

Overcoming Barriers to Healthcare Access and Delivery

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Abstract

Access to standard and economical health care delivery, availability of significant health information are viewed as some of the most functional public health interventions in present-day history. Despite that, current information obtained from the WHO regarding Nigeria's health condition shows that the average existence expectancy is at 54 years and maternal mortality at 608 per 100,000 live births as a result of poor health care services. Several aspects of health informatics have been applied to solve these challenges such as the transformation of records from manual to electronic. Among these are the telemedicine and socialized healthcare, which have been barely adopted in developing nations. This work thus proposes an architectural framework for a cloud-supported socialized healthcare system. In order to achieve this; a web-based application software was designed and implemented through the use of cloud computing technology platforms and server side scripting tools. This study proves that socialized healthcare will really go a long way in defeating barriers of viable human access and delivery.

Keywords: Socialized Healthcare, Internet enabled Devices, Social Networks, Usability, Unified Modelling Language and Government Regulatory Bodies.

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1. Introduction

Most healthcare systems face great challenges due to unavailability of current and accurate health information, making the future survival of these systems questionable. In order to curb these challenges, there is a need for a system that provides up to date and correct health information to its users. Socialized Healthcare (SH) is therefore defined as a social media platform which helps in connecting users and Government Regulatory Bodies (GRBs) thereby providing them with current and useful health information and services. It differs from public social networks because Government Regulatory Bodies (GRB) are involved [1] [2].

Data for socialized healthcare services are gathered from different sources which are combined to provide users with meaningful and current information, these data are gotten from thousands of primary health care centers,

multiple hospital information systems and national disease repositories[1]. SH combines the use of Electronic Medical Records (EMRs), Patient Health Records (PHRs) and Electronic Health Records (EHRs) via the social media [3]. The use of social media as a platform for healthcare has given rise to the number of users and other partners that share and store information regarding their wellbeing in order to enhance and also help others improve on their health so as to make the right decision.

Cloud supported healthcare system for PHR grants patients the accessibility to have easy and free entry to their own personal health data because it is owned and managed by these patients; rather than having their health data stored in the database of a hospital which becomes inaccessible to them[4]. In addition cloud supported healthcare system for PHR also allows self-tracking or self-monitoring that enables patients create an online group in order to share information privately or publicly through the use of web pages.

Liu et al., [5] associated reduction in healthcare challenges and increase in medical resource sharing and exchange to the continued evolution of EMRs and PHRs around the social networks and devices.

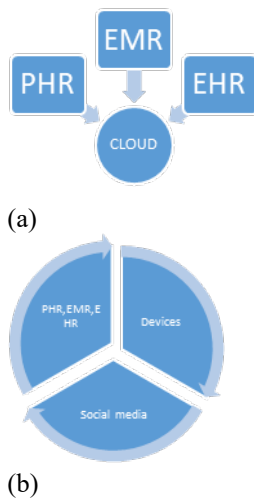


Figure 1. Evolution of intersecting trends (a) between cloud computing and the EMRs, EHRs and PHRs. (b) between health records, devices and social media [6]

Cloud computing, the major driver of social media based healthcare has been in existence as far back as in the 1950s, when large scale mainframes were in use and were made available to schools and corporations. According to Mell & Grance [7], cloud computing can therefore be referred to as a model for empowering ever-present, adaptable, on request network access to a common pool of configurable computing resources that can be rapidly provisioned and discharged with minimal management effort or service provider information with several characteristics which includes on request self administration, broad network access, asset pooling, quick versatility and measured service.

Cloud computing has evolved through using Software as a Service (SaaS), Platform-as-a-Service (PaaS) and Infrastructure-as-a-Service(IaaS) as models and it is also known as a technology that has aggrandized multiple life environments thereby showing noticeable positive changes[8].

Software as a service is priced on a pay-per-use basis which is usually referred to as "on-demand software", While cloud computing platform allows providers manage the infrastructure and platforms associated with each application, it also allows various users have unlimited access to application software and databases.[9].

