Effective Healthcare Delivery using Smart Health Consulting System: A case Study of the Federal Polytechnic Ilaro

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Abstract
The traditional healthcare delivery of today is usually associated with long wait and queue and movement from one point to another in the bid to be attended to by a physician. The movement ranges from getting a hospital card for first timers, retrieving cards for the old users which is a requirement to see a physician, movement to the laboratory to run tests, to the pharmacy to get prescribed drugs and so on. Precious times are normally wasted with this manual process. Very often, patients leave theirs home as early as possible so as to be among the first persons to be attended to. This situation often discourages a lot of people such that they resolve to self-medication while some consult quack doctors. The reason why there are quite a number of mortality rate. This paper solves the above identified problem by development a smart health consulting system using HTML for the font end, MySQL as the database and cross-platform Apache as the web server, PHP and Perl being the scripting language for the application and Xampp as the local host for testing the software. The application developed if deployed will ameliorate the problems normally encountered with the manual process.

Keywords: Hospital, Patient, Smart health consulting, Treatment

Introduction
Worldwide, healthcare is an important part of human lives. Therefore, an error in the service delivery can cause the loss of human life. Most healthcare units are faced with several challenges in the bid to deliver patient centered care. According to WHO (2018), the systematic assessment of quality health services in high mortality nations showed major deficiencies in the quality of care received. The increasing population as well as rise in various illness introduced significant strain on the medical healthcare system. Therefore, an alternative means of healthcare services is required to reduce this strain while still providing good quality healthcare services (Kulkarni & Jakkan, 2018).

Modern computers and the Internet have made it possible for millions of people in recent years to get improved medical care and deliver in the most effective ways possible. The incidence of mortality in the nation and the globe is significantly lowered as a result of the technological advancements that are used today to guarantee accurate and exact patient diagnosis. Smart healthcare that schedules patient appointments with the doctor using technology other than the

traditional means will go a long way to improve healthcare service delivery, thus reducing the mortality rate usually recorded from time to time (Ibrahim & Zhuopeng, 2018).

Electronic health information on a patient or group of patients is systematically gathered in an electronic health record (HER) for short. It is a document that may be exchanged throughout various healthcare settings since it is integrated in network-connected enterprise-wide information systems (Papa *et al*., 2020; Kruse, Thomas & Kaur, 2018; Faber, Greehuizen & Reuver, 2017). Online appointment scheduling is a system in which a user or patients accesses a doctor's website, and through the online platforms patients can easily book an appointment with their preferred doctors, and patient can be able to provide additional information to the doctors, creating more awareness for the doctors on their cases, with quality time to put together the important information of the patients (De Grood *et al*., 2016). The web-based appointment application can improve the satisfaction of patients regarding registration and can reduce the total waiting time when compared to the traditional queue approach (Racherla & Hu, 2008).

A smart healthcare system is capable of delivering healthcare for people at any time and in any place provided there is electronic device such as laptops, tablets or smartphones (Quasim *et al*., 2021; Renukappa *et al*., 2022; Tian, et al., 2019). A number of smart applications have been developed and in use in the western world and some big healthcare services in Nigeria. However, the adoption of such system is still very little in the country. The advantage offered by digital age and technological advancement should be used to improve the healthcare services and delivery. This paper use the Federal Polytechnic, Ilaro clinic as a case study to implement this work.

The Federal Polytechnic Ilaro Clinic has operated manual healthcare delivery for a long time and in the face of increasing student population and staff, there is the need to develop and incorporate a smart health consulting system for effective healthcare delivery.

System Design

System design is a process that defines the elements of a system to meet the specification by the client. Such design includes architecture, models, modules, components and interfaces and many more. In this paper, the system design includes the input design, output design, file design and process flow that ensure a correct implementation process.

