

Student Web Self-Service Portal for a Tertiary Institution

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Abstract: The optimum condition for students to study is in an environment where they can access virtually all they need to know about courses, lecturers, locate places (for fresh and prospective students), validate staff identity, access past examination questions easily, identify vacant student hostels within and outside the school premises. Some of the reasons for students' failure can be attributed to finding accommodation within or outside the school premises. Also, fresh students find it difficult to locate specific places in the university environment and some students find it very difficult to interact with staff. This paper presents a student self-service portal to address some of these challenges. Unified Modeling Language (UML) was used to model the system. The model was implemented using Microsoft C#, Microsoft ASP.net, Microsoft SQL Server, and Google Map. The proposed system was tested and the result obtained during the execution shows that the system is capable of addressing some of the challenges confronted by students.

Keywords: Web Self-Service, Portal, Students, SQL, Unified Modeling Language (UML).

1. Introduction

Access to information is a serious problem faced by students (both fresh and returning students) in tertiary institutions. Each student is faced with problems to survive and succeed in higher education. However, many universities have been promoting implementation of their information systems and services to aid their students and support academic management processes in various ways.

One of the performance criteria of an educational institute is the number of successful completions by the students. However, records have shown that not all students enrolled as freshmen will succeed (Bean, 2005). The failures can be attributed to lack of access to timely and accurate information among other factors faced by students. This is highly undesirable as this means wasted resources and reduced number of graduates to meet the demands by the

industry and the community. There are many causes to this problem, and they could occur anytime during the student's course of studies. Some of these factors include; inadequate access to course outline, course notes, past examinations and test question, Lecture and Examination Time Table.

With limited resources and increasing competition for students in the education sector, higher education institutes are focusing on efforts to increase the rate of student retention (of what is being taught in the class) and completion of their academic program. Hence, the need for a web self-service portal where students can obtain information about courses, lecturers, lecture timetables etc.

Bodendorf & Sauressig (2001) defined Self Service as a way to switch from the supplier-dominated push principle to the customer-centered pull principle, in which the consumer takes an active role by initiating, controlling and tracking his/her requests.

Web Self-Service (WSS) is a type of electronic support (e-support) that allows people usually students, employees, customers etc to access information and performs routine tasks over the Internet, without requiring any interaction with a representative of an enterprise (Rouse, 2011). Web self-service is widely used in customer relationship management (CRM), employee relationship management (ERM) as well as student relationship management (SRM).

Student Web-Self Service portal is an online system that provides students with access to essential information that they will need throughout their academic careers (University of Oxford,

2013). The Web Self-Service Portal is an example of Self-Service Technologies; technological interfaces that allow customers to produce services independent of involvement of direct service employee. Self Service Technologies are replacing many face-to-face service interactions with the intention to make service transactions more accurate, convenient and faster.

2. Literature review

2.1 Definition of Self Service

It is much easier to describe self-service than to provide an exact definition of it. Self-service can be seen in stores where people use Automatic Teller Machines to withdraw, deposit or transfer funds rather than do it in banking halls, customers serving themselves in a buffet style restaurant, Petrol / Gas Stations where customers pump their own gasoline rather than have an attendant do it (this act is not popular in Nigeria), or students choosing to select and register for courses online rather than having level/academic advisers do it for them.

Many authors, journals and articles have tried to define, categorize and characterize Self Service; one of them is a particular one given by Castro, Atkinson and Ezell (2010) in their book "Embracing the Self-Service Economy", they defined Self Service as the process by which consumers engage in all or a portion of the provision of a service or product. According to Castro, Atkinson and Ezell (2010), Self Service has long existed- think of do it yourself homeowners doing the work of professional contractors, or self-help books substituting for therapists.

Another definition given by Bodendorf & Sauressig (2001) in their book

“Internet Based Self Service Systems for Customer-oriented Processes in Public Administration”, defined Self Service as a way to switch from the supplier-dominated push principle to the customer-centered pull principle, in which the consumer takes an active role by initiating, controlling and tracking his/her requests.

Castro, Atkinson and Ezell further described how Self-Service has grown due to the many opportunities that IT has created to leverage technology for large gains in efficiency and convenience. According to them, many of these changes have become ingrained into people’s way of life, for example telephone operators have been replaced by automatic telephone switching, that lets individual dial a phone number directly, elevator operators have been replaced by electronic control systems that let people operate elevators directly and at supermarkets, shoppers pick their own items rather than taking a list to a central counter and having a clerk get their goods for them.

2.2 Types of Self Service Technologies

Self-service technologies provide technological interfaces that allow consumers to use services independently of the involvement of a direct service employee. (Cardoso & Miller, 2012). Castro, Atkinson and Ezell (2010) also described self-service technology as a technology that allows a consumer to take on a role in the delivery of a service or product.

Self-service is on the rise today, because of the advances enabled by IT revolution such as the Internet and mobile phones. In addition, self-service is the natural outcome of technology that has reached maturity. When

technology was new, it was often difficult to use and it required workers with specialized skills for operation (Castro, Atkinson, & Ezell, 2010). However, over-time, self-service technologies have become more user friendly to the point that the average person no longer requires a specialist to operate the technology. Castro, Atkinson & Ezell (2010) categorized channels which self-service technologies use as one of; electronic kiosks, the Internet, mobile devices, and the telephone.

2.2.1 Electronic Kiosks

Wire spring Technologies, a US based software Development Company, in their publication *“An Introduction to Interactive Kiosks”*, described an Electronic Kiosk or Interactive kiosk as any computer-like device deployed in a public venue to give people self-service access to products and services. Kiosks are typically placed in retail stores, airports, libraries, company cafeterias and other places where personal computers are not available but self-service applications can provide some benefit. Castro, Atkinson and Ezell (2010) instead described Electronic Kiosks as devices that provide stand-alone solutions to provide users access to information or a service, such as checking an account balance at an ATM or checking in for a flight at an airport kiosk. A very important sector where kiosks are deployed for consumer self-service is the Banking sector.

Many Banks and financial services providers offer self-service options. Automated teller machines (ATMs) are one of the earliest examples of self-service technology. First introduced in the 1970s, the technology has flourished

(Castro, Atkinson, & Ezell, 2010). In a publication produced by Retail Banking Research in 2008, over 1.8 million ATMs are in operation in virtually every country, and globally consumers conduct over 44 billion transactions annually on ATMs. As technology has changed, ATMs have evolved to handle increasingly more complicated transactions and to provide customers greater convenience. Today's ATMs not only allow a bank's customers to make withdrawals, deposits, check balances, and make transfers, but ATMs may offer additional services, such as selling postage or concert tickets. Most ATMs also offer accessibility features such as voice prompts to aid visually impaired customers and multilingual options to better serve their customers (Wirespring Technologies, 2012).

