

InquiText: SMS-Based Auto-Reply Inquiry System for Grades and Accounts

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Abstract – *Many services of educational institutions such as management systems for student information are already accessible over the internet. The internet enables different resources to be on our fingertips which can be accessed by individuals who are connected to the internet. Unfortunately, some institutions located in remote and mountainous areas are not connected to the internet. The Cagayan State University – Lasam Campus is located in Lasam, Cagayan, Philippines which is a mountainous and remote municipality. The institution is currently connected to the internet but internet connection in some of the barangays within the municipality is not available due to the geographic condition. Therefore, implementing an internet service to make the grades and accounts available to the students would not be successful. The study aimed to develop a SMS-Based Auto-Reply Inquiry System for Grades and Accounts named “InquiText” as an alternative and convenient way of accessing grades and accounts, and will provide prompt service using any SMS-enabled mobile phones. The development of the system was guided with the Waterfall Model following the five different phases such as Requirements Analysis, System Design, Coding and Module Testing, Integration and System Testing, and Deployment and Maintenance. As a result, the InquiText can automatically respond to the clients’ inquiries on grades and accounts. In addition, the InquiText provides prompt service because it enables the clients to access student grades and accounts anytime and anywhere in the country. Moreover, the InquiText enables parents or guardians to monitor the academic performance and accounts of the students regularly.*

Keywords – *Auto-Reply, Cell Operator Application, GSM Modem, Inquiry System, SMS-Based System*

INTRODUCTION

Internet usage is increasing and most of the services of organizations, businesses, and educational institutions from small to large scale are accessible over the internet. The “Internet of Things (IoT)” has been introduced which refers to the use of intelligently connected devices and systems to control data gathered by embedded sensors and actuators in machines and other physical objects [1]. Consider the impact the Internet already has had on education, communication, business, science, government, and humanity [2]. Today, access of internet of urban centers are stable. Unluckily, internet access in remote communities, particularly in far-flung mountainous and small island communities, are still underdeveloped [3].

Lasam is considered as a rural municipality found in the province of Cagayan and primarily an agricultural community [4]. Some of the barangays are mountainous which causes the inability of telecommunication signal to penetrate these areas especially for internet connection. The Cagayan State University – Lasam Campus (CSU – Lasam) is located

at Centro 2, Lasam, Cagayan, Philippines where internet connection is wireless and signal is unstable.

Many schools especially higher education institutions are already running their information systems that manage student information including grades and accounts over the internet. These information systems allow students to enroll, pay fees, view grades and accounts online regardless where they are and what device they are using without travelling and physically appearing to the school [5]. Unfortunately, CSU – Lasam cannot adopt and implement this kind of internet application or technology due to its geographic condition. In addition, it would not be useful because most students would not be able to access the internet in their places, therefore, they still need to travel in places where internet connection is available.

Currently, CSU – Lasam is using a Local Area Network-Based System in managing student records which includes grades and accounts. The details of the grades to be viewed include the course title, grade earned and the remarks while accounts include the total

fees to be paid, the total amount paid and the total balance. If parents or guardians especially students want to check grades and accounts, they must proceed personally to the registrar's and accounting office to inquire on grades and accounts respectively. Moreover, every after the semester where students are on vacation, checking of grades and accounts will require them to visit the registrar's and accounting office.

To eliminate such problems, the study aims to develop a SMS-Based Auto-Reply Inquiry System for Grades and Accounts called "InquiText" which is considered as a Cell Operator Application [6] that will provide useful service to students, parents or guardians with regards to student grades and accounts. The Short Message Service (SMS) allows textual messages to be delivered between SMS enabled and digital cell phones [7] from a Global System for Mobile Communication Standards (GSM) network [6]. The main application of SMS is the exchange of text messages between mobile users [8]. It does not limit anyone regardless of high- or low-end mobile phones for as long as they can receive and send messages anytime, anywhere [7]. Each short message can be no longer than 160 characters, while these characters can be text (alphanumeric) or binary Non-Text Short messages [9].