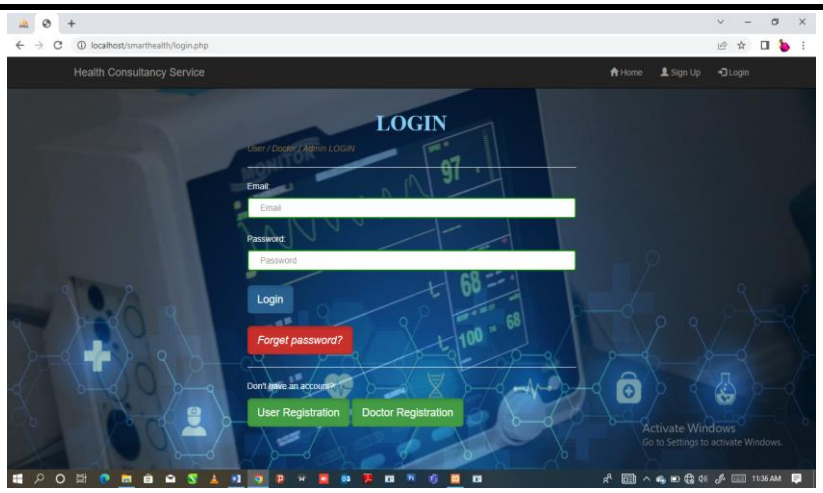


Figure 1: Input Design: Sign-up Page

Figure 1 is the output design depicted by the sign-up page. The input to the new system is derived from patient management and scheduling system. These forms contain relevant information concerning patient personal details and their schedule. The inputs are processed to obtain the desired outputs.

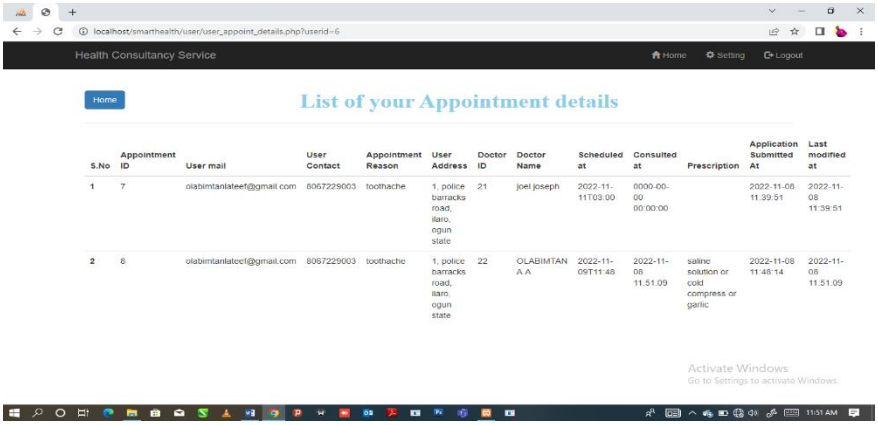


Figure 2: Output Design: Patient data

Figure 2 is the output design depicted by the patient data. When pertinent data are processed to create the necessary information, output can be visualized. The user is aware from the output, that the system kept the data they entered. Based on the inputs, the output design is created. The report produced provides management with insightful information required for decision making. figure 2 data was a screenshot of a new patient's successful registration. A patient is required to provide his Unique ID to the doctor at every appointment so that he may access his personnel information.

Table 1: Database Design: Patient Table

Field	Field Type	Field Size
Card No	Text	25
Patients Name	Text	30
Address	Text	40
Age	Integer	4
Sex	Text	6
Ward	Text	30
Bill	Single	6
Date admitted	Date/time	8
Treatment	Text	150

Table 1 is the Database design. Good database design ensures the removal of duplicates and redundancy. For this paper, application's database was done using Ms access database. Figure 3 depicts the structure of the file design in the database.