Another sector where Electronic Kiosks are applied is in the Aviation Sector (Castro, Atkinson, & Ezell, 2010); Airlines have invested heavily in airport kiosks to allow customers to manage their reservations. Airport kiosks with touch screen displays, magnetic stripe card readers, and bar code scanners are now common in airports around the world. Using these kiosks, customers have the opportunity to check in for their flight, change or upgrade their seats, modify their reservation, and even purchase a ticket. Travelers without baggage can check in and then proceed directly to the gate; travelers with baggage can check in and then take their luggage to the baggage drop.

Other examples of self-service technologies that make use of Electronic Kiosks are Self-Service Gasoline Stations, Self-Pay Parking, Food-Ordering Kiosks, Airport and Travel

Kiosks, Vending Machines and Reverse Vending Machines, Self-Checkout, Retail Kiosks, Human Resources Kiosks, Digital Photograph Printing, Electronic Voting, Health Care Kiosks, Information Kiosks etc. (Castro, Atkinson, & Ezell, 2010).

2.2.2 Mobile Devices

Castro, Atkinson and Ezell characterized Mobile devices as one of the most important channels for delivering self-service applications and its use will likely continue to grow in importance as wireless networks and low-cost mobile devices become more advanced. Mobile devices include smart phones, such as iPhone or Blackberry, smart cards and other portable mobile electronics.

Like Kiosks, smart phones provide another medium for interacting with online applications and services. According to Castro, Atkinson and Ezell (2010), one of the most interesting self-service applications on mobile devices is mobile commerce, a concept defined broadly as "commercial or financial transactions mediated through mobile phones or other handheld electronic devices." (Organization for Economic Co-Operation and Development, 2008). Mobile commerce is exploding worldwide with research firm Juniper predicting that, by 2011, the global value of all commercial or financial transactions effected through mobile phones will exceed \$587 billion. Much of this is driven by browser-enabled smart phones that allow individuals access to any Internet-based application from a mobile device. In addition, many self-service applications currently available online have been, or will be, adapted for smart phones, for example,

Banks have developed mobile applications so that customers can access their funds, transfer money out of their accounts, pay for bills etc. from their mobile phones (Lomas, 2008).

According to Investopedia an online investment encyclopedia, another important self-service technology is mobile payments systems; this involves using a mobile phone as an electronic wallet; a system that securely stores user's payment information and passwords for numerous payment methods and websites. Combined with near field communication (NFC) technology, a specific standard of Radio frequency Identification (RFID) technology, NFC-capable phones can securely transmit data wirelessly over short ranges between electronic devices thus enabling contactless payments (Castro, Atkinson, & Ezell, 2010).

2.2.3 Telephone Applications

IT also enables consumers to use the telephone to access self-service solutions. In particular, telephone operators have been largely replaced with digital technology. The major reason why productivity for telephone operators has increased approximately 12 percent a year since 1950 is because customers, rather than operators, now place the vast majority of calls through direct dialing (Castro, Atkinson, & Ezell, 2010). In addition, when requesting a phone listing, most consumers use a technology that allows the phone company's computer to ask the customer to say the listing they want, saving an operator from asking that. Voice recognition technology is getting so effective that there is little need for the operator to be the go-

between for the customer and the telephone company computer

2.3 Applications of Web Self Service

Indeed, various Internet applications have equipped consumers to take on new roles and responsibilities that previously required assistance from individuals employed in the service sector, including professionals from virtually every field from banking to education to retail. Internet based Self Service has been applied in various sectors, According to Castro, Atkinson, & Ezell, they include; Online Health, Online Banking, E-Learning, Professional Services, Retail E-Commerce, Customer Service, Ticketing and Reservations etc.

2.3.1 Online Health

In HealthCare, IT empowers patients by giving them access to the latest medical research, their own health records, and information on the quality of care they receive. Online applications such as Microsoft Health Vault have emerged to allow individuals to track and analyze their personal health information. The Microsoft HealthVault is a web-based platform from Microsoft to store and maintain health and fitness information. (Rouse, 2011). The HealthVault allows users to upload data from a small number of HealthVault-compatible devices, it also allows sending, receiving and storing of medical records and information from doctors and healthcare providers. Also, there are online applications that allow patients to track health markers such as their blood pressure, cholesterol, and body mass index to see how these indicators change over time and how they compare to healthy patients of the same age and sex. As a result, patients are less dependent

on health care workers for medical solutions and can take more active role in their own care. Examples of these applications are Revolution Health, WebMD etc. (Castro, Atkinson, & Ezell 2010).

2.3.2 Online Banking

Another area in which Web based self-service technologies has manifested is also in the banking sector, much like ATMs, online banking has replaced the need for tellers for most financial transactions at a bank. Banks increasingly offer online applications that meet the day-to-day banking needs of most customers, such as opening an account, checking account balance, and transferring funds. Self-Service technology has become so matured that Nigerian banks like Guaranty Trust Bank, United Bank for Africa now provide facilities for opening bank account on their respective Facebook Pages. Other banks such as WEMA bank, Stanbic IBTC have followed suit by providing reliable internet banking facilities that allow their customers to transfer funds, pay bills etc. on their websites.

2.3.3 Retail E-Commerce

In the area of E-Commerce, Self-Service technology gives consumer control over their service encounter (Castro, Atkinson, & Ezell 2010). Buying goods and services online allows consumers the freedom to choose where and when to shop, and the opportunity to research the product, the seller and any other available options. Just about anything that can be bought in a store can be bought online, even perishables like groceries. And consumers have embraced these possibilities; more than 85 percent of the world's online

population has purchased something using the Internet. (The Nielsen Company, 2008). According to Castro, Atkinson & Ezell, the Internet has introduced many online services that substitute physical goods for digital goods. Online services like iTunes, Amazon, Jumia, Konga and the E-bay allow consumers to find and purchase goods without ever interacting with a service worker.

2.3.4 Customer Service

Many companies provide self-service options for customers to receive customer service online. The service options range from a simple list of frequently asked questions to advanced online applications that give customers access to detailed information and services so that many of them can solve their own problems. Instead of consumers contacting customer service representatives, they can go online and do the work themselves and find a solution in the same time or less. According to Castro, Atkinson and Ezell (2010), companies like FedEx and UPS allow customers to track their packages online rather than call a customer service agent to find out its status, Also Computer manufacturers like Dell allow customers to look up product information and get support based on the unique serial numbers printed on each device. Many businesses also give their customers online access to their accounts. For example, utility companies, cable companies, and telephone service providers all typically offer online access so that their customers can pay their bills online, see past statements, and make changes to their service. Some companies have gone a step further with online self-

service and created human-like automated customer service agents (Castro, Atkinson, & Ezell, 2010).

