DESIGN AND IMPLEMENTATION OF INTEGRATED MOBILE RESPONSIVE STUDENT ENROLMENT SYSTEM

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ABSTRACT: *The integrated online student enrolment and information management system enables applicants to apply and enroll into programmes of their preferred choices in Wa Polytechnic prior to the commencement of the academic year and semester. The activities involved in the implementation of the system were requirements gathering, specification analysis, system design, end user training and post implementation review. A prototype of requirement specifications was developed, tested, reviewed and approved by the user. The successful implementation of the student information management system was based on the involvement of the stakeholders working in higher institution of learning. The system allows students to enroll through the Internet without traveling to the campus. It incorporates school management rules and processes which include enrolment, registration and grading. The system design and development was modeled to allow mobile device accessibility and responsiveness. Students receive notices of their application outcome, admission and examination results on their global system for mobile telecommunication (GSM) mobile phones, emails and school website. The mobile responsiveness and user friendliness of the application provide high user experience satisfaction. Since Wa Polytechnic does not have online library system, the system should be scaled up to allow lecturers to upload course materials for students to access.*

KEYWORDS: Enrolment, Information Management System, Internet, GSM Mobile Phones, Mobile Responsiveness

INTRODUCTION

The rapid growth of web technology allows the use of various techniques to surf the web. Some of the many different devices used for accessing the web include desktop computers with a wide range of screen dimensions, tablets, mobile phones and television. It is reported thatnext billion new phone users will use primarily mobiles (ITU, 2003). Ericsson Company predicts that people accessing the web using mobile phones in 2018 will be around 9 billion (Vanguardngr, 2014). Therefore, any application that intends to succeed must make effective use of responsive web procedures in both design and implementation. In the view of (Karolić, 2013.), the main idea behind the principles of responsive web design is to make the Web for All and Web on Everything. The essence of this idea is to enable access to the web content using all opportunities existing with regard to media screens.

Google reports that over 50% of Google Search is done with mobile devices worldwide (Search Engine land, 2016). However, a mobile device responsive test conducted by Google provides conclusive evidence that majority of local websites are mobile user unfriendly. Further, Dowuna reports that tests on responsiveness of Ghanaian-based websites on mobile devices showed that more than 90% of government and public institutions' websites are very mobile

unfriendly (Dowuna, 2015). The main challenges identified with the websites include poor user experience, navigability on mobile devices, small texts on the websites, and forced horizontal scrolling. Therefore, designing and implementing a system with high mobile user friendliness, user acceptability and responsiveness is timely. Introducing mobile responsive website especially in the higher learning of institutions in Ghana as part of the Information and Communication Technology integration strategy and provision of access to education in higher learning institutions where users mostly use mobile devices in searching for relevant information from academia has far-reaching benefits. These include ease of use and retrieval of information with convenience.

Against this background, Wa Polytechnic as a higher learning institution with the mandate to train middle and top level manpower for national development (Wa Polytechnic ICT Policy & Plan, 2008), aims at providing opportunity to qualified applicants within and outside Ghana. Consequently, the admission processes of the institution which were, until recently, predominantly paper-based are now modernised by employing innovative way of advertising admission opportunities using the Internet in order to provide access to interested and qualified applicants.

Problem Analysis

The decline in enrolment at Wa Polytechnic was worrisome to management, academic staff, students and other stakeholders. A number of reasons were speculated to that development. Prominent among them was the unfriendly nature of the admission processes and procedures, authentication and registration. The hitherto student enrolment process ran manually with extensive human intervention. Paper based forms were used to capture prospective applicant's enrolment information. Every potential applicant seeking to enroll in Wa Polytechnic had to travel to the school or to prearranged places to buy the form. Applicants waited till they received admission letterswhich sometimes got stuck at the Post Office resulting in their late delivery. It is reported that at the end of the 2008/2009 academic year, five students were withdrawn due to poor academic performance which was attributed to late receipt of admission letters (Adjei et.al, 2010). Students' assessment and grading was paper based with inadequate security, which rendered the grading system vulnerable. Further, there was no standard format for the institution and therefore the design and format of transcripts were driven by the discretion of the Heads of Departments and Examination Officers. The integrated online enrolment and students information management system seeks to provide solution to all these challenges in Wa Polytechnic.