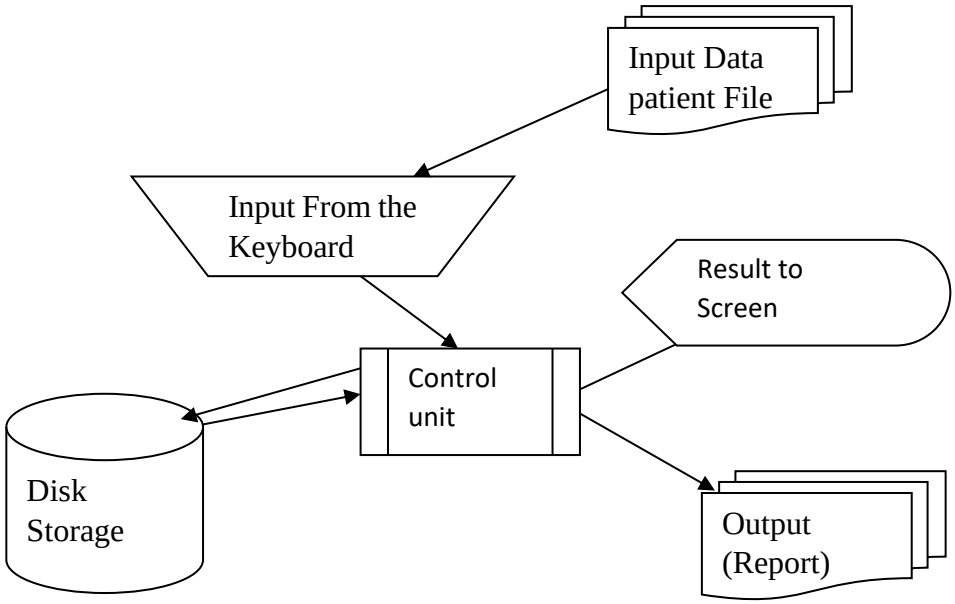


Figure.3: System Flow

System Implementation

Manual process of healthcare delivery is predominant in most hospitals except few ones where patients wait for long before obtaining medical care in the hospital under the first come, first serve order (FCFS). New patients register by completing a patient form at the hospital, demonstrating that they are a recognized patient of the facility. The patient is also given access to medical care

and is given ownership of a hospital file, which is used to store basic information regarding the patient's diagnosis and any medications recommended by the physicians.

For old patients, the record file is retrieved using the patient's file number which is required by the physician to deliver the healthcare service. He may refer the patient to the laboratory unit for test (if the need be) or to the pharmacy unit for already prescribed drugs. But any treatment given to the patient by the doctor has to be recorded on the patient's hospital file to prevent inappropriate medication.

For the system implementation, PHP was used extensively throughout the project development to generate dynamic HTML pages. Microsoft Access was used to implement the database. The core goals while developing the PHP was that of efficiency, high rate of user interaction, as well as security. The Xampp must be executed at the server side to enable an easy view of the PHP results generated.

The figures below are the screen shots of the implementation modules of the software application – smart healthcare consulting system.

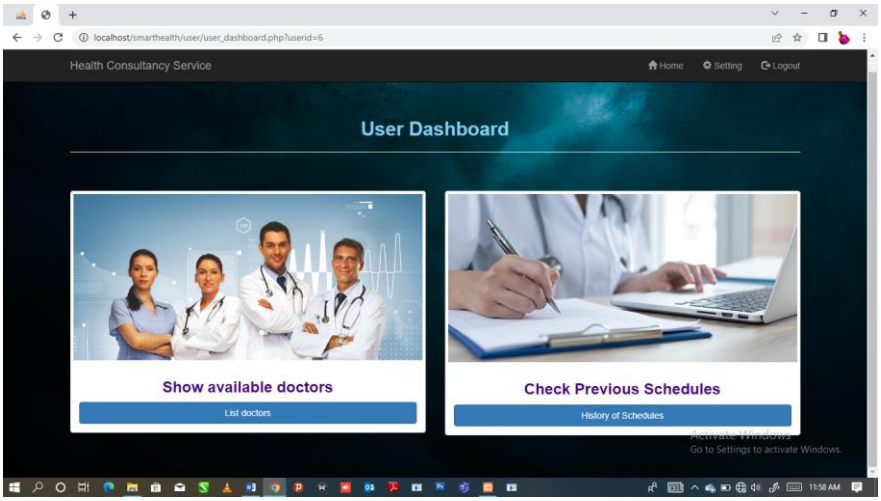


Figure 4: Home page

The figure 4: shows the home page which allows both doctors and patients to login and see the main patient, doctor, administrator's login page. It also describes how a patient should make use of first aid treatment in case of an emergency such as electric shock, snake bite, burn etc. This page also talks about medicament which simply describes different types of drugs and how it should be used in an emergency situation (First Aid) and the benefits.