2.4 Benefits of Self Service

Based on the already explained types of self-service technologies, Castro, Atkinson and Ezell (2010) noted that self-service has grown so largely, as it provides benefits to consumers, organizations, and the economy as a whole.

Self-service technology can provide consumers greater convenience, accessibility and ease of use. According to a paper published by Oracle Corporation in 2013 “Benefits of Web Self-Service”, the company noted that consumers want to solve their issues quickly and easily on the Web, when they can, they are likely to buy more, with 80% saying they will increase their spending.

According to Castro, Atkinson and Ezell, Convenience is a big factor; Self-service technologies often make business available 24 hours a day, seven days a week rather than being limited to traditional working hours. They also noted that, consumers often find self-service technology empowering; using the technology, the consumer can control the service encounter and not feel rushed or pressured.

Self-service technology can also make service encounters more accessible for individuals with disabilities. For example, individuals with mobility disabilities may find online shopping more accessible than shopping in brick and mortar (Castro, Atkinson, & Ezell, 2010). Individuals can take advantage of accessibility options in Web browsers to access online applications and services.

For businesses, Castro, Atkinson and Ezell (2010) noted that investment in self-service reduces cost and helps provide a better quality product or service. According to them, using self-service technology frees up workers that can either be reassigned to more profitable jobs or eliminated to reduce pay-roll costs. For example, a retailer that introduces self-checkout can reassign cashiers to sales or customer service jobs to increase sales and customer satisfaction or cut these jobs to save on overhead.

The economy also benefits from self-service technology, According to Castro, Atkinson and Ezell (2010); Per-capita income growth is the single most important indicator of a nation’s economic well-being. And per-capita income is largely a function of the growth of productivity (the amount of output per hour of work). Higher productivity growth goes a long way in solving pressing societal problems, including lagging income growth, national debt, and the ability of society to spend in key areas (e.g. transportation, environmental protection, and health coverage).

2.5 Concerns Over Self Service

In spite of the significant benefits of self-service, particularly for economic growth, self-service has some criticisms or concerns. Castro, Atkinson and Ezell (2010), identified four major concerns, they are listed below;

- Self-service simply shifts work to the consumer with only the company benefiting.
- Self-service eliminates consumer choice and robs individuals of human contacts.

- Self-service eliminates jobs and finally,
- Benefits of self-service will not go to workers.

The following concerns on implementing a self-service system are also noted;

- Errors: The rate of errors is likely to increase.
- Training and Support: Users of a self-service system must have training before they can use the technology.
- Cost: Implementing a self-service system requires an upfront investment.
- Security Concerns

2.6 Student Web Self-Service Portal

Portals started as a way to organize a variety of web-based information sources on one desktop interface: a search tool, news feeds, links to favourite web sites, content organized by topics, and so on.

Portals in tertiary institutions serve multiple functions for multiple customers with one tool. Lee J., Hong, N. L. & Ling, N.L. (2002) noted that a portal provides the faculty members at the individual campuses with efficient, direct links to current knowledge about teaching and learning through technology among the campuses of the university system, nationally, and internationally.

The trend toward portals as the technology tool of choice for knowledge sharing leads to the convergence of knowledge management. As Kidwell, Linde and Johnson (2000) stated, portals have the potential to revolutionize learning in tertiary institutions and have ways of encouraging: -

- Increased competitiveness and responsiveness for research grants, contracts, and commercial opportunities.
- Reduced turnaround time for research.
- Minimized devotion of research resources to administrative tasks.
- Facilitation of interdisciplinary research.
- Leveraging of previous research and proposal efforts.
- Improved internal and external services and effectiveness.
- Reduced administrative costs.

However, some of the limitations of portals is the fact that they are costly and require a lot of time for maintenance and management (Olibie and Akudolu, 2015).

Narrowing it than, very good examples of a student web self-service portal are university portals. The portal allows students to perform variety of actions, some of which include;

- Registration of Courses.
- Payment of charges.
- Viewing and Printing of Results.
- Editing of Personal Details.
- Access to Current School Information etc.

However, needs of students of the Universities are not fully met by these portals, below are some of the limitations of the existing portals:

- Locating Specific Places in the University Campuses is a headache especially for fresh students as there is no diagrammatic representation of the Campus Layout on the school portal for students to navigate through the campus.
- The current portal takes care of hostels available on campus which

is limited in size and cannot contain the ever increasing student's populace.

3. Methodology

A Software Development Life Cycle (SDLC) is essentially a series of steps or phases that provide a model for the development and lifecycle management of an application or piece of software (Glynn, 2008). The Software Development Model used in carrying out this development is the Agile Development Model. The processes under this model are:

- a. Communication (Requirement Gathering and Specification)
- b. Design and Development
- c. Integration and Testing
- d. Operation and Maintenance

3.1 Communication

This is the first stage of the software development process; it includes requirement gathering and requirement specification. The interview style of gathering information was adopted.

After interacting with several students, it is discovered that there is need to develop a web portal that will be able to perform the following services:

- a. Allow students to locate specific places on Campus.
- b. Allow students access to past questions and course materials.
- c. Allow students access to available students accommodation on and off campus
- d. Allow students access to Staff's profile via a search app, that will enable students view a staff's profile by basically typing the staff's name in a textbox that will be provided on a page in the portal.

3.2 Design and Development: This phase includes the class diagram, user flow diagram, administrative flow, and the entity relationship diagram.

3.2.1 Class Diagram: The diagram shows the link between the department and faculty and relation to the user. It also provide for staff of the department and courses offered along with past question for the courses.