DEVELOPMENT METHODOLOGY

System Development Processes

The design and development of the system went through prototyping phases. The prototyping model is presented in Figure 1. User needs were elicited and critically analysed in order to design and implement a system of high reliability and correctness. A prototype was prepared based on the user requirements. This facilitated a better understanding of the desired system development which actively involved the users. In this process, the users were interviewed to know the requirements of the system. A prototype of requirement specifications was developed, tested, reviewed and approved by the user.
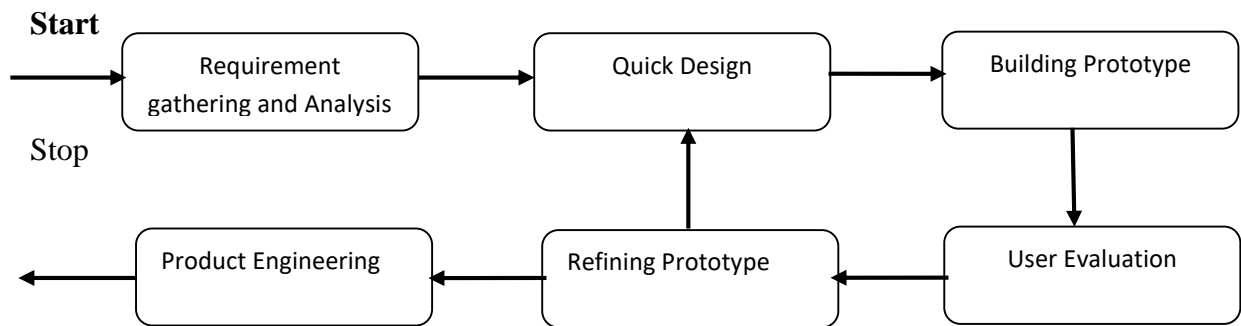
Figure 1: Prototyping Model

The prototype design formed the foundation for the development of the system. In the system design process we used three distinct aspects: conceptual, logical and physical designs.

The conceptual design process helped to acquire, evaluate, document and validate the user requirements which led to a solution from a user perspective. Because the study aimed at solving higher school management problems, specifically Wa Polytechnic, at any point in the design process, the current state of the design was directly traceable to a problem and requirements within higher institution of learning.

The logical design was derived from the usage scenarios. The logical view was used as a basis to evaluate different physical options. The boundaries and the objectives of the system were defined. Further, the interfaces between the system and external entities, such as users and other systems were established. Among the key considerations in this component were Input/Output specifications, file specifications and processing specifications.

The logical design was translated into implementable solution according to user requirements. The physical design was tied to chosen set of technologies such as the hardware and software on which the application runs. The deliverables at the physical design were the design responsiveness to the physical media, specify input/output media, design of the database and specify backup procedures as well as the design of the physical information flow through the system. The final design of the system, development, testing, deployment and system administration were done as illustrated in Figure 2.
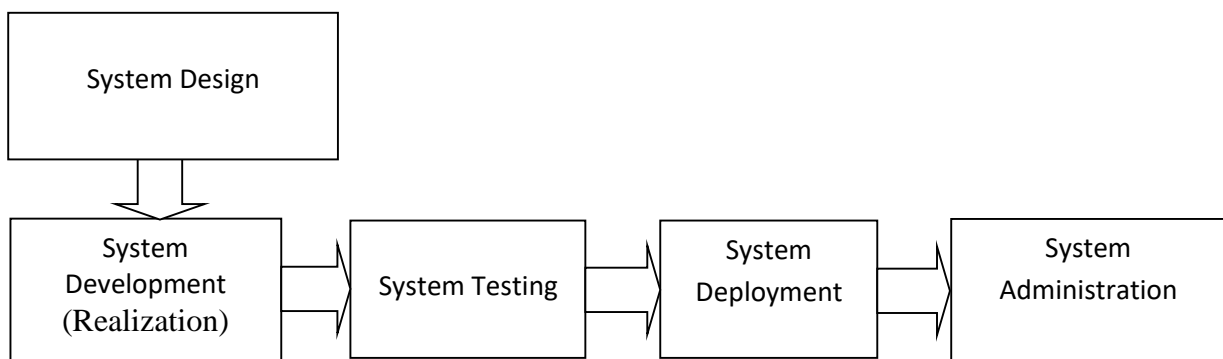

