Web-Based Medical E-Consulting System

By

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Abstract

The difficulties in accessing medical services are alarming and have become of a serious concern in Africa, particularly in Nigeria. The lack of enough medical professionals due to relocation syndrome and difficulties people undergo to access medical consultations is what motivated this research. The Medical eConsulting System is for medical consultations online. It is a platform where medical professionals and those in need of any medical services can register while patients known as buyers of medical services can as well register to consult medical professionals. There have been in existence different form of medical consultations systems but not highly effective due to lack of accessibility and affordability by all. The system is developed to give medical professionals of different specialties, the opportunity to offer their services online to buyers (patients) and get paid. The development of this system is very necessary because it will reduce the lack of medical professionals in some medical field and the stress patients undergo in the hospital while waiting for the few doctors available to attend to them. It is accessible and affordable to all in need of medical consultations. Object oriented methodology was used to design the system. The Medical eConsulting System is designed with PHP programming language for the Server-Side, HTML, CSS was used for the front-end and MySQL as the relational database management system.

Keywords: Medical Consultancy, Micro jobs, E-commerce, Online Medical Consultation

Introduction

The ability to responsibly harness the power of the technological revolution to tackle the difficulties of improving health and delivering better, safer, and sustainable care for everyone is one of the 21st century's greatest prospects, according to United Kingdom College of Communication and Information. (2016). Recent years have seen a significant increase in worldwide changes due to the concentration of almost half of the world's population online and the resulting increased connectedness which have caused changes from traditional ways of face to face transactions to online transactions. The physical meetings for medical consultation has turned out to be risky because many have been affected or contacted deadly diseases in the process of queuing for a consultation. It is observed in several occasions when medical professionals are on strike, many die because there is no one available to attend to them, and many patients are forced to patronize quack or fake medical professionals who

have little or no knowledge of health practices. These have led to the increase in mortality rate. It has also been noticed that even the few available health facilities are not easily accessible by so many people; most especially those in a remote areas, the disabled do not find it convenient to reach medical care. In some cases, long queue in the hospital discourages people from going to stand all through the day without being attended to and couple with lack of good manners by some medical professional. Our dependence on the World Wide Web seems to be becoming stronger every day as a result of the seemingly endless innovations that transform our lives. Electronic Health Records (EHR), Telemedicine and Remote Patient Monitoring, Artificial Intelligence and Machine Learning in Diagnostics, Robotics and Automation in Surgeries, Wearable Devices and Health Monitoring, and Online Medical Consultation are just a few of the innovations and opportunities that technology has brought about in the healthcare sector (Tan, 2023).

According to National Library of Medicine, NLM (2014)."Online Medical Consultation" (OMC) describes remote patient-doctor consultations conducted over the internet. Colin (2014) states that Pendleton referred to medical consultation as "the central act of medicine which deserves to be understood." It is undoubtedly essential to both the doctor-patient relationship. The fundamental instrument of general practice, the consultation has undergone changes and evolution over time, much like general practice itself. Changes in the length, content, and style of medical consultations have been caused by numerous variables.

Statement of the Problem

It has been observed that the traditional face to face medical consultation has turned out to be risky because many have been affected or contacted deadly diseases in the process of queuing for a consultation. There have been several occasions where medical professionals are on strike, which has led to the death of many because there is no one available to attend to them. The lack of access to modern medical health care facilities has compelled many Nigerian patients to seek treatment with quack traditional healers and patent medicine dealers who have little or no knowledge health practices. These have led to the increase in mortality rate. It has also been noticed that even the few available health facilities are not easily accessible by so many people; most especially those in a remote areas, the disabled do not find it convenient to reach medical care. In some cases, long queue in the hospital discourages people from going to stand all through the day without being attended to coupled with lack of good manners by some medical professional. This research tends to fill the gap of delays in accessing medical needs caused by lack of adequate manpower and facilities.

Objectives of this paper

The aim of this research work is to develop a web-based medical consultancy system to aid people access to medical services and information online. The objectives include to develop a system that can:

1. Provide a platform for medical professionals of different specialty to register and offer medical services to the buyers.
2. Provide consultations between the buyers and Sellers of medical services.
3. Provide buyers of services an avenue to pay for the services and sellers of medical services to get paid.