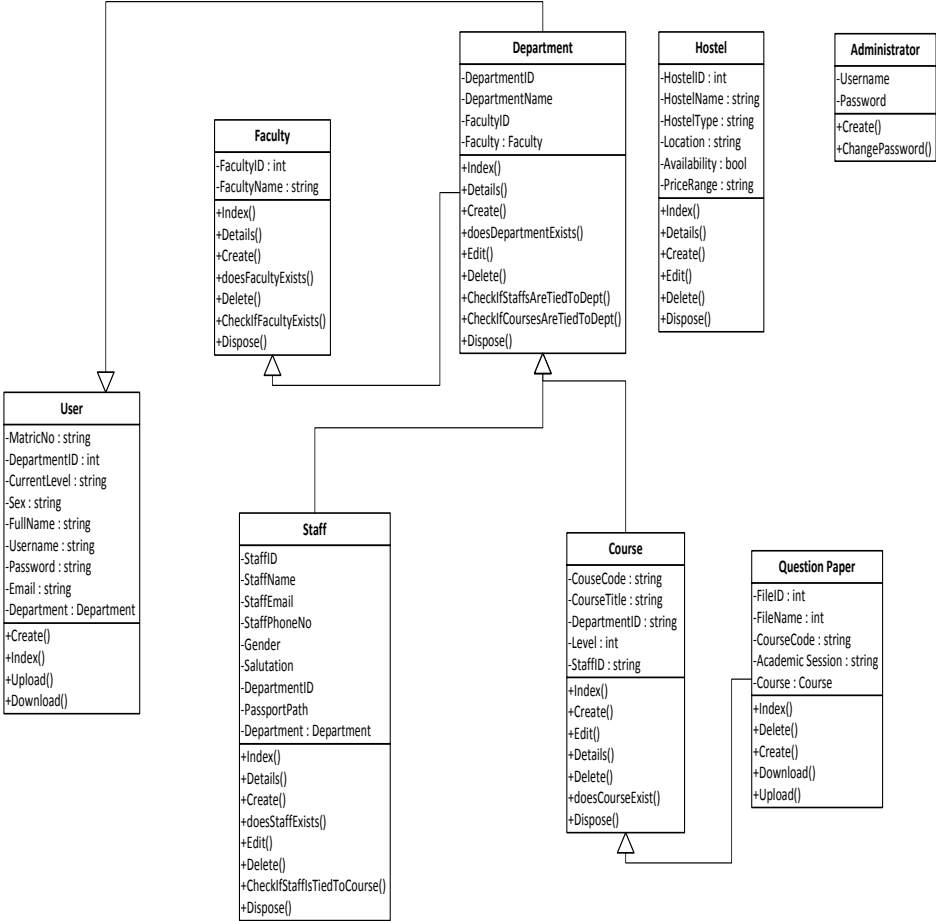


Figure 1. Class Diagram

3.2.2 User flow Diagram: This is the user flow chart diagram. In between the start and end, the user can perform several operations like register, log in , download and so on.