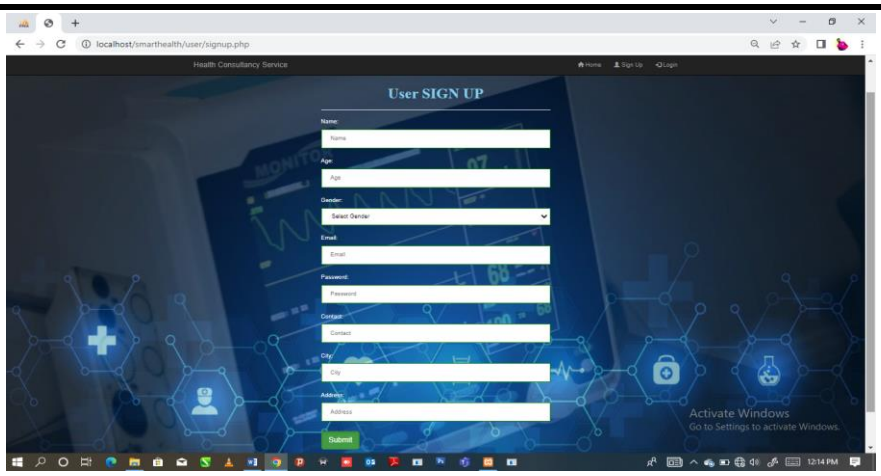


Figure 5: Registration Page

Figure 5 shows the new user's registration page which users of the system must fill in other to supply their biodata to the system for the doctor to view during an online consultation and for record keeping purpose. Once a user has successfully created an account then the patient will be able to describe the various symptoms of the sickness he is passing through and also get an online prescription of drugs to use but if there is a need for the patient to go to the hospital the doctor will communicate the patient through this online system.

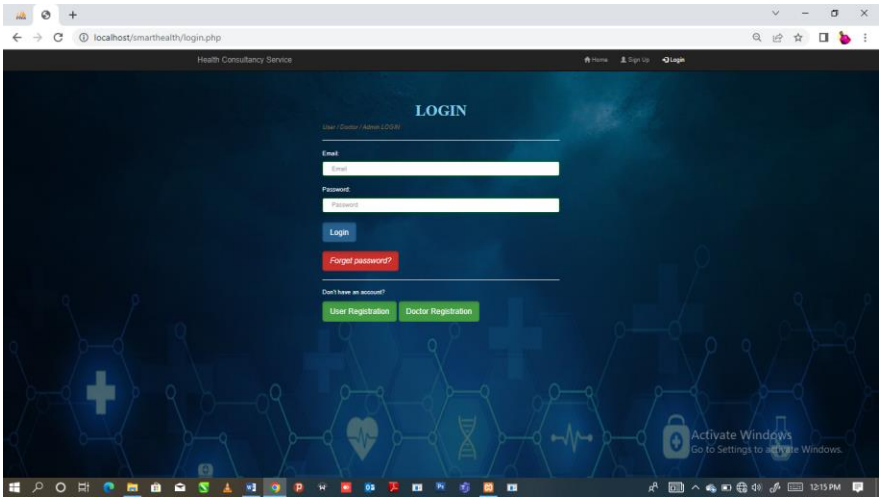


Figure 6: Users/admin/doctor Login Page

Figure 6 shows the login page for the doctors, Admins and patients that have completed the registration process. When a patient has successfully logged in through their page, the patient will see the user dashboard where the patient will view all the available doctors, history of schedules and list of specialists available.

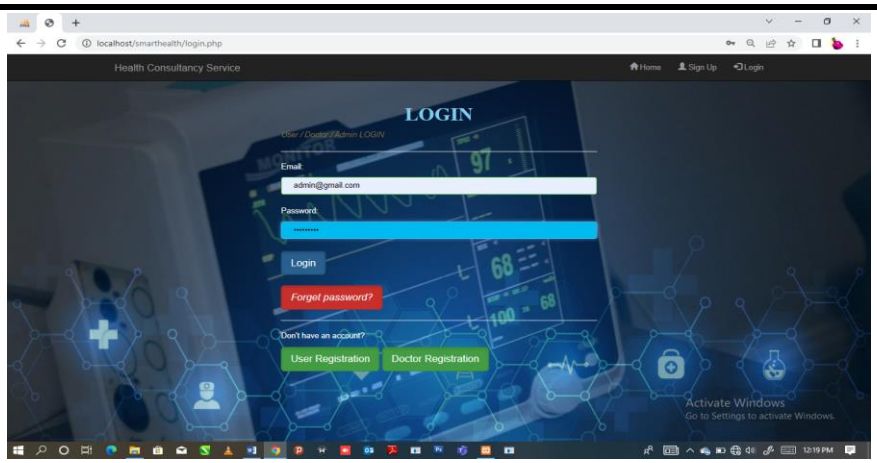


Figure 7: Admin login page

Figure 7 shows the admin login page which helps the admin to check for the available patients that are ready for prescription, treatment and also add a new patient to the list of registered patients. This page enables the admin to also view the list of registered doctors that are available and add new doctors, check all the functionalities a doctor can perform such as checking patient's appointment list and setting doctors' schedule.