The InquiText is designed to reply inquiries on grades and accounts and it will be available and accessible anywhere in the country as long as there is a minimum required signal to send and receive SMS. Using the InquiText, students, parents or guardians will no longer proceed to the registrar's and accounting office; hence, the InquiText provides a convenient way of accessing grades and accounts. Likewise, the InquiText serves as a tool for parents or guardians to monitor the grades and balances of their children. In addition, it would lessen the tasks of the registrar and accounting staff in responding student inquiries.

CONCEPTUAL MODEL

The conceptual model shows the different processes of the system (Figure 1). The process starts from the client (sender or originator) where the inquiries will come from. The GSM modem then receives the SMS from the client's mobile phone. Upon receiving the message, the application reads and decodes the message and save it in the SMS database. Likewise, the application will search the student details, grades and accounts if it exists in the SIAS database. The SIAS database is the centralized database that is being utilized in the campus where student details, grades, and accounts are stored. After verification of records

based on the query or request, the application will then send the requested information (reply) to the client's mobile phone through the GSM modem.

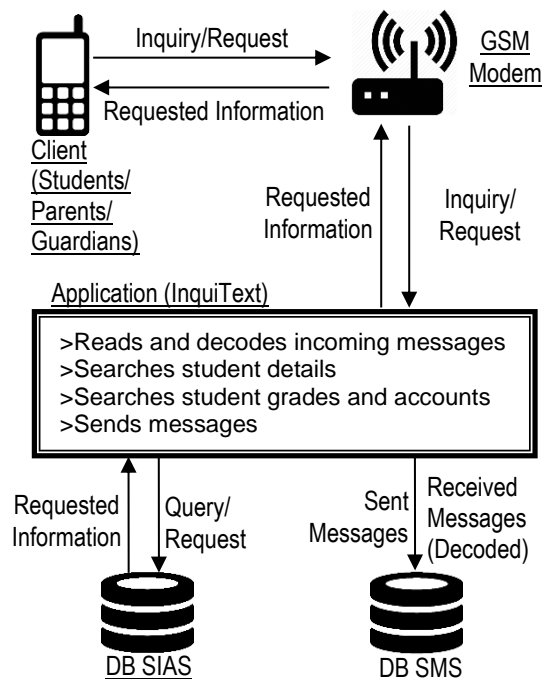


Figure 1. Conceptual Model

OBJECTIVES OF THE STUDY

The objective of the study is to develop a Cell Operator Application called "InquiText" which is a SMS-Based Auto-Reply Inquiry System for Grades and Accounts to be used by the students as well as parents or guardians. Specifically, the study aims to (a) provide an alternative and convenient way of accessing grades and accounts; and (b) provide a prompt service to the clients using any SMS-enabled mobile phones.

MATERIALS AND METHODS

Research Design

The development process until implementation of the InquiText is bounded with the Waterfall Model with five different phases such as Requirements Analysis, System Design, Coding and Module Testing, Integration and System Testing, and Deployment and Maintenance [10].

As mentioned by Ghezzi et al. [10], Waterfall Model is sequential, phase based, and document driven. This means that a phase should be completed before the next phase can be started, and each phase results in the preparation of one or more documents that form the input to the next phase. Pfleeger [11] also mentioned that stages are cascading from one to another where a

development stage should be completed before the next stage.

In the requirements analysis phase, Pressman [12] said that the software engineer must understand the information domain for the software, as well as the required function, behaviour, performance, and interface to understand the nature of the program to be built. In order for the researcher to understand the nature of the program to be built in the study, the researcher conducted an interview with the registrar's clerk, bookkeeper, and the students to gather relevant information for the design of the system. Information from the registrar's clerk is all about the grades of the students. Likewise, information from the bookkeeper is all about the accounts of the students. Both information about grades and accounts are necessary because these are the basis in the behaviour of the system and in giving reply to the student inquiries. Information from the students is all about the shortest possible format or parts of the message to be sent such as the student number, school year, and semester. In this stage, hardware requirements were also identified.

During the system design phase, the researcher created the design of the system based on the information and requirements gathered in the first phase. As mentioned by Pressman [12], the design process translates requirements into a representation of the software that can be assessed for quality before code generation begins. As a result of this phase, the operational flowchart was created as a representation of the system which is shown in Figure 3.