Literature Review

Many other medical consulting systems have been in place, and other words are used to describe different medical services that are provided online; these terms do not, however, have widely agreed definitions Ibrahim *et al,* (2015). The terms used in Medical Consultancy include video consultation, online medical consultation, teleconsultation, e-Visit, and e-Consultation, Additionally, he mentioned that since 2000, the growth rate of online medical consultation services has averaged 150% per five years. Online medical services appear to be well-liked by consumers. According to an assessment conducted by Pittsburgh University (USA) researchers, patients benefited from the eVisit services in terms of accessibility, timeliness, and convenience without having to worry about receiving insufficient or inappropriate care (Albert *et al* , 2011)The proposed Systems is a Web-based medical e-consulting system that will provide health related services to the people and provides job opportunities to the medical professionals and experts who are ready to make use of the opportunity to earn themselves some money, as well as rendering services to the people. The system allows patients to consult doctors and specialist of their choice from the comfort of their homes and work places. This research contributed to e-commerce by bringing in medical consultancy to aid people access to medical services, and they will in return pay for the services. It provided a platform for medical professionals of different specialty to register and offer medical services to the buyers. It made consultations between the buyers and Sellers of medical services possible and an avenue to pay for the services and sellers of medical services to get paid.

Online Medical Consultation which is also known as online doctoring. The phrase "online doctor," which first appeared in the media and in academic circles in the 2000s, refers to a new breed of doctors and other health professionals who provide medical care—including

prescription drugs—online. Online medical consultations are described as internet-based remote patient-doctor (consumer-provider) medical consultations (Ibrahim *et al*, 2015) Online Medical Consultation written in short form as "OMC". It is a web-based remote patient-specialist (purchase supplier) therapeutic conference. The phrase "Remote Consultations" refers to an interview conducted by remote broadcast communications, usually with the intention of reaching a decision or initiating therapy, he continued. This might be seen as a characteristic of telemedicine. Luk *et al*, (2016) opined that "Remote consultation" initiatives are frequently established to connect medical professionals in developing nations with experts in North America, Europe, and India. Online Medical Consultaion (OMC) can be seen from remote consultations in three main aspects as described by Luk *et al*, (2016). Firstly, non-internet-based consultations such as phone-only or radio-based consultations are not included in the definition of OMC. Second, OMC represents a paradigm change in the way patients obtain medical advice, enabling them to independently "shop around" for advice in the same manner that they do for internet services. Third, since OMC is about direct patient-doctor consultations, it excludes consultations for other reasons such as health education and doctor-doctor (provider-provider) consultations. The idea of OMC extends beyond standard telemedicine procedures, which are typically restricted to particular medical specialties for patients in particular geographic or geopolitical areas. 2.1. The Relevance of the Online Medical Consultancy System. There are numerous chances for practice and research with Online Medical Consultancy. Since the start of this century, OMC has drawn the interest of both medical professionals and patients. Blair, R. (2006) stated that the editor of Health Management Technology magazine reported in 2006 that patients have always desired the ability to communicate with physicians electronically, just as they do with the rest of the world. This is particularly true for non-urgent issues that do not require an in-person visit to the doctor. The importance of good health can never be overemphasized, just as there is an old saying that "Health is Wealth". According to Vijay (2016) the greatest blessing of life is good health." A person with poor health has a heavy weight in life. The wealthiest man who is ill is always miserable and moans. Despite his enormous wealth, he is sad. While the World Health Organization, asserts that "Better health is central to human happiness and well-being. It also makes an important contribution to economic progress, as healthy populations live longer, are more productive, and save more WHO (2017)" In the recent past and at present, there have been improvements to the quality of health care. These global health advancements during the 20th century, particularly in the last several years, are remarkable. Over the past 40 years, life expectancy has increased and

infertility has decreased globally, outpacing changes over the preceding 4,000 years. Compared to 1900, life expectancy is over 25 years higher now than it was at comparable economic levels.