Figure 2: System development procedure

SYSTEM IMPLEMENTATION

System Architecture

In order to enhance data security, operational management, communication and scalability, a 3-tier system was used in an efficient and well-structured client/server model design as illustrated in Figure 3. The client/server model was categorized into user process components, business components, data component services and sources. A well designed client/server model enabled us to have clearly defined web data sources and services such that a new user interface could easily be designed without having to modify server side application logic. MySQL was used to build the database with PHP, WordPress and SQL providing programming interface for all server side codes. The client side interface was programmed with JavaScript and jQuery and formatted with HTML and CSS.
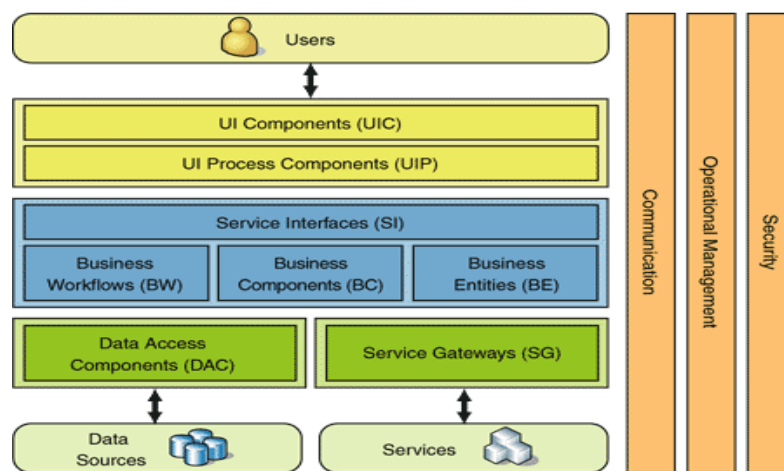

Figure 3: Three-Layered Services Application

System Administration

Figure 4 is a flowchart showing the major activities of the system administrator. The system basically starts by displaying the homepage. Thereafter, username and password are requested from the administrator. The system administrator validates his or her credentials in order to proceed. The administrator invites every user into the system. Other major activities of the administrator are admission and registration of students, deletion of a student from the system.
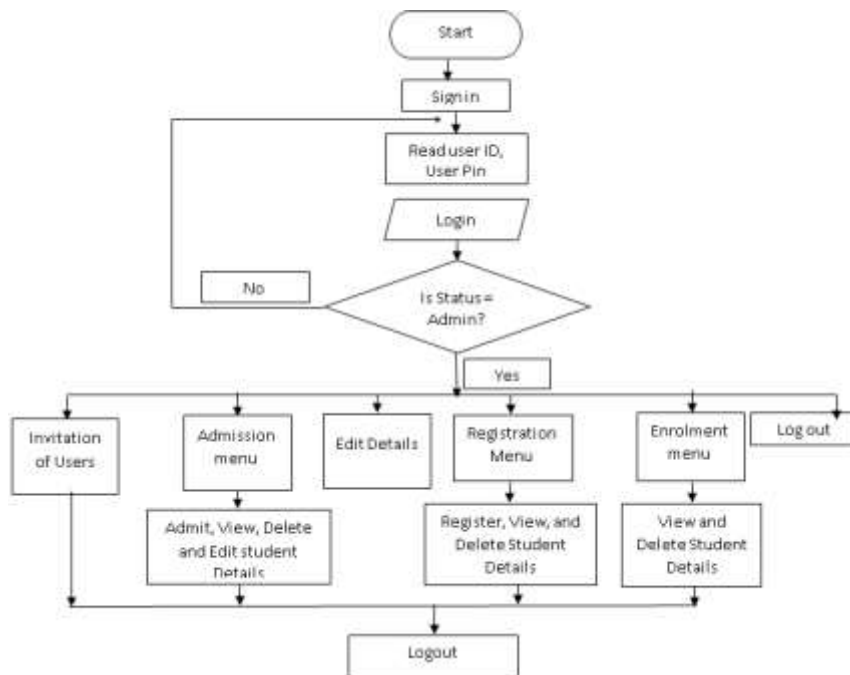
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Figure 4: Flowchart showing the major activities of the system administrator

Applicant/Student User

The qualified applicant uses the system to apply online. The system allows the applicant to visit the site from time to time to check his or her admission status till admission is offered otherwise the applicant will have to reapply.