According to Boniface et al., [10], PaaS is a cloud computing paradigm which allows providers deliver platform such as the operating system, programming language execution environment, database, and the web server. It also helps application designers solves the problem of expensive and complex underlying hardware and software layers by providing a cloud platform where

these developers can run their software solutions successfully. Examples of known leading PaaS cloud computing platforms are the Google App Engine (GAE) and Microsoft Azure.

IaaS is also a known cloud computing paradigm which provides consumers with the capacity to process, store, network, and also with other fundamental computing resources, this provides the customer with the capacity to send and run arbitrary software, such as the operating systems and its applications, one of the detriments of this cloud computing paradigm is that consumers does not have the access to control the basic cloud infrastructure and potentially contrained control of select networking components, yet rather has control over operating systems, storage, and deployed applications in the system.

According to WHO [11], Nigeria, our test base is still lacking in many respects in terms of health care delivery, affordability and access to necessary information because of the poverty level. The World Health Organization (WHO) suggested that the best way to address these inadequacies lies squarely on universal health coverage.

The poor state of health care delivery according to WHO [12], is caused by the low number of registered physicians in the country which is about 41,000 and implies ratio of 1 physician to 3902 citizens (1:3902). The Health and Statistics department of the Nigeria National Bureau of Statistics (NNBS) are currently facing a challenge of gathering health related data. According to NNBS, [13] only data from few general hospitals, infectious diseases hospitals and public health units is contained in their repository.

The aim of this research work is to design and implement an architectural framework for a cloud-supported socialized healthcare system and also to evaluate the designed collaborative virtual SH system.

Thus, this work proposes the use of SH to solve the health care challenges identified by the WHO and NBSS can be curbed using SH so that the general populace would have access to formal health care delivery, also this work explores how cloud-supported social networking principle could help the health care system solve current and future issues.

1.1 Statement of Problem and Objective of Study

Access to standard and economical health care delivery, availability of significant health information are viewed as some of the most functional public health interventions presently. [14].Nonetheless, current information obtained from the WHO in regards to Nigeria's health status is challenging; which shows that the average existence expectancy of a Nigerian is at 54 years which is regarded to be lower than the normal rate, maternal mortality is 608 for every 100,000 live births, which when viewed with South Africa's maternal

mortality rate it is twice as high as South Africa's is 300 for each 1,000 and right around 10 times Egypt's 66 for every 1,000 live births, the rate at which the health care system in Nigeria is degrading is alarming which is as a result of weakness in the health care services system.

The NNBS also reported difficulty in gathering health related data as there is no standard repository which contains structured health data, thereby making the health sector suffer a great deal which in turn endangers Nigeria health status and national profitability. Due to this, Nigerians are being denied quality healthcare services, particularly the individuals who cannot afford these services (rural communities). Between 2005 and 2012, Nigeria's Human Development Index value expanded from 0.434 to 0.471, a normal yearly increment of about 1.2% [15].

A visit to major health care institutions has likewise uncovered a considerable measure of inadequacies in the health care process. Good healthcare being one of the most basic and most important amenities a government should provide for its people, Nigerian governments are still striving in their obligation and yet to improve the health care delivery using innovation [16].

2. Review of Related Findings/Technologies

The challenges (such as security and privacy issues) involved in the implementation of the socialized health care have made it difficult for any country to fully implement it into their system. In Nigeria, the major consideration in our test base is to contrive a means of making use of available IT tools to leverage healthcare delivery. Below are some of the closely related SH technologies [6]

2.1 Existing Technologies

- **TuDiabetes:** This is a type of a socialized healthcare system that supports, educates its users by sharing the steps involved in living a healthy life while still living with this serious condition (<http://www.tudiabetes.org>).
- **MoodScope:** A social network that measures and tracks the users mood, it is known to be built with a capacity of 34,000 users who are able to learn about their behavior in order to be able to predict their health lifestyles. (<http://moodscope.com>)
- **CureTogether:** A social network that allows various health data from various sources to be tracked and compared, this socialized network allows different users come together to share related health information, thus; allowing them fully understand the way their body works (<http://curetogether.com>).