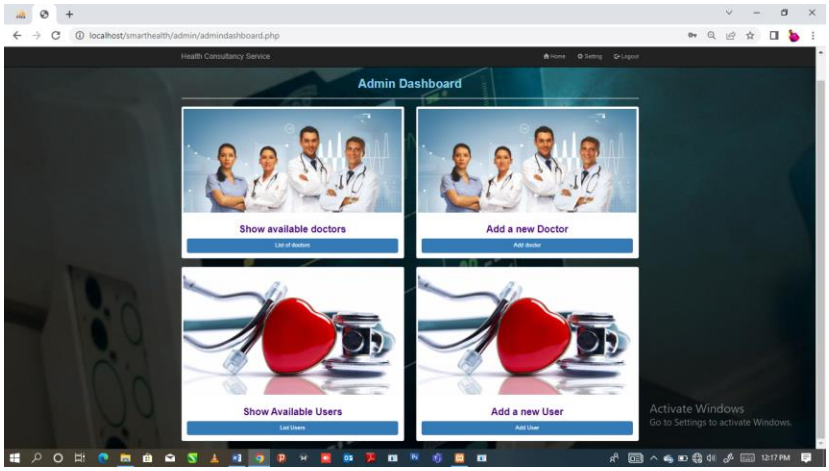


Figure 8: Admin dashboard

Figure 8 shows that an Admin has logged in into the admin's dashboard and can view the list of available doctors and available users, the Admin can also add new doctor and new patients through this page.

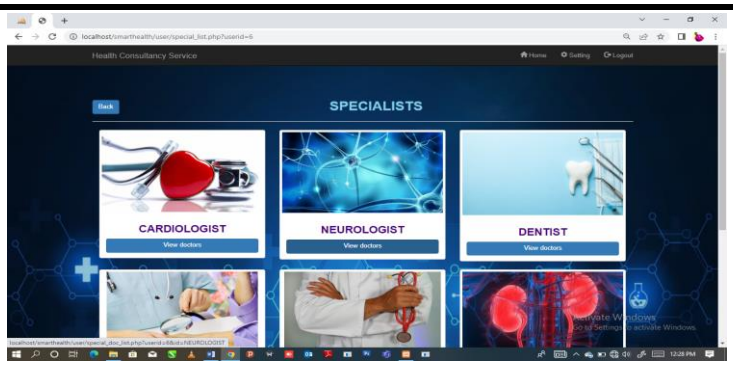


Figure 9: Doctor Schedule Page

Figure 9 is the page that allows the patient to book medical appointments based on the calendar (available) slots made available by the doctor or scheduler. This page also enables the patients to choose among the different types of medical specialist according to the patient's sickness.

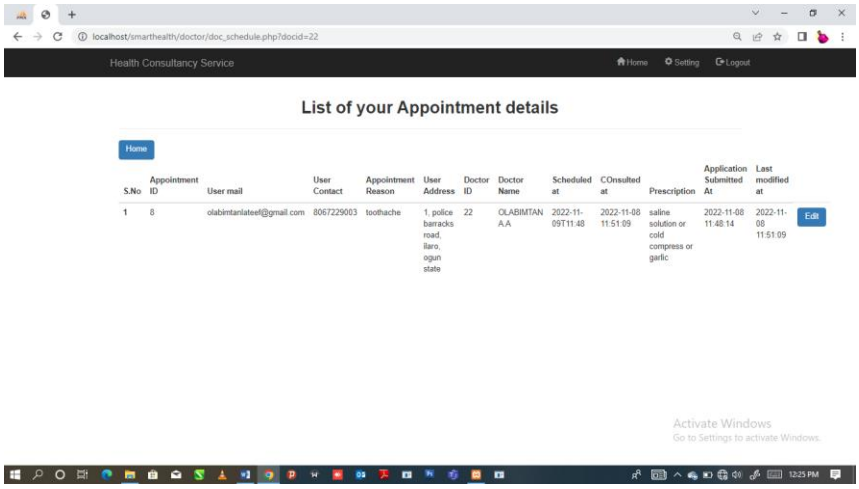


Figure 10: Patient List Page

Figure 10 is the list of patients who have successfully registered for an appointment with the doctor and can successfully print the registration slip that could be presented to the doctors.

Conclusion

This application aside from a huge comfort for the nurses and physicians that works at the hospital, it will provide opportunities for the patient to make short operational decisions, allowing them to solve their problems more quickly and precisely than a human interaction would. The ultimate result of computer use in the medical system is that patients gain competence, precision, and efficacy in their operations in the shortest amount of time.

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