

A SYSTEM FOR TWO-WAY QUERY MECHANISM WITH INFORMATION DISSEMINATION USING SHORT MESSAGE SERVICE (SMS)

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ABSTRACT: *The availability of up-to-date information to people is an important requirement in many scenarios, especially in educational institutions. Thus, most Universities either use social media or bulletin boards. In this paper, the researchers developed a system that can be used to provide up-to-date and reliable information to students using the most common technology. This developed system utilizes Wi-Fi and GSM technology along with a web application. The system is designed to have two-way communication between the staff and the students. When a student needs any information, they will need to send a query message via SMS to the system, and then the system will analyze the query. Formatted queries will be automatically responded by the system. Unformatted queries will be redirected to an office suitable to answer the query. The system also has the facility to disseminate announcement to students via SMS. The researchers conducted a system usability evaluation to the users using the System Usability Scale (SUS) and obtained a score of 71.875 which means that the system has an average performance to the users. The system was tested on its efficiency in terms of query classification and redirection and gained positive on its results. The results have shown that the users find the system easy to use and information handling is more efficient.*

Keywords: two-way query mechanism, automatic response, information dissemination, short message service

1. INTRODUCTION

With the increasing population of the university, disseminating information in a timely manner is a challenge. This information could be a university event, announcement, enrolment schedule or other related information. This varied information involves varied groups of recipients and different offices are involved depending on the type of information to be disseminated. Communication channels used to disseminate info also varies which may create confusion to the students on where to have this reliable information.

For basic student inquiries regarding school matters, students have to go through all the hassle of getting information for their inquiries by going to offices, and these would result to unsystematic and congested offices. It is a wearying task for both the students and the staff.

The developed unified system will provide a single reliable source for dissemination of school related information. The system is a web-based application that provides the staff an interface where the information will be inputted and will be sent automatically to the selected group of registered mobile numbers of the students using Short Message Service (SMS). The system can also automatically reply to formatted queries or redirect unformatted queries to the concerned office.

SMS is one of the easiest and fastest ways of communication. Student's access to mobile technology is very high and therefore the use of SMS is very convenient for the students [1]. In addition, Philippines is known as the 'texting capital' of the world. SMS has become a popular communication utility among people and especially to students [2]. SMS can be used to send updates to students and employees [3]. SMS can also be used as a means of communication between the school and the parents [4]. SMS can also be used as a platform for distance learning [5]. The role of SMS in education has become a phenomenon and an indispensable communication system. With the use of mobile phones as a tool for receiving information on student academic and

extracurricular affairs, the students will be notified when and wherever they are.

The system is made to have a two-way communication with the students. The students may send their school inquiries to a registered mobile number used by the system and staff from corresponding offices will send a response to the query. The students can also send a code for a certain query that was set into the system and the system will automatically send a corresponding response.

2. MATERIALS AND METHODS

Figure 1 depicts the flow of information dissemination from the staff to the students and query response requested by the students. The admin/staff in-charge of handling the system will input the announcement message and select the set of recipients into the web application. The contact numbers are stored in the database as soon as the students are registered into the system. The notification details such as the notification message and contact numbers are forwarded into the Wi-Fi Module, then this information is sent to the set of recipients using the GSM Module.

For query response, the student will send his/her query to a phone number to be used by the GSM Module. The query and student's phone number that the GSM Module received will be forwarded to the server using the Wi-Fi module. The system will analyze the query and if the query is a code, the server will look for the suitable query response stored in the database, or else the query message will be sent to the admin. The query response will then be sent to the students.

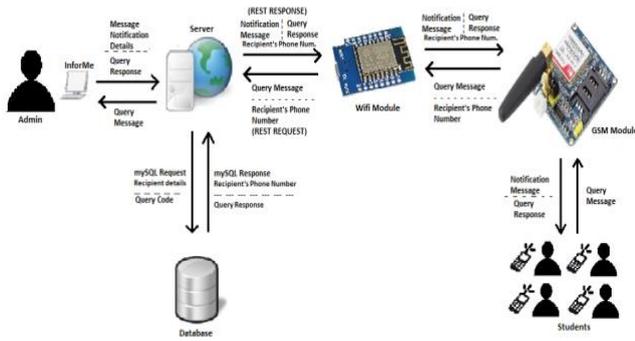


Figure 1. System Architecture

A. Query Classification and Keyword Matching

The system supports two-way query mechanism which accepts formatted and unformatted queries. The query will be classified first if it is formatted or unformatted. If the query matches a code in the database, then it is a formatted query, and an automatic response will be sent to the student. Table 1 lists some sample codes to be used for the formatted inquiry and the corresponding response for each code.

