives for achievement, analyze academic performance, and assist in identifying problem areas of learning and instruction. Hence, grades are vital information needed in advancing to the next level thus heightening the importance of its accuracy. The study conducted by Muñoz & Guskey (2015) revealed that grading and reporting are foundational elements of the educational system. Educators must ensure that rating and reporting always meet the criteria for validity and reliability.

Design of the Developed System

Figure 4 shows an interface when a student sends the keyword to the developed system.

Figure 5 displays the text message replied by the developed system once the system will receive SLSUGS keyword.

Figure 6 displays the message sent by the user which will be logged on the developed system.

Figure 7 shows the transaction logs of the developed system.

Implementation and Evaluation of the Developed System

Results revealed that the performance of the developed grade inquiry system was very effective and the students were very satisfied. They strongly agreed that the software has more functional suitability compared to the existing system. The study of Donnelly et al. (2014) stated that enhancing the existing platforms combine the efforts of many individuals and, thus, strengthens the field. The study of Barreno et al. (2016) asserted
Table 3. Features to be included in the proposed grades inquiry system

<table>
<thead>
<tr>
<th>Features</th>
<th>Frequency</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Releases accurate information / grades.</td>
<td>53</td>
<td>5</td>
</tr>
<tr>
<td>Allows students to use any type of cell phones.</td>
<td>53</td>
<td>5</td>
</tr>
<tr>
<td>User-friendly.</td>
<td>53</td>
<td>5</td>
</tr>
<tr>
<td>Provides security of grades.</td>
<td>53</td>
<td>5</td>
</tr>
<tr>
<td>Allows students to inquire grades anytime and anywhere.</td>
<td>54</td>
<td>1.5</td>
</tr>
<tr>
<td>Allows grades inquiry via SMS.</td>
<td>54</td>
<td>1.5</td>
</tr>
<tr>
<td>Able to send grades automatically.</td>
<td>53</td>
<td>5</td>
</tr>
</tbody>
</table>

Figure 5. Text message replied by the developed system

that an updated grading inquiry system is highly desirable in addition to the educational tool kit, particularly when it can provides less effort on the part of the end-user and a more effective and timely outcome.

Conclusion

This study intended to develop and implement a grade inquiry system with SMS application. Specifically, this study intended to identify the needed features to be integrated into the new system. Results of the study revealed that the developed system was very effective and very secure. Furthermore, the respondents were also very satisfied with the developed system.
Also, the developed system has functional suitability that provides functions which met respondents expectation. Findings of the study will help the University’s retention policy on grade inquiry to be technologically advance and help to satisfy student needs.

**Recommendation**

The developed system caters only the students who know how to use mobile phones and whose locations have network signals. Involving the concept of usability and the integrating commitment to value human activity and experience as the primary driver in technology will boost technology advancement. Future research that will involve grade inquiry system that is a more human-centered application where students’ satisfaction is the measurement of success is thus recommended.

**References Cited**