However, the face-to-face connection with a knowledgeable or dependable health care professional that characterizes the traditional model of care delivery can only be used with a limited number of patients, which limits its impact and reach (Preker and Harding, 2000). Hence, the introduction of information technology in health sectors becomes necessary and relevant. Among the global ecosystem's segments, information and communication technology (ICT) is undoubtedly the one expanding the fastest. Information communication technology, according to Uk College of Comunication and Information (2016) is an umbrella word that refers to any quickly developing and evolving computer, software, networking, telecommunications, internet, programming, and information systems. ICT has transforemd how we live and see the world, and it is now a vital tool in the provision of health care (Idowu, 2014). Werder (2015) refers to the technologies that healthcare provider organizations employ when providing patient care. Technologies include software, mobile devices, computers, and numerous forms of communication. It is acknowledged that clinical equipment and patient care, such as an MRI scanner, can enhance the patient's experience and enhance their opinion of their healthcare professional. With the introduction of electronic patient registration, the use of various forms of information technology (IT) in the health care industry has advanced significantly, particularly in developed nations. This has improved the interfacing and fusion capabilities of a wide range of computer and telecommunication technologies. Part of the reason for this evolution can be traced back to the unique characteristics of the health-care industry, including its size, prominence as a market for computer companies, and requirement for infrastructure for managing and storing information, raising standards of care, and controlling costs in both public and private organizations. It divides the effects of health information technology on patient experience into four categories: technology tools; technology as an enabler; quality, communication, and safety; and, lastly, access to and use of the electronic health record (EHR). Computer literacy is now the most crucial component of a higher standard of living for both educated and illiterate people (Benson, 2001). Without the use of information and computer technology, there is no effective health education anywhere in the world (ICT). ICT was seen by (Humphrey, 2000) as a necessary technology for enhancing teams, individuals, and organizations in the information era. Computer compliance on the part of individuals has become the catalyst for increased affluence and productivity. ICTs consist of sophisticated

hardware and software-enabled electronic networks connected by a wide range of technological protocols. ICTs include network-based information services, internet service provider, information technology equipment, library and documentation centers, and other associated communication activities, according to the United Nations Economic Commission for Africa.

The Impact of the Internet as an Information Technology tool in Health System

The fact that health is the most searched topic on the Internet indicates how important it is (Folake *et al*, 2014).The vast and fascinating electronic wonderland known as the Internet is expanding quickly. The medical field is feeling the growing impact of technology and internet connectivity of the society. The majority of clinics and hospitals rely on the internet for access to clinical data as well as for financial and administrative tasks. The internet has developed into an information system for medical education; one can view online the most recent imaging techniques for operating medical equipment. The medical world has long expected the day to come when diagnosing patients and making treatment decisions would be made easier with the help of the internet. Computer applications in medicine are growing quickly and have the potential to revolutionize the field. Due to its strong penetration and scalability, the Internet is becoming a more and more popular source of medical information. The electronic medical record, the Internet with email and the World Wide Web, and file transfer capabilities are examples of this developing technology. In the new millennium and the new century, it is imperative that this technology be integrated into a comprehensive information system for clinicians Glowniak and Bushway, (1994). Electronic mail has the potential to enhance the professional relationship both between physician and patient, and among physicians of the same and different specialties. There are distinct advantages of communicating via Email: It is faster than all other forms of mail services. It can be exchanged across time zones. E-mail is the most useful resource extending the avenues of learning to an international audience through news or list-server groups. Associations, departments, educational sites, organizations, peer- review scientific journals, and Medline database web pages of prime interest to healthcare providers have been developing at an amazing pace. The Internet is the best medium for exchanging medical knowledge since it enables instantaneous text and image transfer as well as computer-to-computer communication. This may result in important discoveries and innovations. Cyberspace interactions will also assist Nigerian doctors in staying up to date on new advancements, particularly those who practice in tiny towns, cities, and rural areas and frequently feel alone in their work. Healthcare practitioners can access a wealth of knowledge on a variety of

topics through the several websites, including AIDS, emergency medicine, geriatrics, orthopaedics, rehabilitation, public health, rural medicine, transplant medicine, and travel medicine. Healthcare professionals can also become a part of the various discussion of their interest and can exchange their experience. A large amount of information on patient care, education, and support is available. Most health sites have traditionally been information-based and the Net (Internet) is, for example, the best way to find a self-help group for any disease. It's also a huge source of details on individual diseases, no matter how obscure, and is increasingly being used by patients as a way of locating the best hospitals and doctors. Primary healthcare practice in Nigeria is already being impacted by changes in healthcare delivery and the proliferation of health information available on the Internet. They speak of the rate at which Internet access is expanding as well as all the performance gains brought about by new technology, particularly in the fields of telemedicine and patient-provider communication (Ajuwon, 2006). The Internet will be utilized more and more to disseminate information that is "real-time." By sending all of the photographs and data to the specialist online, a doctor working in a distant community can now consult with him from anywhere, removing the risk of travel and saving both time and money. The most significant change is occurring in the general physician's clinic, even if internet technology has significantly increased access to health information. Doctors can key their patients' symptoms into a computer and receive an instant diagnosis. In several rural areas of the developed countries, doctors are using ISSN-based technology to enable a medical consultant to examine patients 120 miles away. In a doctor's office, a consultant will examine the patient and make a diagnosis with the use of video pictures and remote sensors that can transmit information about vital signs like heart rate, blood pressure, and others. Doctors can also alter how they treat patients because to the Internet. With the help of a patient's DNA database, physicians should be able to customize medications for each patient's unique condition and rule out any potential negative effects (Younger, 2010).