Table 1. List of sample codes and its corresponding response

CODE	RESPONSE
CODES	Formatted Queries
	USTP_EXAM_PRELIM
	USTP_EXAM_MIDTERM
	USTP_EXAM_SEMIFINAL
	USTP_EXAM_FINAL
	USTP_DRESSCODE_MALE
USTP_DRESSCODE_FEMALE	
USTP_EXAM_PRELIM	2018 July 12-18 Preliminary Examination for 1 st Semester Undergraduate Level
	2018 December 3-7 Preliminary Examination for 2 nd Semester Undergraduate Level

For the unformatted queries, the system will extract keywords from the text and compare it to the list of keywords for each identified office. Each office is assigned with a cluster of keywords. The cluster with the highest number of matched keywords will determine to which office a query will be redirected.

B. Development of the Web-based Information Dissemination System

The web-based system provides an interface for the offices to input announcement message and select target recipients. Unformatted messages are redirected to a suitable office to answer the query using keyword matching. Unformatted queries will then be viewed by the office staff where the message is redirected to and the staff can response to the query in which the response will be received by the student through SMS.

The web-based system is developed through the use of CodeIgniter with Javascript. CodeIgniter is a popular, lightweight, open-source framework written in PHP and based on the Model-View-Controller (MVC) architectural pattern.

C. Setting up the SMS Transmitting Device

Figure 2 shows the actual setup of the SMS transmitting device. The device consists of modules – a Wemos D1 Mini Wi-Fi Module and a sim900a GSM Module. The LED light serves as an indicator for Wi-Fi connectivity.



Figure 2. Actual Setup of the SMS Transmitting Device

The device consists of a GSM Module, a Wi-Fi Module, a led light, and 330 ohms resistor. The GSM Module is powered by the Wi-Fi module via its 5v and ground pins. For both modules to communicate, the TX pin of the GSM Module is connected to the Wi-Fi Module’s D2 pin and the RX pin of the GSM Module is connected to the Wi-Fi Module’s D3 pin. The led light serves as an indicator for network connectivity. The whole system is powered by a power supply with 5 volts and 2 ampere output.

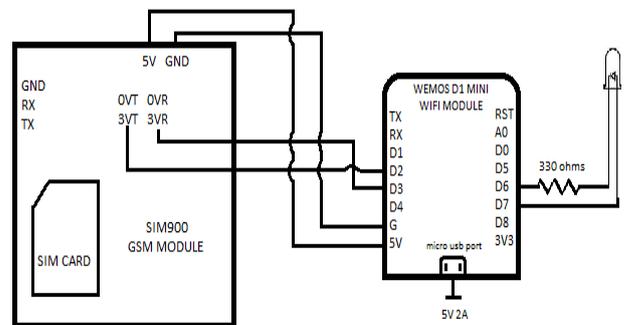


Figure 3. SMS Transmitting Device Schematic Diagram

3. RESULTS AND DISCUSSION

A. Web Application Interface for Information Dissemination

Figure 4 presents the interface where the staff can input the announcement message and select the set of recipients which is classified by college or by department.

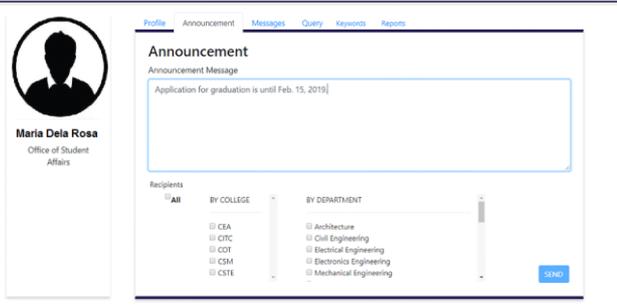


Figure 4. Sending Announcement Message and Selection of Recipients

Figure 5 shows the list of recipients registered in the system and their corresponding information such as their college and their phone number, which are both vital to the announcement dissemination process.