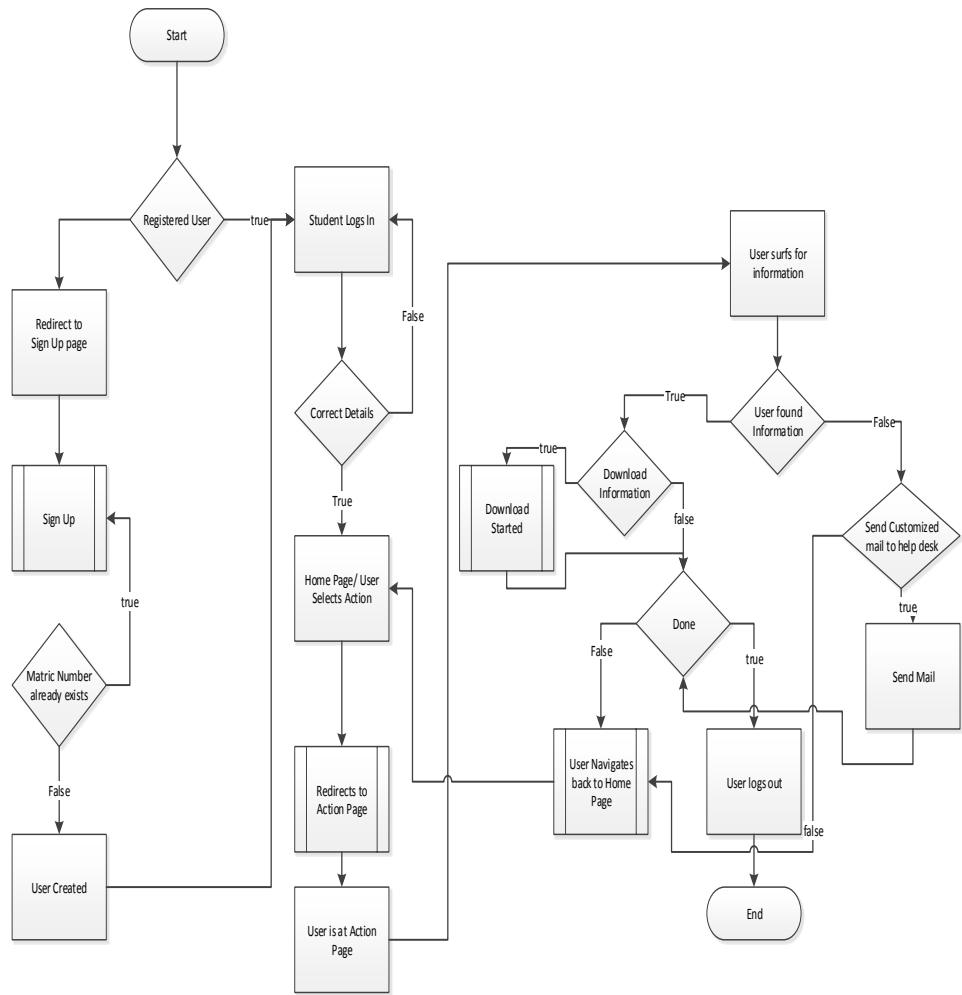


Figure 2. User Flow Diagram

3.2.3 Administrator Flow: The administrative flow chart log in page from which other actions can be performed.

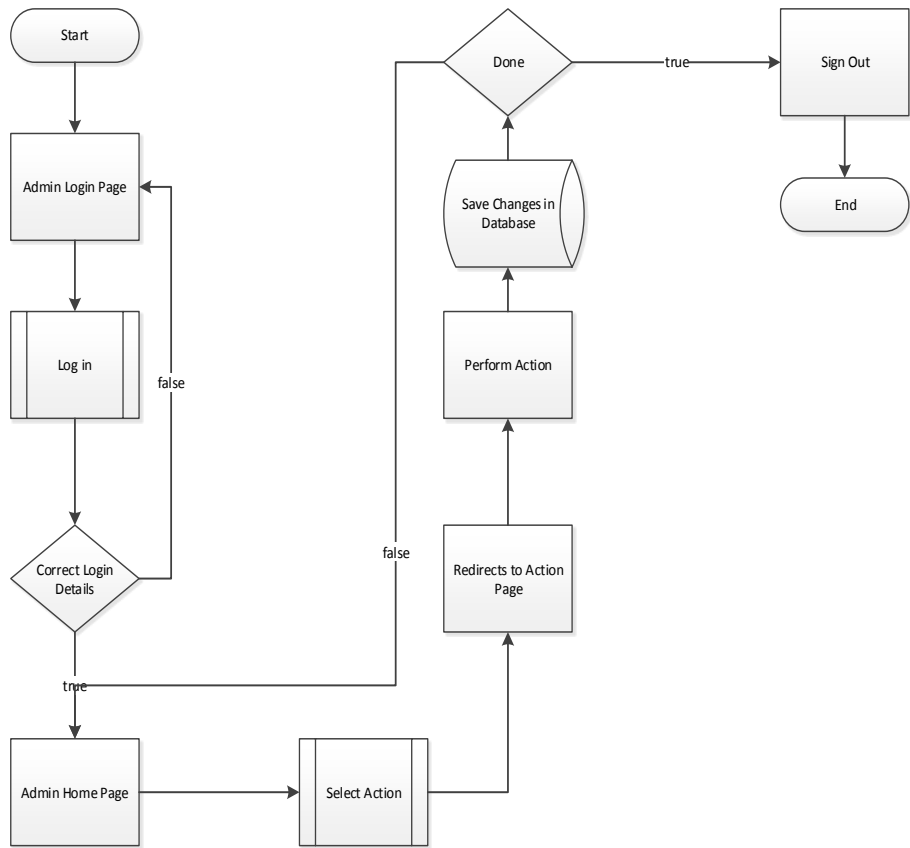


Figure 3. Administrator flow

3.3 Entity Relationship Diagram: The diagram shows the user page with the user having access to department, faculty, courses, staff etc.

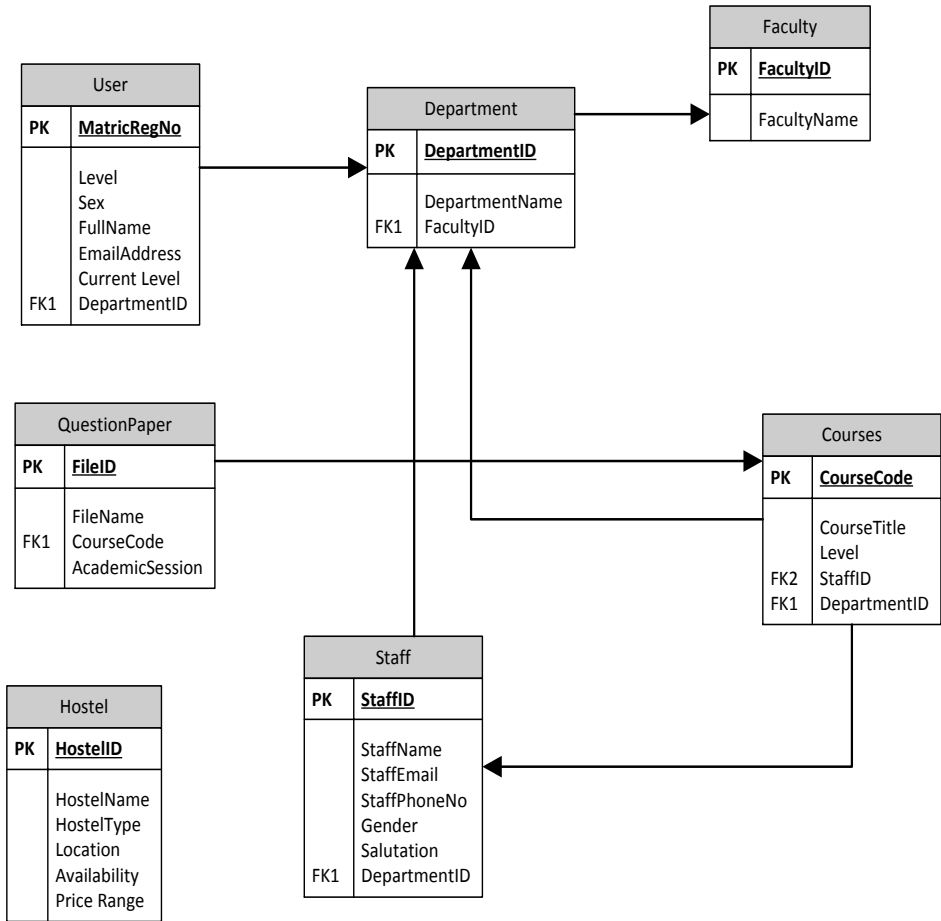


Figure 4. Entity Relationship Diagram

4. Implementation and Results

User Home Page: This is the first page the user of the application sees, it features an interactive Map of the University and links to performing different functions on the portal.

University and links to performing different functions on the portal.

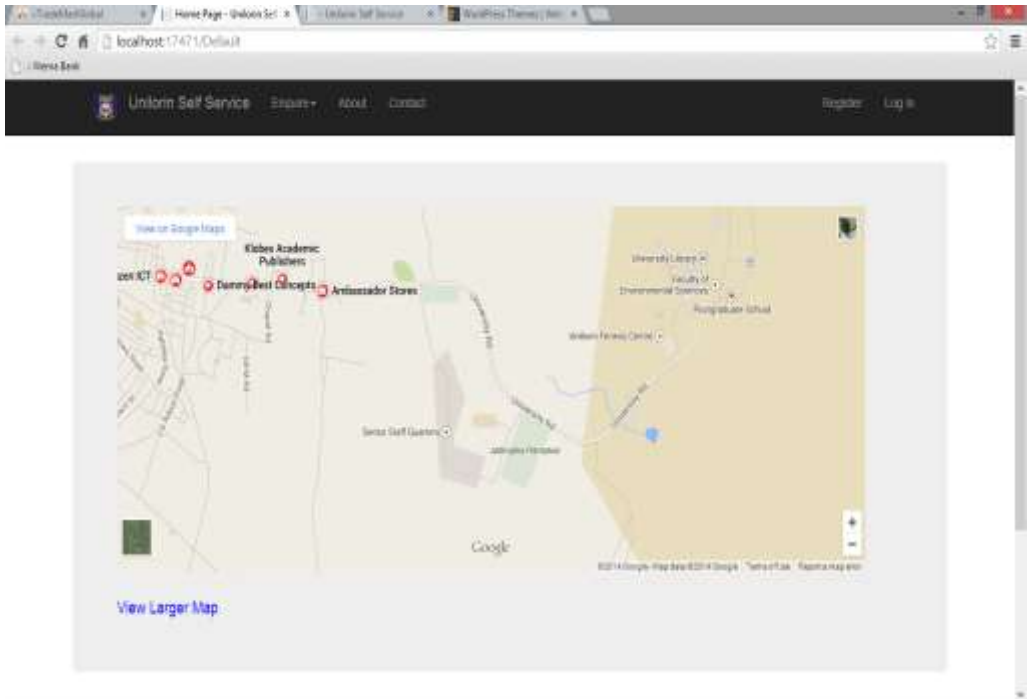


Figure 5. User home page

Portal Registration Page: This is the page where the user of the portal registers his/her details for portal authentication. Details collected on this page are the User's Matric Number or Registration Number, the User's current level, Sex, Faculty, Department, Choice Password and Email Address.

