

Enhancing Student Automated Registration, Information, and Accounting System through Interactive Voice Response System and Customer Relationship Management using Asterisk Application

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Abstract:

The advancement of information technology helps improve customer services worldwide, it is also a tool in improving existing systems to facilitate CRM information retrieval faster and smarter. The enhancement of Student Automated Registration, Information, and Accounting System (SARIAS) through Interactive Voice Response System (IVRS) and Customer Relationship Management (CRM) using Asterisk application enables the ease of handling documents by reducing paper works, time consumption that improves access to students to get information based from their query about their grades from the database of SARIAS anywhere at any time through their mobile phones. Among its benefits, IVR relieves administrative staff and faculty of routine customer interactions and helps the university increase their efficiency, productivity, and profitability. It also routes call to concerned offices and make inquiry to the personnel of the office, and finally it allows the caller to evaluate the services before exiting to the IVRS. System evaluation with the used of questionnaires based on the extent of compliance of the developed system in terms of Agile and DevOps methodology, and ISO 25010 software quality standard were used. The overall assessment by IT experts and end-users revealed that the enhanced SARIAS along with quality of services, accuracy of records, reports, and timeliness had a positive result and an effective instrument in the delivery of front-line services of Isabela State University.

Index Terms -Asterisk Application, CRM, DEvOps methodology, ISO 25010, IVRS, SARIAS.

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I. INTRODUCTION

Advancements in technology are yielding significant benefits for organizations to improve the overall customer service over the world. The Interactive Voice Response System, shortly called IVR, is a technology that allows a computer to interact with humans using voice and Dual-tone Multi-frequency signaling (DTMF). This technology enables the identification and routing of users to the most adequate agent within the company, increasing efficiency and reducing costs as a result from customer segmentation.

In other words, the IVR is the automated technology behind the pre-recorded instructions, questions, and suggestions that you hear so often on the phone before talking to a real agent. In more sophisticated systems, companies are able to gather input and real-time responses through spoken words using voice recognition. This means that sometimes, you can complete less complicated cases (such as paying a bill), without ever having to talk with an actual customer service representative.

Meanwhile, Higher education institutions (HEIs) are experiencing vital changes in the way they operate and interact with their ‘customers’, i.e. students, their parents, alumni, employers and staff members. Higher education clients are demanding more attention and instant service, so proactive universities are turning to technology – customer relationship management systems – to cater to this demand in an effective way.

From the article, “The importance of CRM systems in Higher Education,” the author (Vugt & Knasys, 2018) explains Customer Relationship Management Systems in Colleges and universities as software applications used to automate and manage communications with prospective and current students, employees, alumni, donors – everyone in your institution’s community. Customer information, such as lead’s/customer’s name, gender, educational background, telephone, email, marketing materials, social media and any other relevant information across different channels is compiled into a single database enabling easier information access, allowing to personalize and customize messages and the channels used to deliver the message to the student in a timely manner. Every interaction with the “customer” is tracked by the CRM, all in one place.

Higher education CRM systems normally serve three key audiences: prospective students, current students, and alumni/donors. As colleges and universities increasingly embrace distance learning and e-business, Customer Relationship Management (CRM) will become stronger and more pervasive. Viewing students as customers provides a competitive advantage for higher education and enhances university’s ability to attract, retain and serve its customers. According to Seeman and O’hara (2006), the benefits of implementing CRM in a college setting include a student-centric focus, improved customer data and process management, increased student loyalty, retention and satisfaction with the college's programs and services. Furthermore, viewing students as customers provides a competitive advantage and enhances a college's ability to attract, retain and serve its customers. As colleges

increasingly embrace distance learning and e-business, CRM will become more pervasive.

It is a technology that builds the bridge between user and computer database where user communicates with the computer through dual tone multi frequency (DTMF) signals that are given as input through their telephone keypad when connection is established. IVRS can automatically answer more customer questions over the phone without any need to have them speak to live agent (twilio.com, 2018). This technology accurately recognizes customer interaction whether it is spoken, using artificial intelligence (AI) driven speech software, or generated by keypad, using DTMF.