The Internet has emerged as a new telemedicine platform. The Cyber Medical Center (CMC) is a project that aims to create a multimedia network system for the electronic management of patient records, teleconsultation, online prescriptions, online continuing medical education, and web-based information services. It integrates multimedia, database management, and a multiple site video-conferencing system. The World Wide Web's (www) resources can be used as a highly helpful "Information for Health" tool, filling in the knowledge gap and lowering the number of mishaps and hazards brought on by drug abuse or improper use. The major issue of prescription medicine misuse is mostly caused by ignorance. In order to close

this gap in the right and safe use of prescription medications, WWW can certainly be used. A plethora of research conducted in the last ten years has demonstrated the critical roles that nutrition and exercise play in preventing disease (Bennett *et al*, 2006)

Methodology

The proposed Medical e-Consulting system would take care of all the observed weaknesses of the existing and would perform better than the existing system. The development of web-based system for medical consultancy is a system that takes care of online medical consultancy using micro job ideology. The system has majorly three operators, the administrator, the sellers of medical services (consultants) and the buyers of medical services (patients). The administrator will manage the system, authenticate users (buyers and sellers), process payment in the system. The buyers are to create an account in the system, and search for services they need and also consult the consultants. The seller of medical services will also register on the system, edit their profile and create jobs for the buyers to see the medical services they are offering.

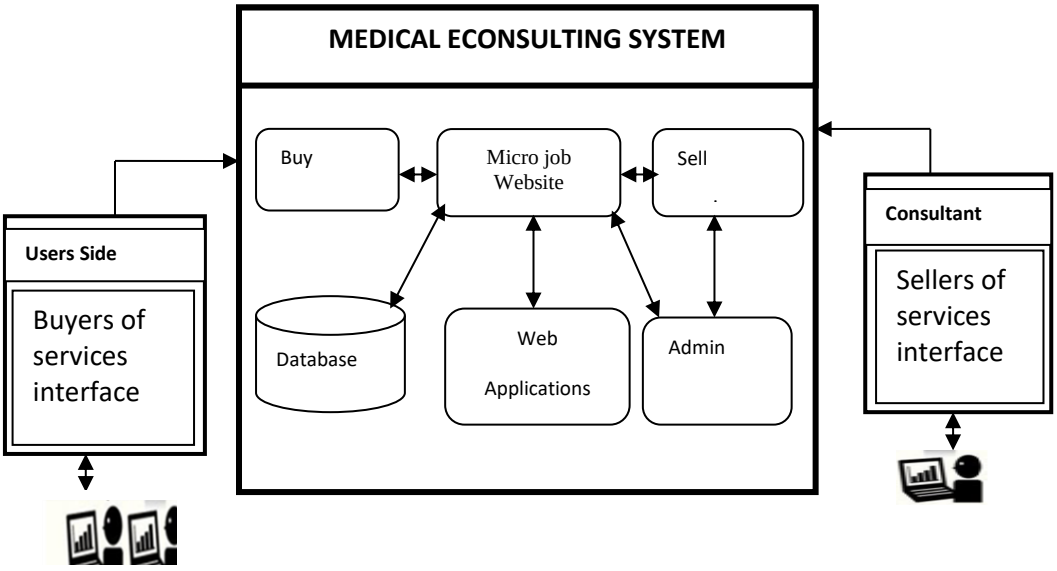

Figure 1: Overview of the Medical eConsulting System

Source: (Researchers)

Figure 1 shows the proposed system, Medical eConsulting System is software designed for medical professionals of different specialties to register for free and offer medical services to buyers of medical services.