After creating the design of the system, it must be translated into a machine-readable form. This task is done during the third phase which is the coding and module testing phase of the Waterfall Model [12]. During this phase, the researcher performed step-by-step coding and module testing procedures in developing each function of the system. In addition, the researcher tested each function or individual module after coding to find errors or bugs.

Integration and system testing is the next and fourth phase in the Waterfall Model. In this phase, the researcher integrated all the functions and modules or features of the system as a whole. Likewise, the researcher conducted the final testing of the system as a whole before it was implemented. According to Pressman [12], this phase focuses on the logical internals of the software assuring that all program statements have been tested, and on the functional externals to uncover errors and ensure that defined

input will produce actual results that agree with required results. Hence, the researcher sent multiple messages with different formats to the GSM modem to test if the system can accurately give reply to the sender.

Finally, the last phase is deployment and maintenance which means that software will undoubtedly undergo change after it is delivered to the customer. In addition, change will occur because errors have been encountered, and because the software must be adapted to accommodate changes in the external environment [12]. During this phase, the researcher deployed the InquiText with close monitoring of the system's behaviour and activities especially in receiving SMS and sending replies to the clients. Also, some revisions were made during this phase because not all errors or bugs were discovered during the integration and system testing phase.

Hardware Components

- a. *SMS-Enabled Mobile Phone*. This will be used by the clients to send and receive SMS. Low- and high-end mobile phones can be used as long as it can send and receive SMS. Oppo A37 (high-end) mobile phone were used in the study during system testing.
- b. *GSM Modem*. This device is connected to the computer's USB port which is used to receive and send SMS. Globe Tattoo Pocket Wi-Fi was used in the study. Likewise, a SIM card (TM) is inserted in the modem with unlimited text promo which enables the system to send numerous SMS.
- c. *Computer*. This is used to deploy and manipulate the system. Windows 8 with 64-bit Operating System (OS), 4GB Ram, and 1TB Hard Disk was used in the study but computers with lower OS and lower specifications can also be used because the system does not require computer with high specifications.

Software Components

- a. *Visual Basic 6*. The researcher used this programming language in developing the front-end of the InquiText because of its features and capabilities. As described by Brown et al. [13], Visual Basic 6 allows programmers to develop Windows applications quickly and easily for PC without being an expert in other programming languages. In addition, the graphical environment of the language allows programmers to visually design the forms and controls which become the building blocks or the foundation of the

applications. Using the language makes programmers to be more productive because it provides many useful tools such as projects, forms, templates, class objects, add-ins, custom controls, and database managers. Moreover, these tools enable programmers to develop and finish applications in a shorter period. Pepito [14] added that Visual Basic 6 is use to design and develop graphical user interface (GUI) programs easily where users of the programs will be working on graphics, forms, and icons rather than typing text to accomplish tasks. This language is use to develop programs such as information systems, computer games, multimedia powered application, computer-aided instructions, and as a front-end application system for back-end databases.

- b. *Microsoft Access*. The researcher use this as back-end database because of its simplicity and capability in managing data. Connolly et al. [15] described Microsoft Access as a typical PC-based DBMS capable of storing, sorting, and retrieving data from a variety of applications which provides tools to create tables, queries, forms and reports. It can be used as a standalone system on a single PC or as a multi-user on a PC network. Elmasri et al. [16] added that this DBMS provides a database engine and a GUI for data definition and manipulation, with the power of Structured Query Language (SQL). Furthermore, MS Access as an RDBMS has several components such as Microsoft Jet Engine which is responsible in managing data. Another component is the user interface, which calls the engine to provide data services such as storage and retrieval.

Process Flowchart

Figure 2 shows the processes of the InquiText from the selection and connection of available COM Port to sending of replies to the clients. It also shows the two conditions in identification of inquiry which is either inquiry for grades or accounts. Likewise, DB SMS and DB SIAS are also included in the flowchart to show how data and information are being accessed and stored.

Measures

The researcher used interview guide in gathering relevant information from the registrar's clerk and bookkeeper with regards to student grades and accounts. Likewise, interview guide was also used in gathering the problems and difficulties from the

students with regards to accessing or inquiry of grades and accounts. The results of the interview were used as basis in developing the features and functionality of the system especially its response to the clients' inquiries. Moreover, interview guide was also used in gathering feedback from the students regarding the response of the system.