It is today’s most common business balancing act like meeting the ever-growing customer demands while optimizing operational costs. With the successful implementation of an Interactive Voice Response System (IVRS), many businesses are doing just that: delighting customers by giving them quick access to the information they need while simultaneously reducing costs.

The implementation of Information and Communications Technology (ICT) to improve and modernize the Isabela State University (ISU) with emphasis on automation of frontline services, inter-connectivity, and online services has been established. Its first major initiative was the automation of its student information, registration, and accounting system – the Student Automated Registration, Information, and Accounting System (SARIAS) project was initiated and implemented in the university system which is intended to automate the major front-line service of the university – admission and registration of students, it was initiated internally with the goal of automating the admission (examination, profiling of student entrants, issuance and assignment of student identification (ID) numbers bearing the University Commission on Higher Education (CHED) Code - university ID and campus ID, year and term of entry; and documentation of scholarship benefits); academic advising (choice and approval of courses to enroll and enlistment to corresponding courses);

assessment of university fees; payment of fees (computerized receipting); and issuance of registration documents. The initiative is a pioneering ICT Project that systematically addressed a broader set of front-line services geared towards the attainment of the set ICT vision. The SARIAS was installed and networked in the ISU system, primarily in the office of accounting and registrar; it allows the staff to input data, view and print records of students. The faculty can also access the SARIAS with their individual security code for them to input the attendance, quizzes and examination results then compute the grades every end of the term. When a client, either student or parent wanted to make an inquiry on the details of grades, they need to go to the Registrar's office. The staff will ask the student ID number or the complete name of the student and input to the SARIAS before she can view the record. For the grades which were not yet submitted by the faculty, the client personally approaches every subject teacher. These processes to inquire may be very tasking, time consuming and expensive especially if the parent is leaving outside the municipality, province, or even in the country. In today's fast life, parents do not have time and find difficulty to visit the school to know their child's performance. Hence, the automatic voice responding system is used.

In order to give the best services to its clients and to fast track and lessen the work of the personnel, the proposed enhancement of Student Automated Registration and Integrated Accounting System (SARIAS) with Interactive Voice Response System (IVRS) and Customer Relationship Management must be strategically deployed to improve the overall customer service by providing functionality rather than being too time-consuming or expensive to do manually.

The system used the existing system (SARIAS), where all the needed information regarding grades are stored in the database. The system enables ease of handling documents by reducing paper works, time consumption and allow parents to get information anywhere at any time through their mobile phones. It also has the capacity to increase staff efficiency, as performing of task and analyzing

of data can be done more quickly through their phones without the interaction of the college authority. It enables the caller to receive information or data based from his query from the database of SARIAS anywhere at any time over the phone. It also routes the call to concerned offices and make inquiry to the personnel of the office, and finally it allows the caller to evaluate the services before exiting to the IVRS.

Conceptual Framework

The study will be anchored on the concept of enhancing SARIAS through Interactive Voice Response System and Customer Relationship Management, which is composed of four phases namely: the user interface, models, knowledge generated out of the models and the data (Abdullah Saad AL-Malaise, 2013). Figure 1 shows the integration of DM and the DSS.

The concept of the study will evolve on the conceptual model adopted from the article of Rouse (WhatIs.com)

How a Call Moves Through the IVR System

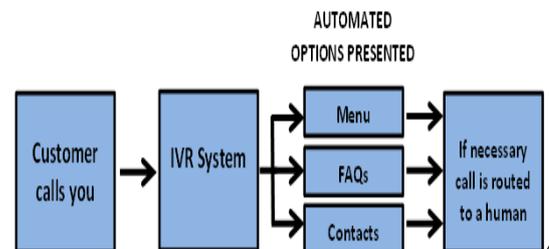


Figure 1. Conceptual Framework

An IVR application provides prerecorded voice responses for appropriate situations, keypad signal logic, access to relevant data and, potentially, the ability to record voice input for later use. Using computer telephony integration (CTI), IVR systems can hand off a call to a human being who can view data related to the caller on a display.