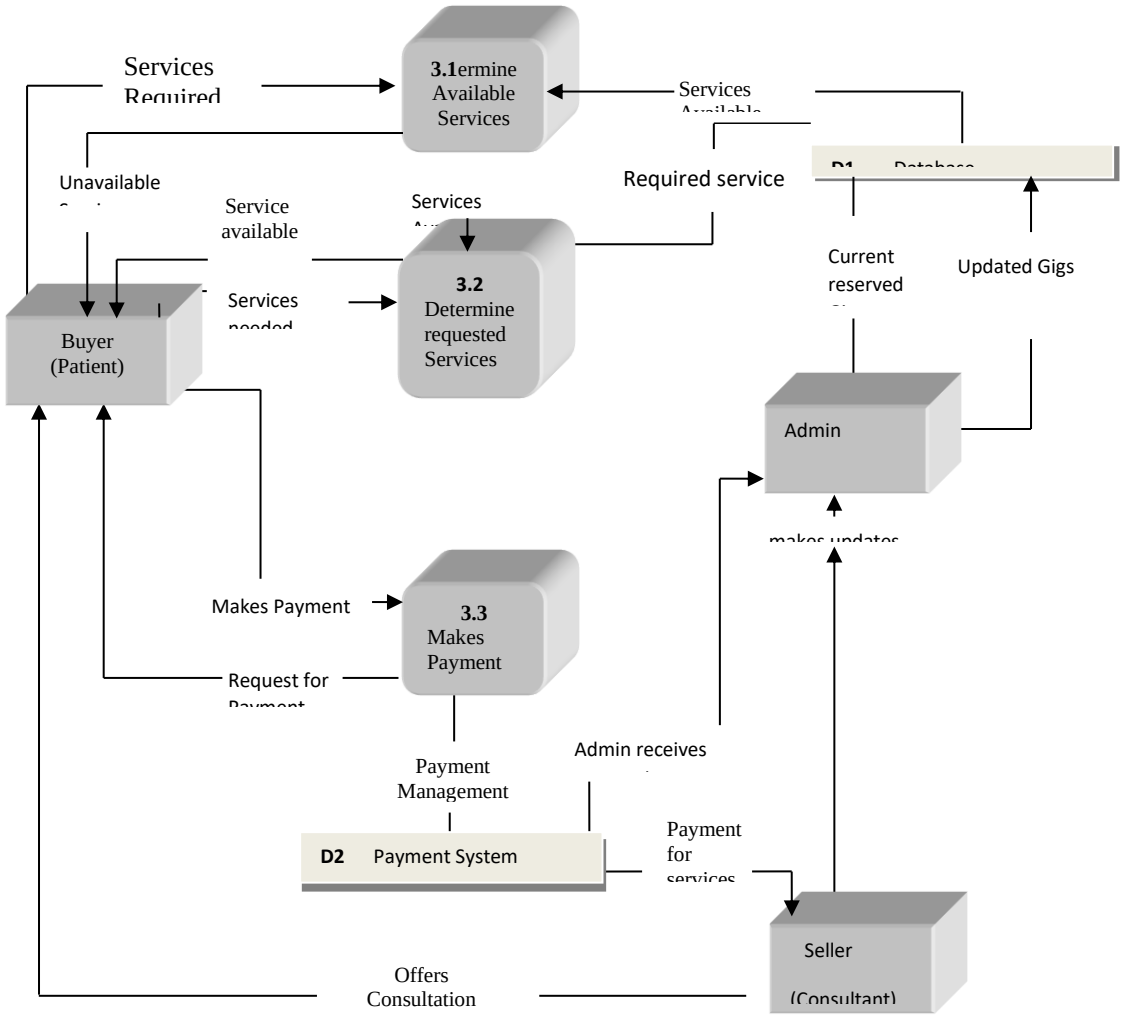

Figure 2: The diagram of data flow of the Medical eConsulting System Source: Researcher

The diagram of data flow in figure 2 shows the components of the of the medical consultancy system. The users-side is the buyers of the services and the consultants are the sellers of the services. The diagram shows the buyers, sellers and the administrator as the actors, linked to the system. The system has a database and it is a web application. The buyers check for the available services, which the system will make it available to him, if he sees what the service he is looking for, he will consult the seller and make a payment which will go to the payment system (PayPal). When the service is rendered to him, the seller receives his pay.

Use Case for the Proposed System.

The many phases of interaction between the system actors and related Use cases are depicted in the Use case diagrams in this work. It serves as a tool of communication between the software developer and the user group. The three actors (Administrator, Sellers (consultants) and Buyer (patients) interact in the use case diagram as shown in figure 3.