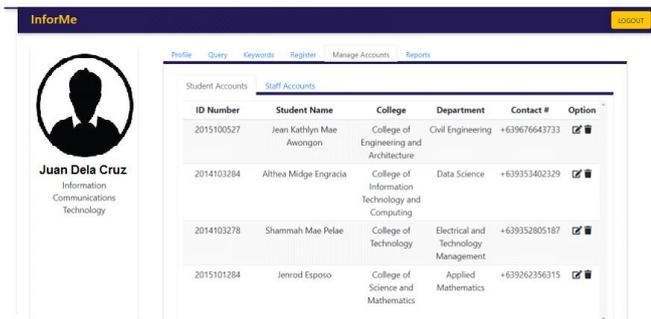


Figure 5. List of Recipients Registered in the System

The screenshots in Figure 6 shows proof that the announcement message in Figure 4 was successfully received by the registered students in Figure 5.

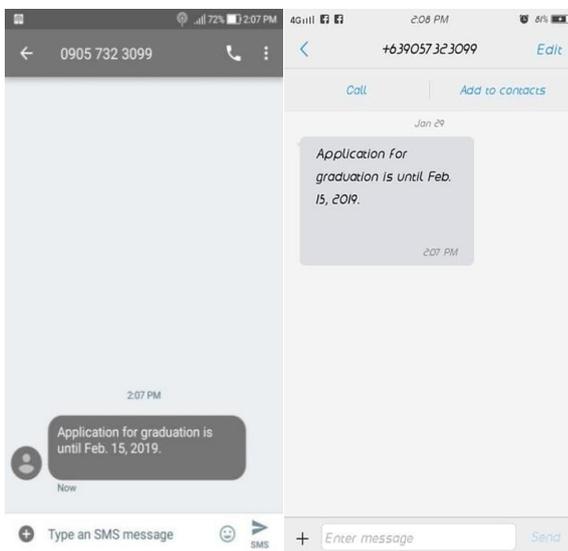


Figure 6. Sample Received Announcement

B. Inquiry Using Formatted Text Message

Figure 7 shows the list of formatted text queries with its corresponding response that are stored in the database that the students can inquire about. The staff can add another formatted query by clicking 'ADD QUERY' button. The screenshot shows proof that the student inquired using some

of the formatted queries and was replied automatically by the system.