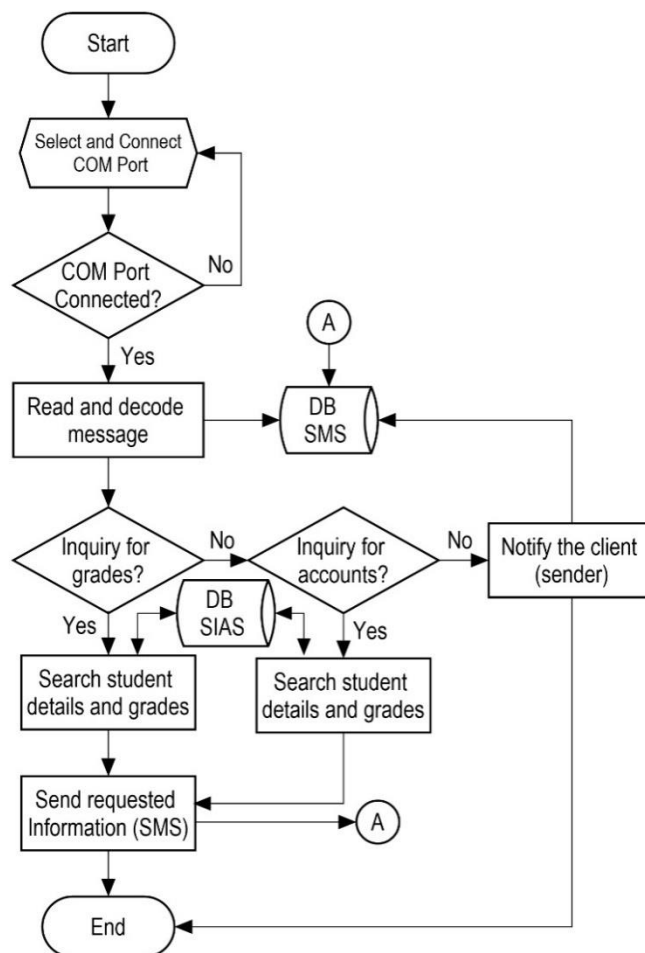


Figure 2. Operational Flowchart

RESULTS AND DISCUSSION

After gathering the necessary requirements, creating the design of the system, coding and module testing, and integration and system testing, the InquiText enables the clients to inquire grades and accounts by sending SMS through the use of any SMS-enabled mobile phones. This section presents the features, graphical user interface, and the behavior of the system towards inquiry of grades and accounts, the basic configurations before using the service, and the sample responses during testing.

Figure 3 shows the interface of the InquiText. The Initial Setting is used to select the COM Port of the

GSM modem connected to the computer but the InquiText will automatically search and connect to the available port upon launching. The Refresh Port button is used to refresh, search, and automatically connect the InquiText to the available port when it was disconnected or a new GSM modem is inserted after launching. If the port is connected successfully, a notification will be displayed in the event log and the InquiText is ready to read incoming SMS.

Excluded Subscribers' Prefix button is used to display the sent responses (Figure 4) and the prefix of mobile numbers from the different subscribers that will be excluded in receiving replies (Figure 5). Figure 4 and 5 are used to manipulate the responses and prefix of mobile numbers stored in the SMS database.