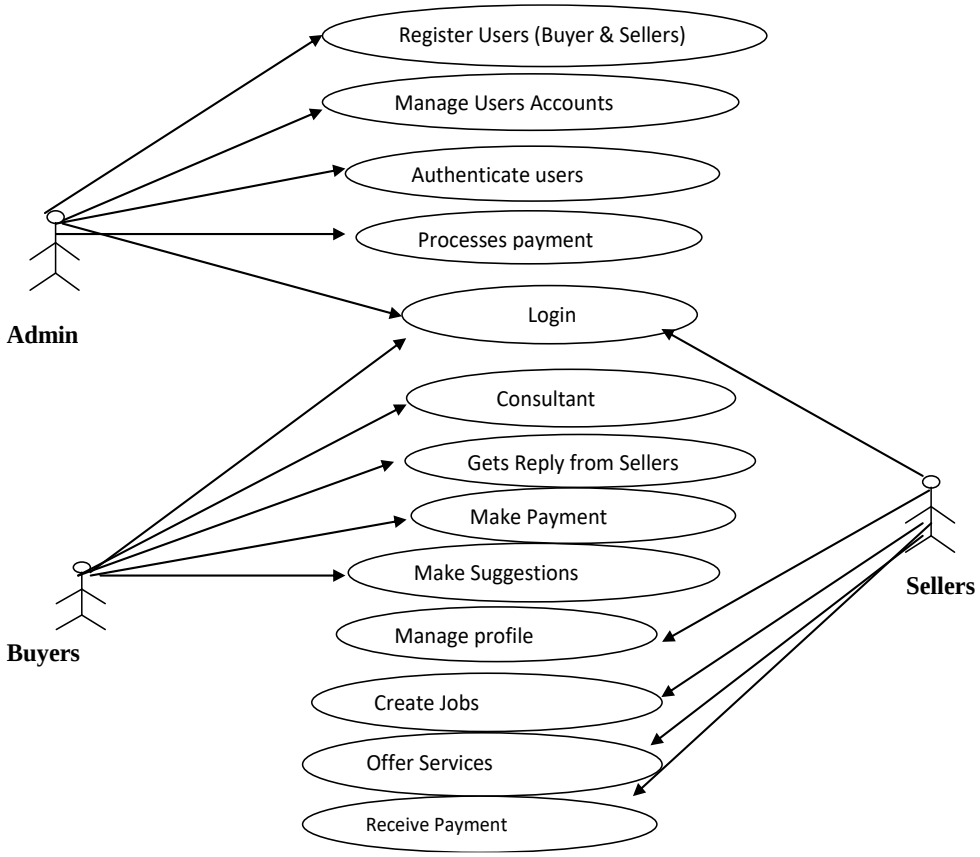

Figure 3: Use Case for the Medical eConsulting System

Source: Researcher

The Administrator creates and manages the accounts of both the sellers and buyers. He alone can delete any account from the system and make payment for the services offered by the sellers. Buyers and sellers can modify their account as desired but cannot delete their account.

Sequence Diagram of the Proposed System

Sequence diagram is one of the major UML diagramming techniques. Sequence diagrams show the objects involved in a use case and the messages that flow between them during the course of that use case. In the sequence diagram below, we have the two actors' buyer and seller of medical services.

The seller will login, create job also called gigs. The buyer consults for medical service, he makes payment and once the payment is approved, the service he wants will be administered to him by the seller.