The flowchart in Figure 5 shows the activities of an applicant/student. A student is granted access only through the username and passwords created from first visit to the online system when applying at the web portal in order to utilise the features available to applicant or student from a remote location. The system is used to capture applicant's information related to applying for enrolment, providing personal data, guardian information, academic qualifications, programme to enroll in, and sponsorship. The student also has to his/her examination results, which are not editable.
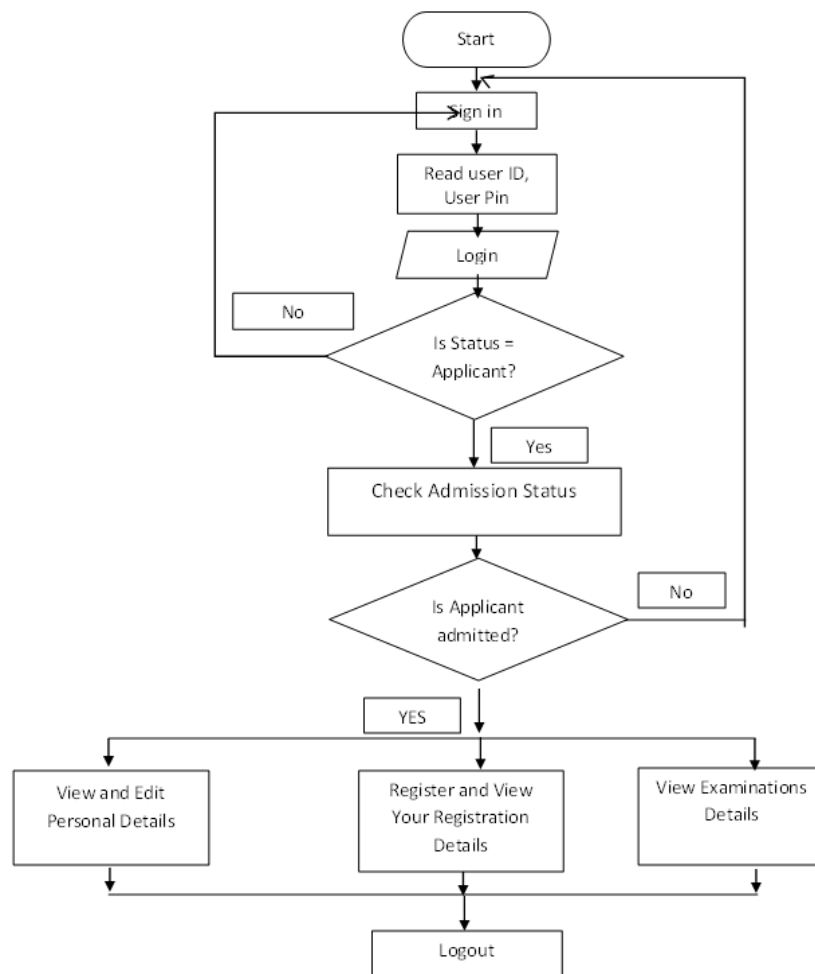
Figure 5: Flowchart showing the activities of a student user