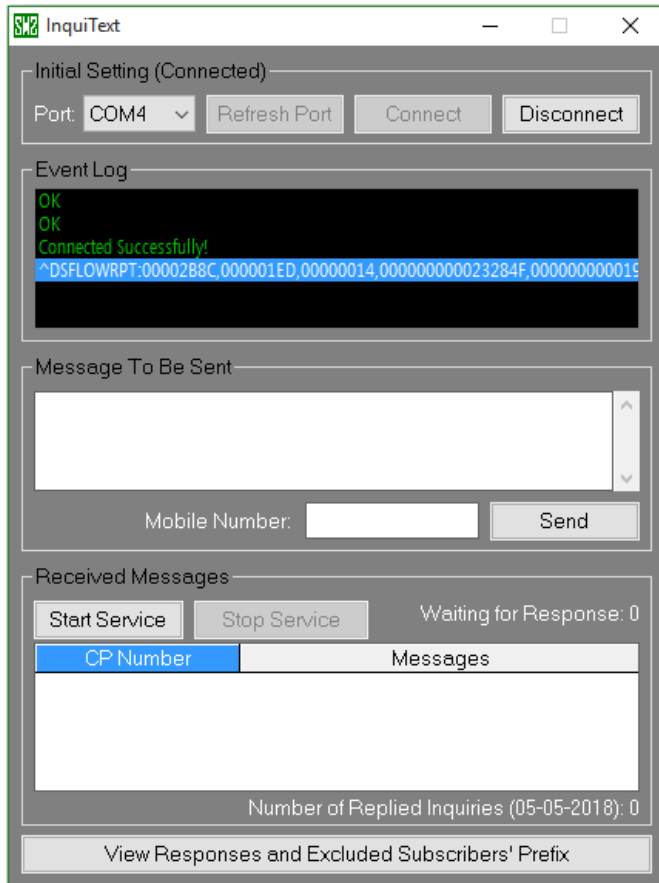


Figure 3. User Interface

The Event Log simply displays the events or activities of the GSM modem such as reading of messages from the COM port and sending of replies. The Message To Be Sent is used to display message to be sent to the clients. It is also used to manually encode the message to be sent to a specific mobile number if the service has not yet started. The Received Messages portion is used to display the decoded SMS stored in the SMS database that were not yet responded by the InquiText. The user needs to start the service to activate its auto-reply feature to the clients' inquiries. Notification that the service has been started will also be displayed in the event log. The View Responses and

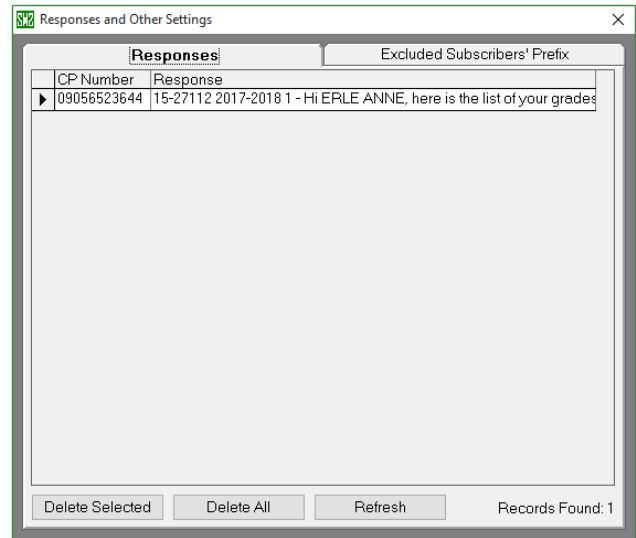


Figure 4. Sent Responses

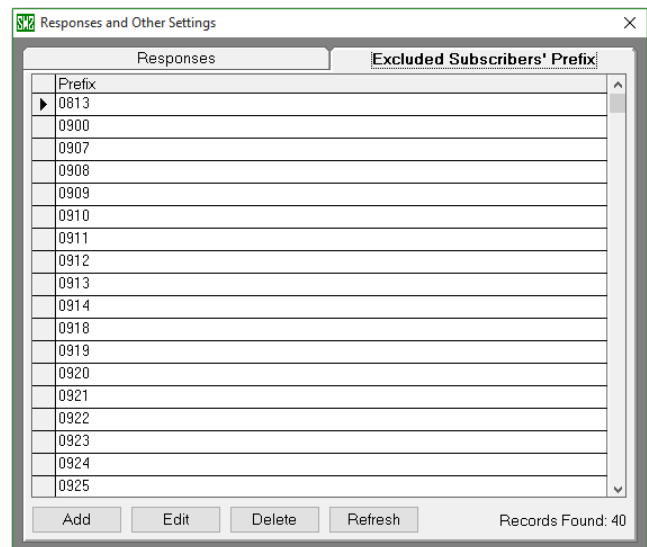


Figure 5. Excluded Subscribers' Prefix

After completing the basic settings, inquiry of grades and accounts will immediately be available to the clients. The first feature is the grades inquiry. In the behavior of the InquiText, if a client sends a correct

format for grades inquiry, the InquiText searches the student information as well as the grades from the SIAS database then sends the requested details to the client through SMS (Figure 6). After a few seconds, the client will receive the SMS containing the requested grades with general average based on the school year and semester indicated in the request (Figure 8).