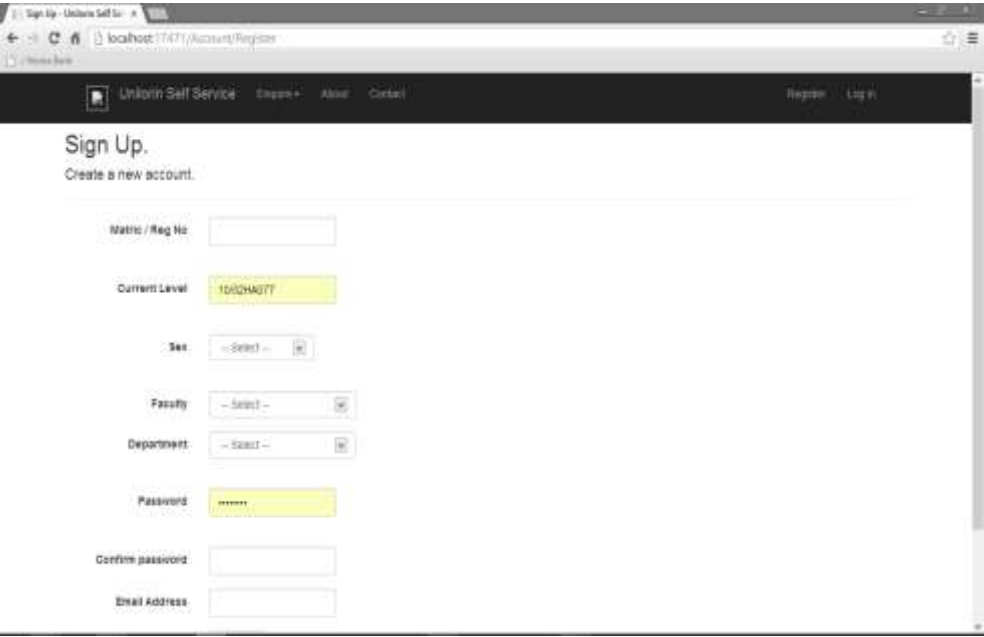


Figure 6. Registration page

User Login Page: This is where the User Login to the portal in order to access functionalities of the portal.

The details required to login are a registered email address or matriculation number and password

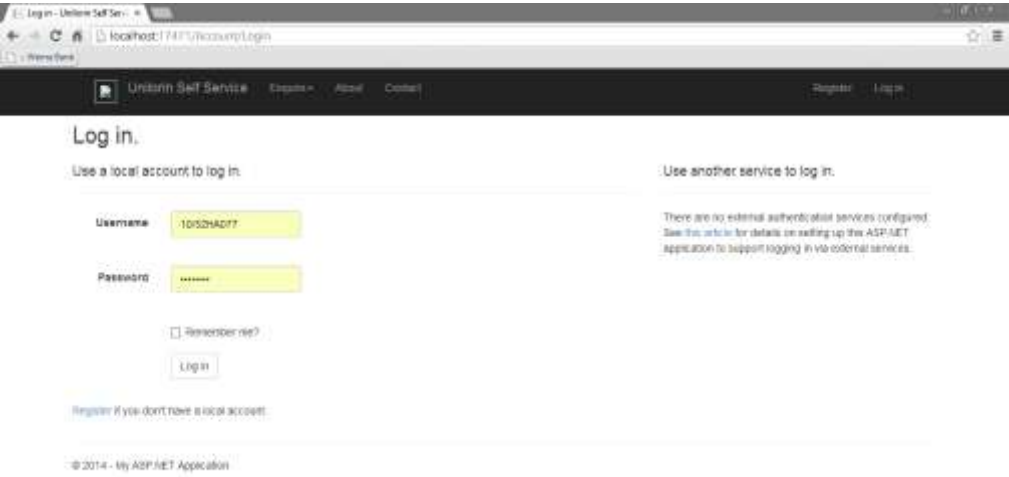


Figure 7 User login page

Staff Search Page: These allow the student to search for any member of staff from different faculties.

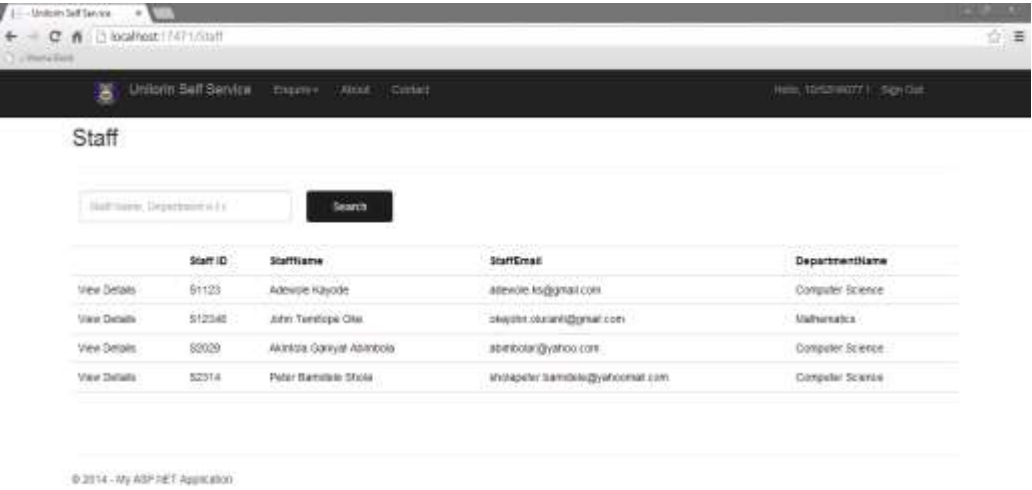


Figure 8. Staff search page

Staff Details Page: Page showing details of a particular staff including His/her Staff ID, Salutation, Name, Email Address, Phone Number, Gender, Department and Faculty.