Lecturer user

A lecturer user accesses the system by providing username and password. His/her credentials are authenticated in other to access the lecturer web page. When access is granted, the lecturer will then register his/her course based on the semester. The system permits a lecturer to release a course whenever there are changes in course allocation. Further, the lecturer is allowed to grade the system within a stipulated time. Figure 6 shows the activities of a lecturer user.
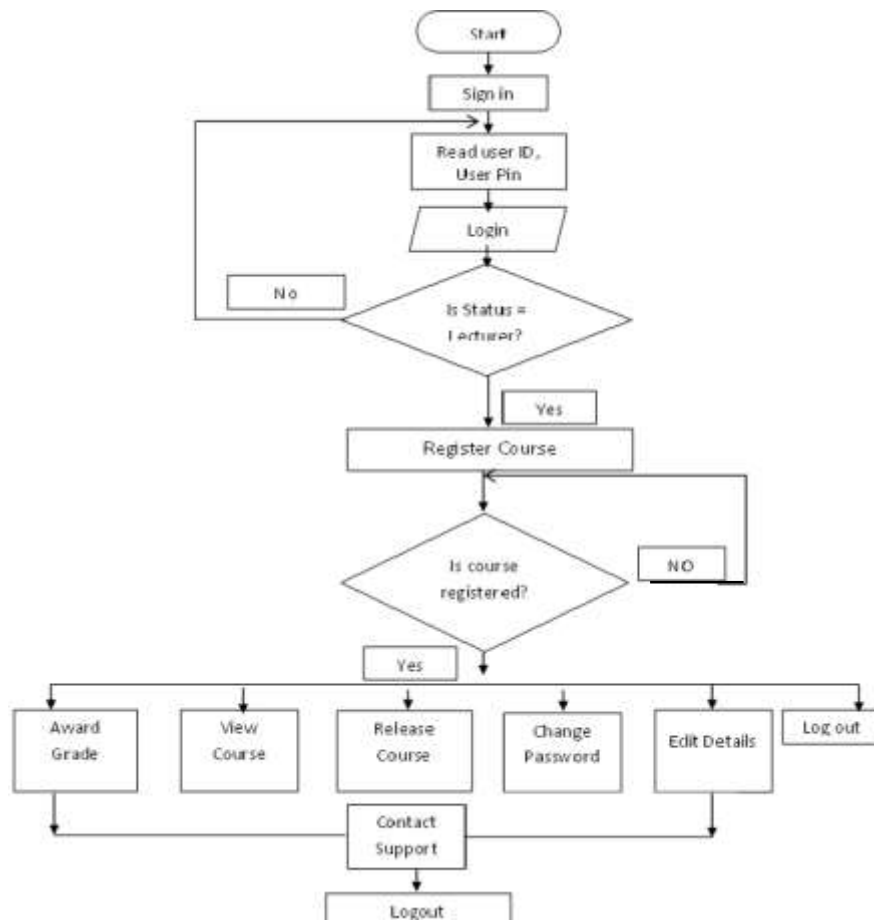
Figure 6: Flowchart showing the activities of a lecturer

Mobile Responsiveness Test of the application

With the web being accessed more on mobile devices currently (Search engine land, 216), a mobile responsive test was conducted to ascertain the user mobile friendliness of the system.

This test was done using:

 https://search.google.com/search-console/mobilefriendly?id=Bhtk2YZ_nv6g8nVCfMjxaQ,

 a portal provided by Google for testing the mobile user friendliness of sites. The result reveals that the system is mobile friendly. The interfaces/screens displayed on different mobile devices are captured in Figures 8, 9 and 10.
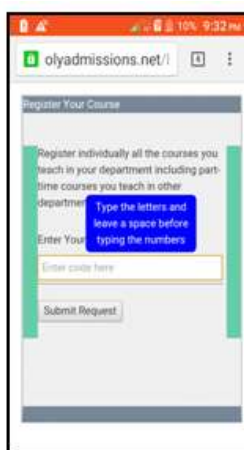
Figure 8: A responsive staff web page on Intel IT 1409 3-inch mobile phone screen
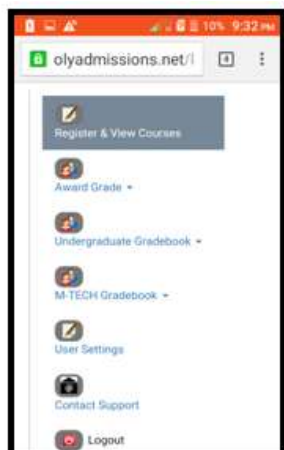
Figure 9: A responsive sample of student's web page on TECHNO 5.00 inch mobile phone screen

Figure 10: A responsive sample of lecturer's web page on Acer 14 inches laptop screen

CONCLUSION

The implementation of student record management system in Wa Polytechnic enables prospective applicants to electronically enroll into the institution without necessarily having to travel to campus to buy application forms. Applicants are able to conveniently access the application through all forms of devices used to surf the net. Admitted applicants just download their admission letters online at any convenient time. Grading of students is done online with enhanced security. Students are able to electronically access their semester results and transcripts electronically. Transcripts for all programs maintain the same format and security features. Every student is able to receive his/her results on a mobile phone and email. The notification mechanism of the system makes it highly automated and interactive. This interaction is made simpler with SMS, email and webpage. The successful implementation of the system increased enrolment from 137 students in the 2016/17 academic year to 346 students in the 2017/18 academic year. Therefore, the application contributed immensely to an increase in the enrolment of the institution. Since Wa Polytechnic currently has no online library system, scaling up this enrolment system to enable lecturers to upload course materials and receive feedback from students will enhance innovation in the teaching and learning process in the institution.

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