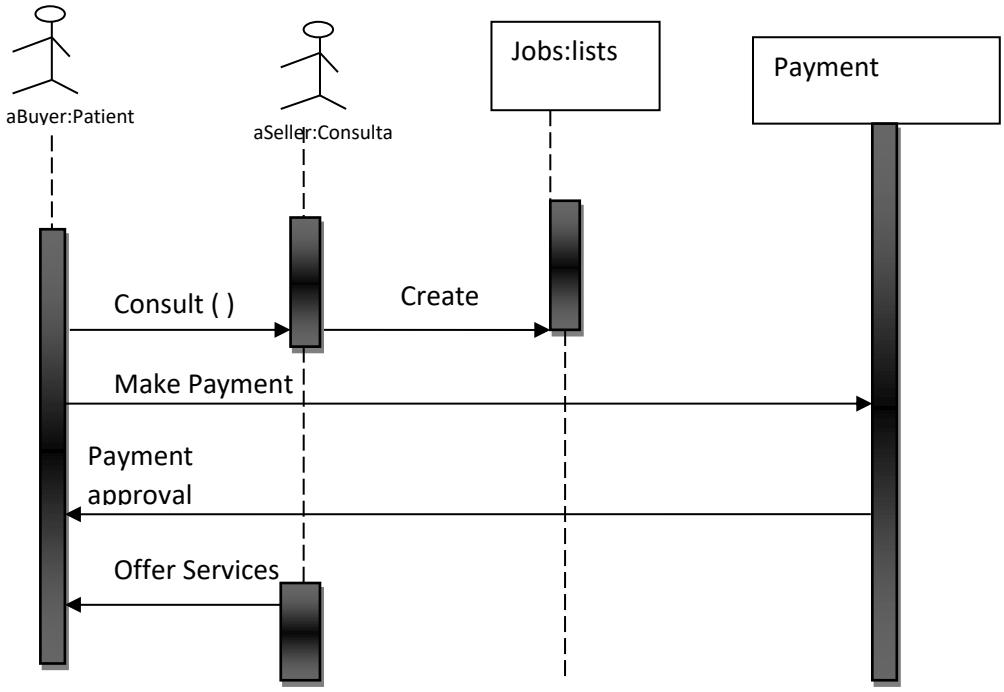

Figure 4: Sequence Diagram of the Medical eConsulting System

Source: Researcher

Implementation

Implementation activities for Medical eConsulting System for the patients in need of medical services to come and consult medical professionals. It is the stage where the technical specifications or software components, through computer programming are practically employed. Main users of this system (i.e. Buyers and Sellers) will be involved during this period of implementation. For the successful implementation of this new system the following conditions should be met:

1]. The content gathered via upload for the web-application must be relevant to the users. This included text, and images.

2]. Testing the web-application is critical both throughout the building phase and after.

3]. Only registered users should have access to the platform. When the above has been ensured, the new system can then be introduced.

Input Form Design

This is the means in which users, in general, introduce data into the system for processing. The Input form is the initial part of the graphical user-interface which allows the user to interact with the system. The users (patient or medical professional) interaction begins with

the login form for the purposes of collecting and validating the user's login details in the database. When this has been successfully accomplished, the appropriate user-interface is displayed. From here, the user can continue the interaction with the system based on predetermined roles. Additionally, provision is made on the login form login form for new users who are not yet registered, after which he/she can login to the system.

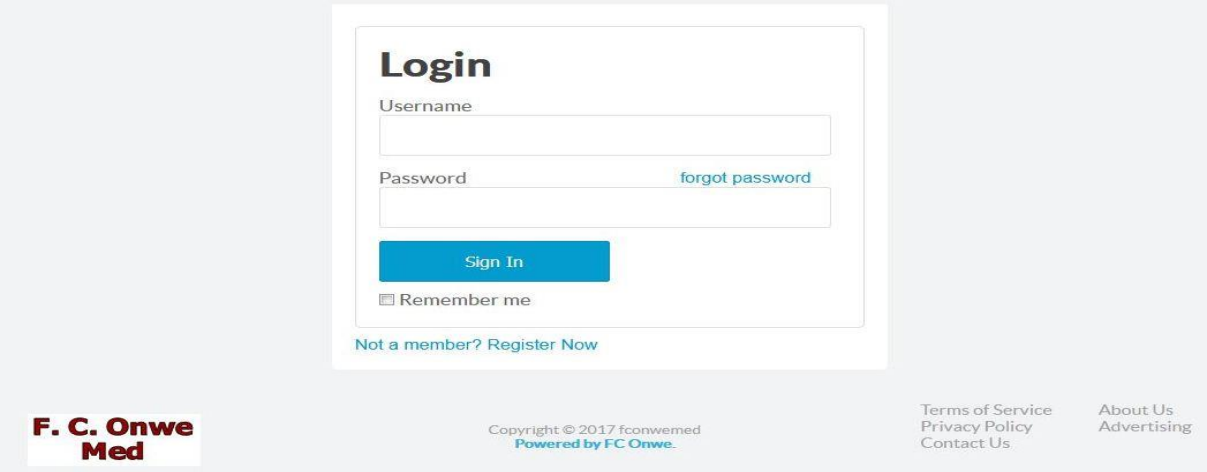

Figure 5: Login implementation of the Medical eConsulting System

If there is any deviation between what is entered and what is already in the database, for already registered users, the login form, as represented figure 5 will continue to reappear. When correct entries are made and validated by the system, the users will be displayed in users interface implementation**.**

Implementation of User Interface

This is the user interface of the eConsulting system when the user logs into the system. When medical professional's login, he creates the kind of services he would offer the patients, they are regarded as the sellers of medical services. The patient login and search for the kind of medical need they desire, after which they will pay the system administrator the amount for such services, and goes on to consult the medical professional of their choice that offers the service, and if they are satisfied with the services rendered, they will have to notify the administrator who will now pay the medical professional. The Administrator also has a dedicated interface where he/she confirms the registration of the users to the system, updates the systems, deletes users violating the system, and approves payment withdrawals. The figure 6 shows the activities at the administrators end.