- **WiserTogether:** A socialized network that offers users the best and affordable drug for treatment related to their health risk (<http://www.wisertogether.com>).
- **HelloHealth:** Enhances the experience for both providers and patients by lessening paperwork, coordinating income cycle administration, streamlining procedures and utilizing the most recent on the web and mobile communication applications to enable providers and users to engage in effectively and comfortably (<https://hellohealth.com>).

2.2 Related Findings

The expansion of IT has brought about developments most especially in the aspect of healthcare [6]. This has caused a shift in healthcare records from manual processing to electronic. Socialized healthcare is a branch of electronic healthcare that deals with real-time communication between various stakeholders in the healthcare industry including the GRBs.

Stewart [1] stressed the fact that there is nothing that stops people from having their health records online if they can have their entire financial life online. He hassled that social networking in healthcare has indeed connected consumers with accurate, current health services and information. The only issue outlined by this author was privacy and credibility. In [2], Hansen tried to explore the self-tracking devices and social media platforms used by various self-tracking communities, implications were also examined. This author concluded that as PHRs are shared across connected healthcare networks, ethical and scientific issues begin to rise. Loh et al., [17] hassled that social media represents the steady increase in the ease through which patients are able to access health information online. This author also noted that these increase would also automatically influence relationship among stakeholders particularly in the areas of diagnosis, testing and treatment.

According to [18], patients with chronic diseases made use of public social media to make decisions about their care. The author presented enough cases to buttress this fact. Laranjo et al., [19] tested to prove a positive effect of social networking sites interventions on health related outcomes, which was statistically confirmed. In [20], Evidence from the author's research shows that Facebook has been integrated into medical education. While the study in [21] proved that nurses use twitter to network with healthcare professionals and organizations, communicate and deliver health messages. From these empirical findings, we can justify that social media based healthcare is very key in shaping the future of Global healthcare.

2.3 Motivation of the work based based on the Existing Methodologies

The benefits provided by the design and implementation of a cloud-supported Socialized healthcare framework include; increased initial cost and rapid application development, improved access to records and health care real-time irrespective of location, time and how such information is needed; improved quality of health care delivery in the form of effective and efficient allocation of resources, information support and sharing, remote monitoring, video conferencing, eradication of paperwork and reduction in patient waiting time when it comes to medical follow-up, confidentiality as only authorized personnel have access to information whilst also considering the Health Insurance Portability and Accountability Act(HIPAA) of 1966.

3. Cloud Computing and Healthcare

Healthcare sector is an exceptionally critical information industry, which manages lives. A change from paper-based records to EHRs and EMRs wasn't so efficient since EMRs require maintenance, integration, resources and high implementation cost. Cloud computing concept offers affordable, shared, adaptable, flexible foundation that guides in changing e-healthcare to smart healthcare which comprises of the utilization of modern innovations such as smart cards, robots, smart phones, tele-health systems through the web on payment basis for best medical practices [22].

Cloud computing optimizes the cost of EHRs as well as tracking diseases more effectively and efficiently. It is important in healthcare sector since it decreases complexity and empowers effective administration of EHRs for enhanced care practices. It uses the joint effort between the systems in healthcare. EMRs are entered once in the system but can be gotten from several places in order to recover information by authorized professionals [23]. Cloud-based architecture is capable of collating data from several sources, coordinate and analyze that data instantly. It likewise enables human experts to screen patients remotely, pervasively and ubiquitously which will in-turn save transformation cost, in-patient cost and also considering the comfort of patients. Despite the enormous characteristics of cloud computing in healthcare, we still have some challenges to face. The categories of challenges involved are: economical [5][33-35], legal, privacy [24][25], technical [25-30], medical, and organizational [32].

A number of software options exist for developing cloud supported SH systems. They possess a number of similar features which include [36]: being open source; support is available; support open metadata formats; interactive user interfaces; advanced search/information retrieval, user validation and administrator functions.

4. Architectural Framework Of Cloud-Supported SH System

The architectural framework of the proposed cloud supported SH system is shown in Figure 2. This is centered round the use of connected health services, this enables various number of services such as the communication services.