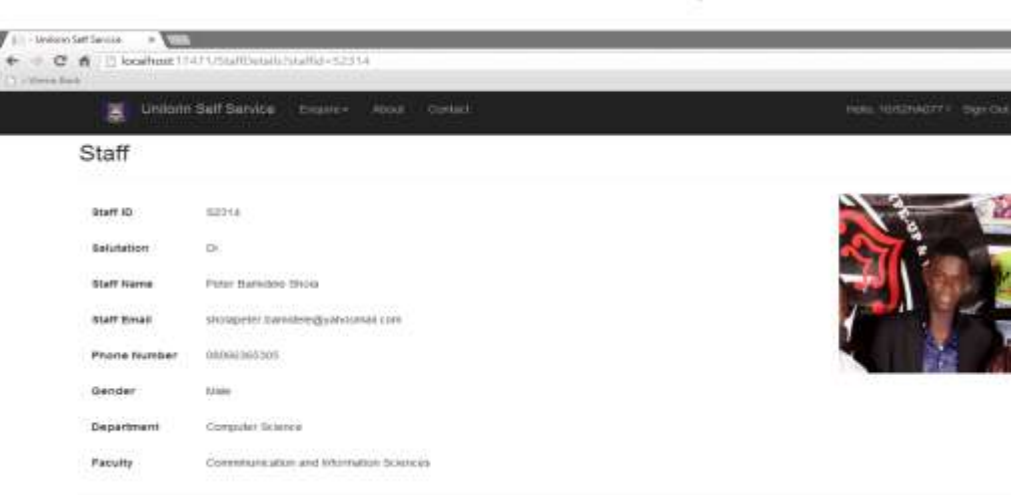


Figure 9. Staff details page

Course Search Page: On this page, the course enters the course code or course title he/she wants to access and the query fetches the details from the database.

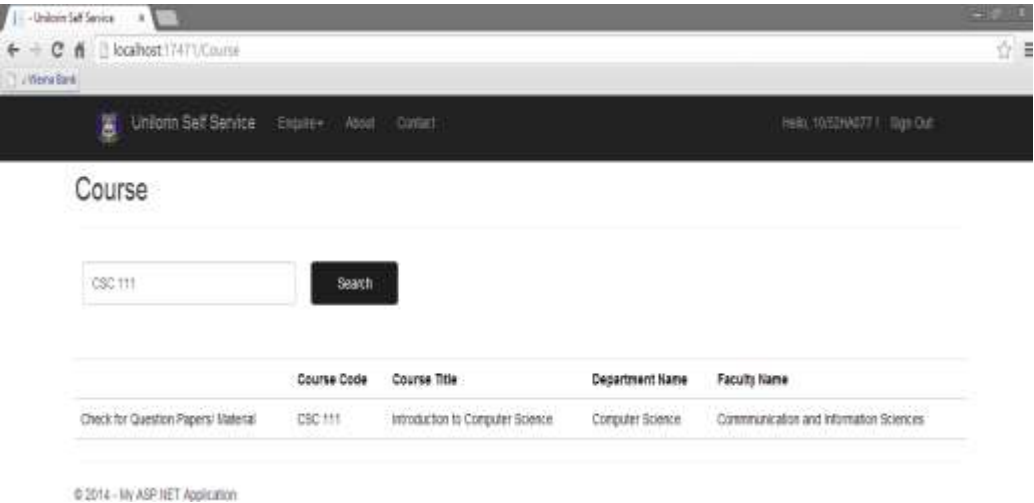


Figure 10: Course Search Page

Course Details Page: Page showing details of a particular course including available materials for download.

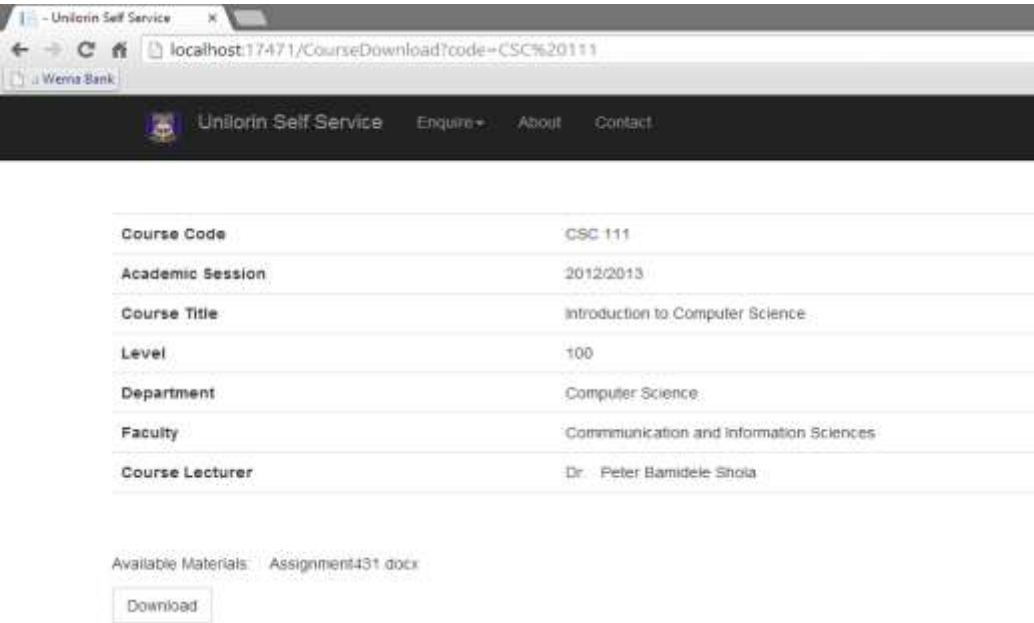


Figure 11. Course search page

5. Discussion

The work ascertains and describes how Online, Web or Internet-Based Self-Service can be applied to Students in a University Environment. The study rigorously visited various scholarship orientations and relevant literature as well as research on the concept of Self-Service and its applications.

The developed web portal model will be able to perform the following services over existing ones in such a way that it allows students to: locate specific places on Campus, access past questions and course materials, access available students accommodation (both) on and off campus and access Staff's profile via a search app, that will enable students view a staff's profile by basically typing the staff's name in a search tool that will be provided on a page in the portal.