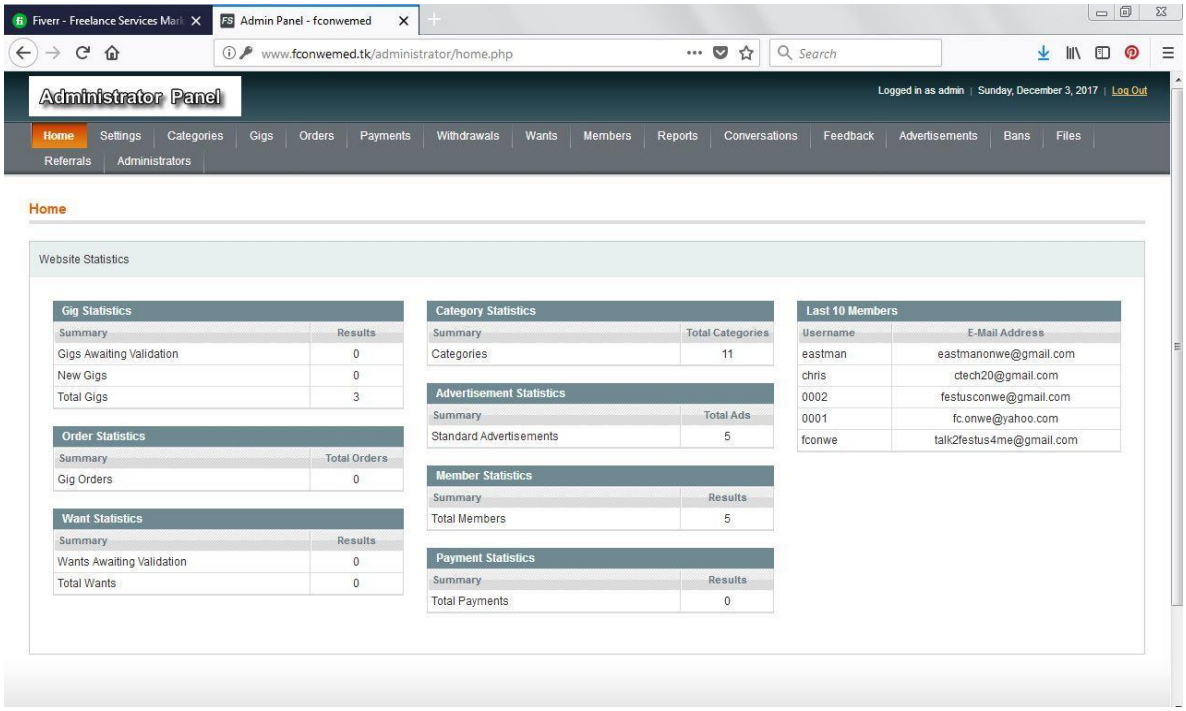

Figure 6: Administrator Implementation of the System Source : Researcher

Conclusion

The workplace has changed significantly as a result of technological advancements. Information technology has made it easier to do a wide range of formal and informal jobs, such as paid survey takers, stock photographers, Internet content writers, bloggers, among countless more jobs. The platforms produced by the micro jobs are beneficial in so many ways, even though can't be void of some challenges, because of few dishonest people in the society. The platforms provided by Web-Based Medical E-Consulting system are flexible, effective and efficient; and can be accessible through the user's preferred device (mobile phones, or tablets, etc.). Utilizing this method in consulting a medical professional does not require much stress, all that is needed is a device and good network. There are numerous micro job website and medical consultancy systems, in this project, we have successfully developed a web based system that will aid in medical consultancy and provide jobs for medical professionals.

Suggestions

1. Government should make health care technology available and accessible to health care providers because the use of technology in the 21 century is inevitable, therefore is it imperative for easy access to medical needs.

2. Government should provide funding for the purchase of digital devices to support innovations such as the telemedicine and e- consulting

3. Staffs should be trained on how to deploy new and innovative health technologies to enhance patient – doctors relationship/

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