The InquiText will also notify the client if the format of the SMS that was received is incorrect (Figure 7). Moreover, if the system cannot find the student information or grades based on the specified school year and semester, the system will also properly notify the client (Figure 9).

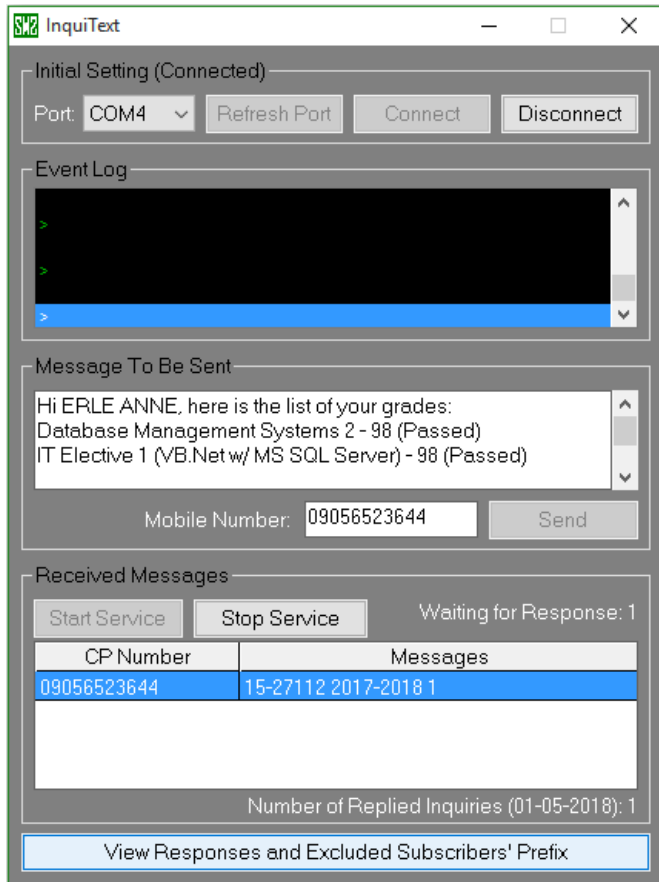


Figure 6. Grades Inquiry

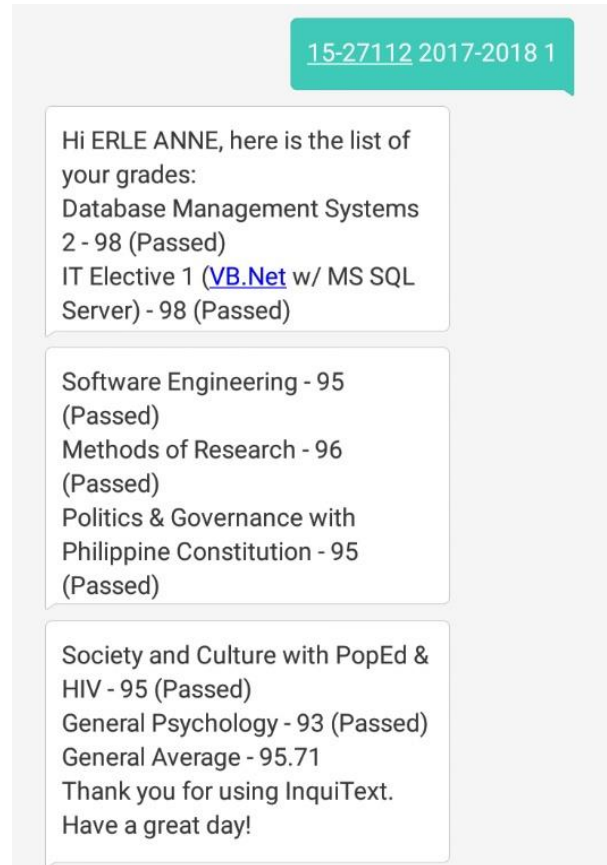


Figure 8. Request and Response (Grades)