IVR systems also use dual-tone multi-frequency (DTMF) signals as a line of communication between a phone and a computer. The computer uses a telephony board or card to understand DTMF signals.

IVR software enables an organization to use prerecorded greetings or menu options that a customer can access through a phone keypad. Advanced IVR systems may include speech recognition software to enable a customer to communicate with a computer.

IVR systems are based on the programming language voice Extensible Markup Language (VoiceXML). VoiceXML consists of several components, including a telephone network, a TCP/IP network, a VoiceXML telephony server, a web server and databases that all work together to provide the best possible customer service. The IVR system in the latter case eliminates the need for a switchboard operator to answer incoming calls. This instance often presents a caller with a menu of options and can attempt to answer frequently asked questions.

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II. METHODOLOGY This chapter presents the methods and procedures used in the gathering of information needed for the current study. It consists of System Development Life Cycle Research Design, Participants of the study, Instrumentation, Data Gathering procedure and Data Analysis.

Research Design

The study utilized a descriptive and software development method of research which involved the integration of CRM using IVRS. This method involved the enhancement of the SARIAS generating a better Customer Relationship Management (CRM). The method ensured a better management as compared to the existing system in terms of its accuracy and it was tested with the assurance of more improved student record’s management. Further, the enhanced SARIAS will bring a better administrative decision support activity of the university.

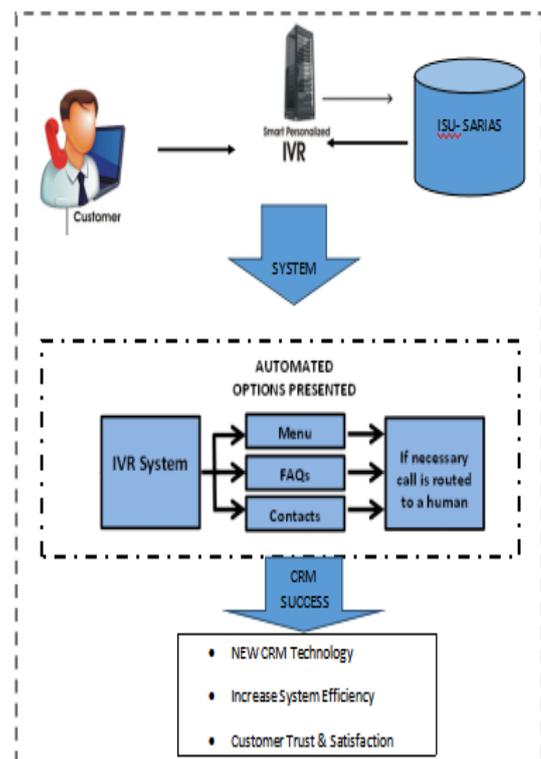


Figure 2. Architectural Design of the Enhanced SARIAS Through Interactive Voice Response System and Customer Relationship Management (CRM).

The enhanced system has 3 options for the client or the user, using the android mobile app, SMS, and call. The IVRS mobile android app was first designed and developed using HTML, ajax and php. In order for the client to use the app, he must first download the said app in his/her mobile phone. For security reasons, he must log in first his username using his ID number, and the default password ISU and his campus (e.g. ISU - Roxas). Once the password is entered, it prompts the user to change the default password into his personal password. In order for the parents to access the app, they must also download first the app then make a request to access the records of their child, and then they will be given a username and a password. Once log-in, the user can now make different queries, such as: 1. Grade, 2. Route calls, and 3. Exit. All the information will be retrieved from the database of SARIAS and will be sent to the client according to his query, once the user will exit, the system will ask the user first to evaluate or rate the service of the IVRS app before he/she can finally exit.