6. Conclusion

A student web portal has been developed using the concept of Self-Service. In achieving this, an existing portal; the University of Ilorin Undergraduate portal was evaluated and current limitations were identified. The Project work ascertains and describes

how Online, Web or Internet-Based Self-Service can be applied to Students in a University Environment.

An Agile Development methodology is chosen for developing the portal because agile methodologies emphasizes on working software and changing requirement over robust documentation or analysis. Technologies used in implementing the portal include the Unified Modeling Language (UML), Microsoft C#, Microsoft Visual Studio, Model-View-Controller Architecture, ASP.net, JQuery, LINQ, SQL, Microsoft SQL Server, Google Map etc.

7. Recommendations

The current implementation can be extended and improved in many ways. The portal can be extended to meet the needs of other entities in the University for instance, Staffs as the portal is designed mainly for the usage of students of the University.

Also, the features present in this portal can be integrated into the already existing academic portal of the University.

References

- Bean J. P. (2005). Nine Themes Of College Student Retention. *College Student Retention: Formula for student success*, A. Seidman, Ed. America: CT:Praeger, 2005, p. 29.
- Bodendorf and Sauressig G., (2001). *Internet Based Self Service Systems for Customer-oriented Processes in Public Administration*. Nuremberg, Germany:CSC PLOEZENKE AG.
- Cardoso J. and Miller J. A., "Internet-Based Self-Services: from Analysis and Design to Deployment," Proceedings of the 1st IEEE International Conference on Services Economics (SE'2012), in conjunction with the 2012 IEEE International Conference on Web Services (ICWS'12), Honolulu, Hawaii (June 2012) pp. 24-31.
- Castro, D. , Atkinson, R., & Ezell, S. (2010, April). Embracing the self-service economy. Retrieved from:<http://www.itif.org/files/2015-self-service.pdf>.Computing

- Careers. (2006). *Software engineering*. Retrieved from [www.computingcareers.acm.org: http://www.computingcareers.acm.org/?page_id=12](http://www.computingcareers.acm.org/?page_id=12)
- Glynn, F. (2008). *Software Development Life Cycle*. Retrieved January 5, 2013, from [www.veracode.com: http://www.veracode.com/security/software-development-lifecycle](http://www.veracode.com/security/software-development-lifecycle)
- Group 3. (2013). *CSC 316: Software Engineering Project Write Up*. Ilorin, Nigeria.
- Hsin, T. (2000). Online shopping: A Fad or A Revolution. In *Retail World Asia 2000* (p. 25). Retail Group Malaysia.
- ISTQB GUID. (n.d.). *What are the Software Development Models?* Retrieved January 5, 2014, from [www.istqbexamcertification.com: http://www.istqbexamcertification.com/what-are-the-software-development-models/](http://www.istqbexamcertification.com/what-are-the-software-development-models/)
- Jarvenpaa, S., & Todd, P. (1997). *Consumer Reactions to Electronic Shopping on the World Wide Web*. International Journal of Electronic Commerce.
- Jawahar. (2010, December 8). *Overview of System Analysis & Design*. Retrieved January 3, 2014, from [www.ddegjust.ac.in: http://www.ddegjust.ac.in/studymaterial/pgdca/ms-04.pdf](http://www.ddegjust.ac.in/studymaterial/pgdca/ms-04.pdf)
- Kelley, E. J. (2009). *The Importance of Convenience in Consumer Purchasing*. Retrieved from JSTOR: <http://www.jstor.org/discover/10.2307/1248014?sid=21105570593991&uid=2&uid=4&uid=3738720>
- Kidwell, R.P., Linde, M. & Johnson, T. (2000). *A survey into the application of ICT for educational purposes in higher education* (pp. 176 – 181). Rotterdam: Erasmus Universiteit/OECR.
- King, & Juhn-Shiuan Liou, S. F. (2004). *A Framework for Internet Channel Evaluation*. International Journal of Information & management.
- Koehler, J., Nebel, B., Hoffman, J., & Dimopoulos, Y. (1997). *Extending Planning Graphs to an ADL subset. Lecture Notes in Computer Science*.
- Lee, J., Hong, N.L. & Ling, N.L. (2002). An analysis of students' preparation for the virtual learning environment. *The Internet and Higher Education*, 4, 231 – 242.
- Lomar, T. (2003). Fast content switching with respect 2.0 Ericsson gmbh.
- Makafan, P. (2013). *CSC 316: Software Engineering Class Project Group 3 Write Up*. Ilorin, Nigeria.
- Margherio, L. (1998). Secretariat for Electronic Commerce. In *The Emerging Digital Economy*. Washington:: US Department of Commerce.
- Microsoft Developer Network. (n.d.). *Visual C#*. Retrieved January 5, 2014, from [msdn.microsoft.com: http://msdn.microsoft.com/en-us/library/kx37x362.aspx](http://msdn.microsoft.com/en-us/library/kx37x362.aspx).
- (OECD), O. O. (1997). *Dismantling the Barriers to Global Electronic Commerce*. Paris: OECD.
- Olibie, E. and Akudolu, L. (2015), Paper accepted for publication in East African Journal of Educational Research and Policy (EAJERP).
- Oracle Corporation (2013). Benefits of web self-service. *Right now cloud service*.
- Plan, P. G. (2011, November 8). *Difference Between Shopping Cart and ECommerce*. Retrieved from [prettygoodplan.com: http://prettygoodplan.com/2011/11/](http://prettygoodplan.com/2011/11/)

- difference-between-shopping-cart-ecommerce/
- Rouse M. (2011); Web self-service definition. Retrieved 23/8/15: <http://searchcrm.techtarget.com/definition/Web-self-service>.
- Rouse, J. (2011). Articulating the World: Experimental Systems and Conceptual Understanding *International Studies in the Philosophy of Science* 25 (3):243 - 254
- Rowley, J. (2000). Product Search in E-shopping: A Review and Research Propositions. In *Journal of Consumer Marketing* (pp. 124-135).
- Tatum, M. (2013, November 25). *What is a Web Portal?* Retrieved December 15, 2013, from [www.wisegeek.org: http://www.wisegeek.com/what-is-a-web-portal.htm](http://www.wisegeek.org/http://www.wisegeek.com/what-is-a-web-portal.htm)
- University of Oxford. (2013, November 13). *Student Self Service*. Retrieved December 12, 2013, from [www.ox.ac.uk: https://www.studentsystem.ox.ac.uk/](https://www.studentsystem.ox.ac.uk/)
- Wikipedia. (2011, November 16). *Self Service Technologies*. Retrieved December 12, 2013, from [www.wikipedia.org:http://www.wikipedia.org](http://www.wikipedia.org)