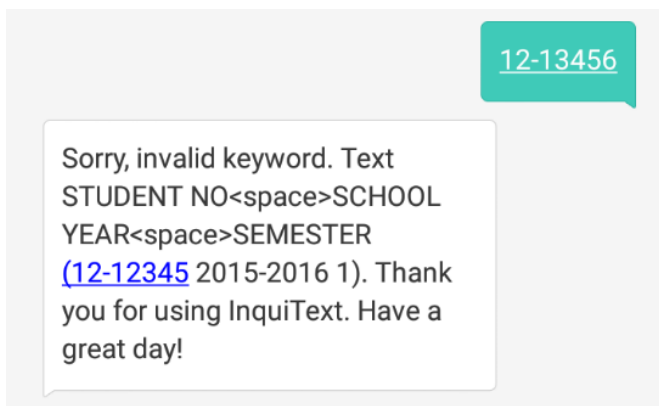


Figure 7. Notification for incorrect format (Grades)

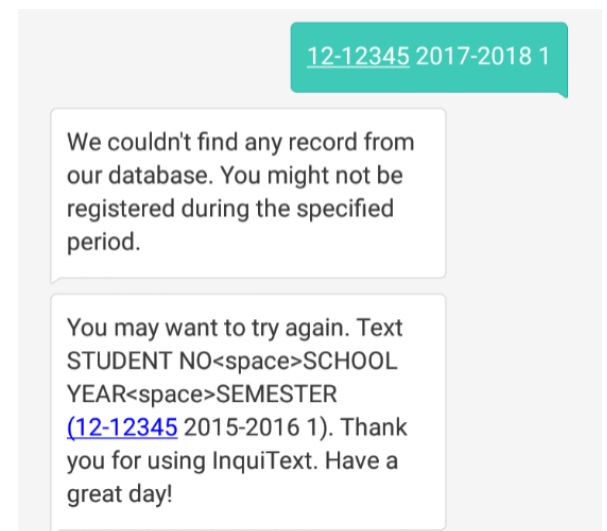


Figure 9. Notification for no record (Grades)

Another feature of the system is the accounts inquiry. If the InquiText receives a correct SMS format from the client, it will search the student information (Figure 10), total fees, amount paid, and balance. After searching for the requested account details, the client will then receive the total fees, total payment, and the total balance (Figure 11).