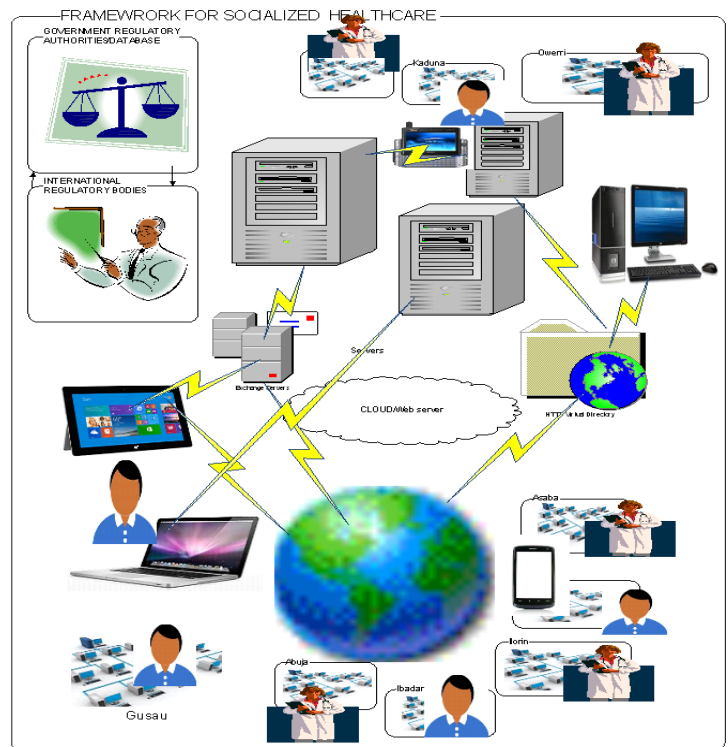


Figure 2. Conceptual Framework

4.1 Discussion of the Framework

The communication among stakeholders and the information technology infrastructures involved is also shown in the socialized healthcare framework.

- The government administrative specialists/database and the worldwide administrative bodies guarantee appropriate accreditation and verification of enrolled doctors and furthermore guarantee proficiency, legitimate record keeping and security of the database including better learning of conceivable results
- The different remote areas demonstrated as discussed about in the introduction demonstrates that patients and specialists can speak with each other constantly despite to their geological areas;

for instance, a patient in Owerri, Nigeria can interact with a doctor in Ibadan, Nigeria.

- Patients requesting medical services at affordable cost can reach out to any specialist of his or her decision over the web utilizing any web empowered gadget that is associated with a central server which will be permanent in the cloud as shown in Figure 2.
- The various Internet enabled devices serves as medium through which patients get connected with current and accurate health information.
- The cloud/web server provides on-demand real time services to shared pool of data for clients.

4.2 Proposed Implementation of the Framework

The framework comprises mostly of communication framework, which incorporates mobile and Internet innovations that requires either remote or local network. Patients and specialists can utilize advanced mobile phones, tablets or desktop PCs for virtual communication. This system permits stream of data among doctors, analysts, and patients commonly. The execution of this system will require the design and development of a web based application programming utilizing cloud computing approaches and server side scripting tools. The application will likewise incorporate a video conferencing stage for real-time communication. The clients of this framework will be anyone that have been approved and authorized by administrative bodies.

5. Conclusions and future work

This research study has thrived in indicating the significance and usability of the core functionalities of a Socialized Healthcare system. The system's core functionalities includes improved communication amongst various stakeholders in the healthcare industry, information sharing, improved capacity building for the health workforce, minimization of paper work and reduction in patient waiting time especially in the aspect of medical follow-up.

This research was able to prove that SH will really go a long way in overcoming barriers of effective healthcare access and delivery. The healthcare industry is a high risk industry, highly regulated, multiple stakeholders, slow pace of adoption, small and large providers, and long-term relationships. There are also multiple stakeholders involved in this industry ranging from care-providers, hospital administration staff, payers, laboratories, patients and GRBs. According to the Health Insurance and Portability Act (HIPAA) 1996, healthcare information is sensitive personal information, and unauthorized access to healthcare information is a breach of a person's privacy. Since healthcare data is highly sensitive, any breach of privacy and security can have serious consequences.

Future research works should drive towards the implementation of the framework and also designing sophisticated security models to prevent third party or cyber criminals from hacking into the system and also to prevent breach of the HIPAA Act.

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