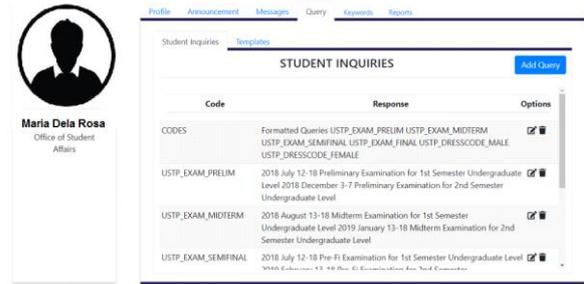


Figure 7. Formatted Text Query List

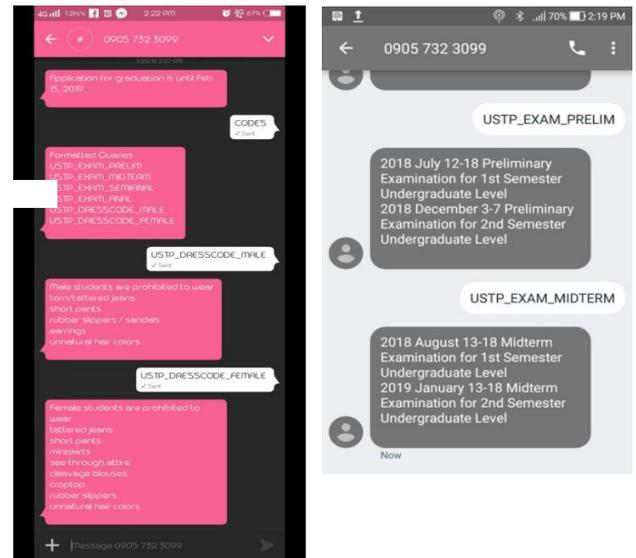


Figure 8. Sent Formatted Query with Automatic Response

C. Inquiry Using Unformatted Text Message

The unformatted query from the student shown in Figure 9 is one example of the Frequently Asked Questions from the Admissions and Scholarships Office. Hence, the query should be redirected to the aforementioned office.

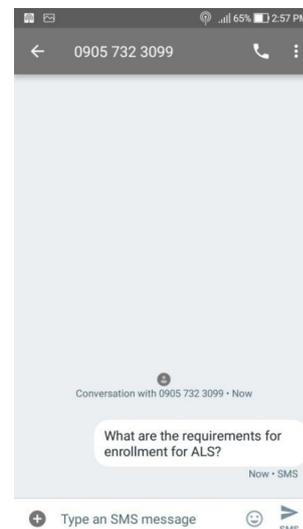


Figure 9. Sent Unformatted Query Message

Figure 10 shows the query message from the student that was received by the system. The message list shows the messages received from a distinct phone number. The whole message thread will be opened when the phone number is clicked. In addition, the query from the student was redirected to the office suitable to answer the query.

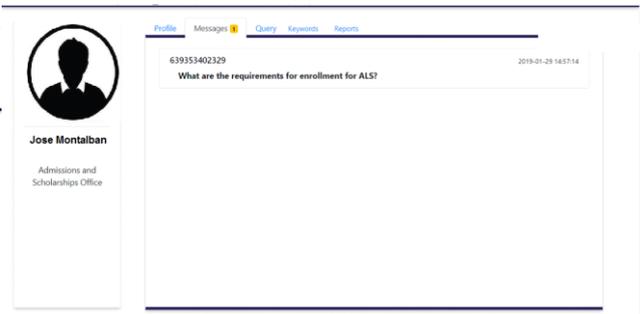


Figure 10. Received Unformatted Query Message

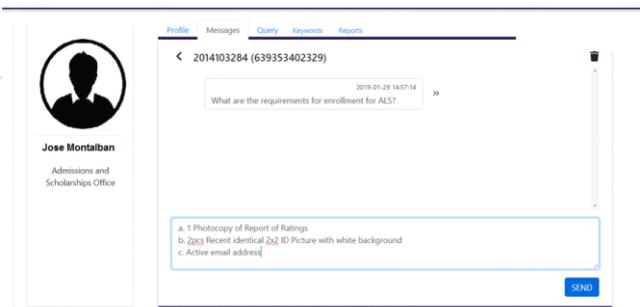


Figure 11. Responding to the Query Message

The query response will be inputted in the text field provided when the message is viewed.

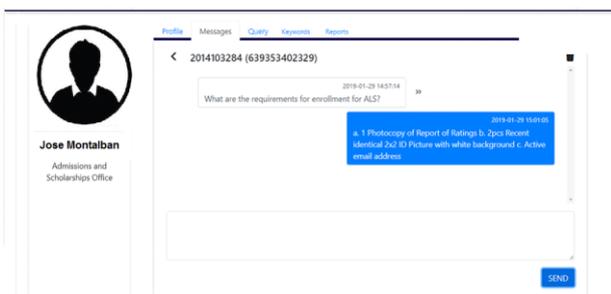


Figure 12. Sent Query Response by the Staff

The message response will be displayed on the message thread when the response is sent back to the student.

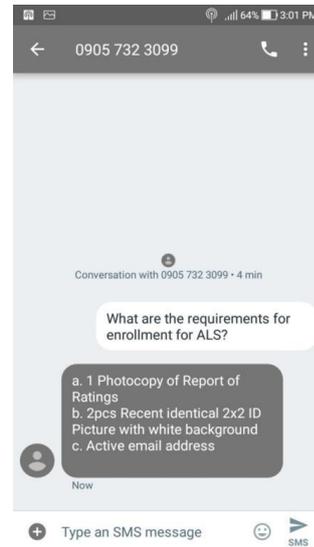


Figure 13. Received Query Response from the System
Figure 13 shows that the response inputted by the staff was received by the student.