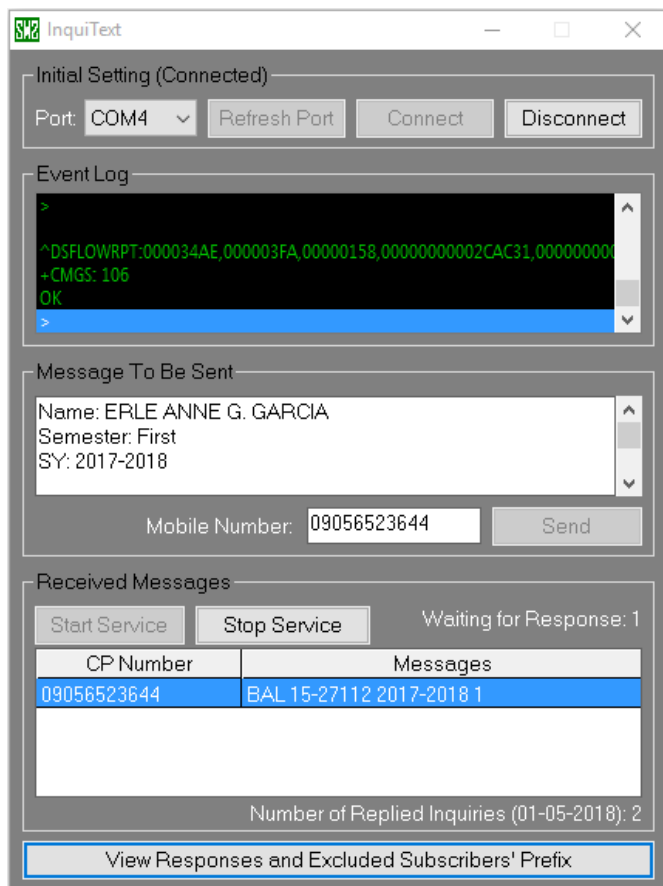


Figure 10. Accounts Inquiry

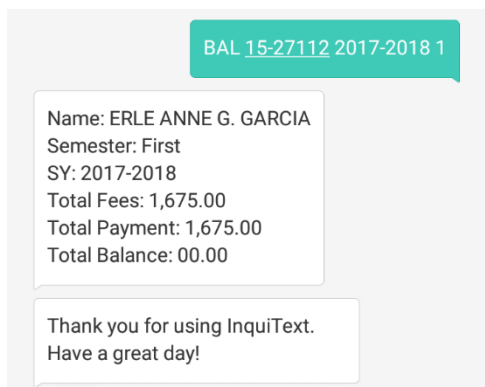


Figure 11. Request and Response (Accounts)

If the InquiText receives an incorrect format for accounts inquiry, the client will also be notified (Figure 12). Likewise, if the student number does not exist in the database, the InquiText will also notify the client (Figure 13).

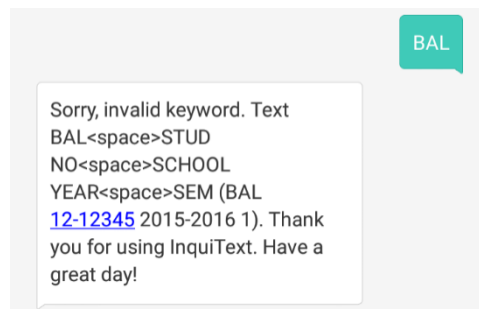


Figure 12. Notification for incorrect format (Accounts)

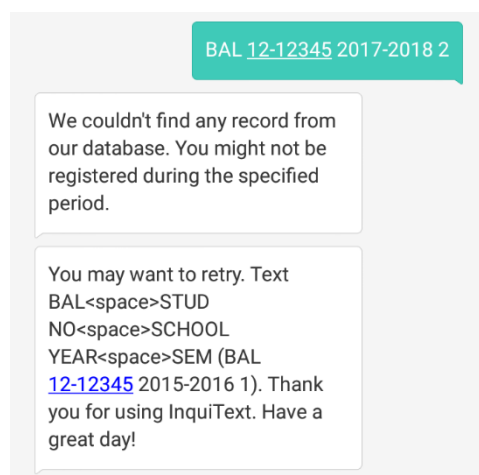


Figure 13. Notification for no record (Accounts)

After series of system tests, the researcher deployed the InquiText and it is being maintained which is the last phase of the Waterfall Model. In addition, the results of the tests show that the InquiText provides accurate and prompt response to the clients' inquiries. Moreover, the InquiText serves as an alternative solution in the absence of internet service which makes the grades and accounts accessible anywhere in the country through the use of any SMS-enabled mobile phone. As a result, the InquiText does not require students, parents or guardians to visit the different offices because it already enables them to inquire grades and accounts conveniently through mobile phones.

CONCLUSION AND RECOMMENDATION

This paper presents the InquiText that is currently implemented and maintained at the Cagayan State University – Lasam Campus, Philippines which provides advantages to the clients especially to the students. Likewise, this paper presents an alternative way of accessing real-time student records in the absence of services over the internet wherein clients can access grades and accounts conveniently anywhere in the country using any SMS-enabled mobile phone with the assistance of the InquiText. In addition, the InquiText provides prompt service to the clients because accessing of grades and accounts can be done anytime without personally transacting with the registrar's clerk and bookkeeper. Likewise, it makes the registrar's clerk and the bookkeeper more productive. Moreover, the InquiText enables parents or guardians to monitor the academic performance and accounts of the students regularly.

The observed advantages of the InquiText indicates that the system should be maintained and sustained. However, due to the absence of factual evidences on the advantages and the positive effects of using the system, the researcher highly recommends that a usability study should be conducted to properly assess the system for improvement.

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