The next option of the user is using the SMS. This system must be first designed and developed using visual.net and mariadb. In this user's option, the client can access the information from anywhere at any time by simply dialing a IVRS customer service number then a menu options will appear. First the client will enter the username and password, once the system verified that the reply is correct or valid, a menu options for the different queries will be displayed, the client can now make queries by simply replying the equivalent number for every menu option, IVRS SMS will send a reply to the client based from the retrieved information from the SARIAS.

The third option is calling the IVRS number. In this user's option, the user gets information anywhere at any time in the form of voice by simply dialing the IVRS service number provided and following the instructions when a connection has been established between the caller and IVRS service number. The ring detector circuitry detects caller and connects caller to computer. The caller gives input in the form of dual tone multi frequency signal, which is obtained when a caller presses a

key from his cellphone set according to the set menu options, then the connection is established, computer generates voice response. Voice response is generated dynamically according to the input from caller. As caller enters valid response the corresponding database is converted into voice format by "Text to Speech converter" which is inbuilt in computer with operating system of the computer. Features of IVR incorporate different technical components such as the IVR software (voice portal), VoiceXML applications, speech recognition, VUI, text-to-speech, and IP telephony infrastructure that must all work together. New technologies such as visual IVR, voice-enabled artificial intelligence (AI), and conversational user interfaces exacerbate the testing challenge.

All the transactions will be stored and recorded to the database. For further inquiries beyond the limit of IVRS, the client can call the IVRS service number and route the call to the selected office.

The Software Development

The development of the enhanced SARIAS was organized based from the Continuous performance improvement (CPI), which is iterative and fits well with both Agile and DevOps software development methodologies. An agile approach defines the business goals and success criteria in smaller increments, delivers continuous subsets of high-value features and puts them in the hands of users as fast as possible. This provides the development team with faster product verification so they may continue to deliver iterations which align with user expectations or adapt their output to counter for missed or changing expectations. Figure 4 depicts the stages that will be undertaken following the RAD process.



Figure 3. Continuous Performance Improvement (CPI) for both Agile and DevOps software development methodologies.

III. RESULTS AND DISCUSSIONS

The following are summary of the results of the study.

1. Respondents' challenges and issues encountered in the existing SARIAS are: 1)lack of end-users training, 2) no direct access to the system, 3) slow processing of data requested, 4) tasking and too tiring 5) to request and follow-up documents was costly and expensive, and 6)time consuming.
2. The enhanced SARIAS helps the school management to give the best customer service to its clients.
3. The overall extent of compliance of the developed application to ISO 25010 Software Quality Standards shows a very high extent on how the system performs in terms of the following: Functional Sustainability, Performance Efficiency, Compatibility, Usability, Reliability, Security, Maintainability, and Portability.
4. Students who wanted to view their grades will no longer proceed to the registrar's office because there is an enhanced SARIAS where students could access their information anywhere and anytime through their mobile phones. On the contrary, when the enhanced SARIAS is not connected to the Internet, the application of IVRS will not function.
5. Enhancement of the enhanced SARIAS should be further be developed to increase its efficiency to give the best customer service among its clients.

IV. RECOMMENDATIONS

Based on the findings and conclusions made, the researcher recommends the following:

1. A need for series of end-users training, orientations, and wide dissemination on how to use the enhanced SARIAS are recommended to avoid issues and problems, and to maximize its usage.
2. The management needs to encourage more researchers, system developers to determine what are the important researches to be conducted, systems to be developed to support or help the university in adapting the latest trends.

3. The need for continuous evaluation of the enhanced SARIAS is strongly recommended by integrating the latest and applicable software quality standards because as we all know that technology changes in a second, the technology we have today may not be applicable for tomorrow.
4. The management needs to support on the technical side of the enhanced SARIAS in order to function at its best service for the clients.
5. There is a need for continuous development of the enhanced SARIAS by adding additional menu options to choose from to increase staff efficiency and better customer service.
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