D. System Evaluation

A survey and testing of the system were conducted to students and staff from identified offices related to student services, which will measure the efficiency, functionality, and usability of the system.

Fifty (50) query messages were sent to the system to test its efficiency in terms of classifying the message whether it is formatted or unformatted query message. Thirty (30) queries are formatted messages and twenty (20) are unformatted messages. During the testing, all the query messages are correctly classified as to the structure of the message (Table 2).

Table 2. Efficiency of the System for Query Classification

Number of Formatted Queries Sent	30 query messages	
Number of Unformatted Queries Sent	20 query messages	
Number of Query Classified as Formatted	30 messages	100%
Number of Query Classified as Unformatted	20 messages	100%

Twenty (20) unformatted queries were tested to try the system's efficiency on the redirection of query messages to the suitable office. Out of twenty (20) query messages, seventeen (17) queries were redirected correctly to the office that was responsible to answer and three (3) queries were redirected to the wrong office (Table 3).

Table 3. Efficiency of the System for Query Redirection

Number of Unformatted Queries Sent	20 messages	100%
Number of Unformatted Queries Redirected to Suitable Office	18 messages	90%
Number of Unformatted Queries Not Redirected to Suitable Office	2 messages	10%

Table 4 shows the usability of the system. The result shows that 8.67% of the respondents were undecided and finds it neutral to use the system. 47.6% agreed to the usability of the system while 43.66% of them answered strongly agree on the convenience of using the system (Table 4). It is evident that most of the respondents strongly agree that the system is useful. Mostly agree that the system is easy to use and would likely recommend it to other students as the system is effective when it comes to addressing their query and announcement dissemination.

Table 4. Usability of the System for the Students

Questions:	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The system is useful to the students.	0%	0%	4%	36%	60%
The system is easy to use for asking questions.	0%	0%	8%	60%	32%
I would like to use the system frequently.	0%	0%	10%	54%	36%
SMS method for announcement dissemination is reliable.	0%	0%	8%	50%	42%
I would encourage my colleagues to use the system.	0%	0%	8%	40%	52%
The SMS query method is effective and informative.	0%	0%	14%	46%	40%
TOTAL	0%	0%	8.67%	47.7%	43.7%

The System Usability Scale (SUS) is the most widely used standardized questionnaire for the assessment of usability [6]. The System Usability Scale (SUS) was used to determine the usability of the system. The findings suggest that the system is a useful tool in serving its purpose. The system usability score that is 71.875 gets a C rate, which says that the system is doing great but could improve (Table 5).

Table 5. Usability of the System for the Staff

Questions:	Mean Value	SUS Converted Value
I think that I would like to use this system frequently.	3.75	2.75
I found the system unnecessarily complex.	2.75	2.25

I thought the system was easy to use.	3.5	2.5
I think that I would need the support of a technical person to be able to use this system.	1.5	3.5
I found the various functions in this system were well integrated.	2.75	1.75
I thought there was too much inconsistency in this system.	3.75	1.25
I would imagine that most people would learn to use this system very quickly.	3.5	2.5
I found the system very cumbersome to use.	2.0	3.0
I felt very confident using the system.	3.25	2.25
I needed to learn a lot of things before I could get going with this system.	2.0	3.0
Total Score: 28.75		SUS Score: 71.875

4. CONCLUSION

Based on the system testing and survey conducted by the researchers, the results have shown that by using SMS for communication between the educational institute and its students is a simple approach for them to keep track of the on-campus activities, the dissemination of announcement is also more efficient and effective than the current process. Using this system to respond to corresponding queries from the student will give less hassle to the staff. Findings also suggest that the developed system had a positive effect on providing an effective way to handle and manage the dissemination of announcements and responding school related inquiries. Moreover, most of the respondents strongly agree that they are satisfied with the system.

5. ACKNOWLEDGMENT

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