

Healthcare Communication Technologies: A Short Note on Opportunities and Challenges

¹Muhammad Shuaib Qureshi, ²Muhammad Bilal Qureshi, ³Vijey Thayananthan

^{1,3}Computer Science Department, Faculty of Computing and Information Technology, King Abdulaziz University, Jeddah 21589, Kingdom of Saudi Arabia.

²Department of Computer Sciences, COMSATS Institute of Information Technology, Islamabad, 46000, Pakistan.

Abstract - The most evitable and focused target of research community is the medical and healthcare sectors. Every healthcare industry tries to facilitate patients with the ever-new technologies in an economical way. Majority of the countries try to open the new horizons of expandable quality healthcare services with minimum cost. With the growing needs and day-to-day innovations, a single technology is no more suitable to contribute to the plethora of services hence, the healthcare industry is moving towards merging old and new Information Communication Technologies (ICTs) to adopt advanced features. This idea gives added value, new possibilities and open ways to enhanced communication opportunities in the healthcare field. This short note describes the basic healthcare technology opportunities and human and social hurdles of healthcare information. It addresses some of the basic challenges in building and complementing different ICT categories and enhancements in solutions already providing by these technologies.

Key Words: Healthcare, ICT, Information system

1. INTRODUCTION

An improvement in health sector is one of the primary goals of any country in order to provide fast and easy access to health-related services. However, at the same time, they are struggling to reduce the growing cost of healthcare. There is no globally accepted standard healthcare improvement process due to its varying aspects. However, the immense development in the field of *Information and Communication Technology* (ICT) during last few decades benefited almost all other fields including health sector in terms of services and quality at low cost [1, 2, 3].

Health sector improvements involve a range of factors to enhance on the whole including general public health, clinical care, medical education, emergency response system, nutrient food, clean water, and hygienic environment. To achieve all health-related aspects, involve changes in other factors such as

political policies, social behavior and economic conditions.

Now a day's health sector highly depends on computerized technologies. According to *World Health Organization* (WHO), a vast range of technologies form roots for the services to prevent, diagnose and treat diseases [5, 6, 7]. ICT offers an array of technologies that support healthcare development on large scale. It can play vital role towards health sector improvements if strategic polices are adopted by top authorities and governing agencies.

With the development in technology, the communication mechanism has also changed extensively with the introduction of cellular technologies; fax, electronic mail and audio/video conferencing that offer new ways for sharing different perspectives. Advanced communication technologies make use of visual images and audio via radio, television, and internet that offer opportunities for general public and experts to share their suggestions, knowledge and expertise. This idea has been enhanced by taking advanced steps to deregulate communication channels in many advanced countries which results in providing new ways such as television channels and radio broadcasts for communication on a large scale [8, 9].

According to the World Bank current report, the fundamental elements in health-related technologies are effective communication and reliable information. Using apposite technology increases the communication and information access in public health-related technologies. Online health monitoring systems enable society to monitor and get information about their health-related problems. Some social public NGOs also give awareness to the public about healthcare systems and processes [4]. The third world countries try to access different healthcare services

and involve in demanding better ICT opportunities on priority basis.

Before proceeding in details, we need to define ICT and healthcare opportunities.

2. HEALTHCARE TECHNOLOGY OPPORTUNITIES

Healthcare technologies provide opportunities for enhancing patient care using clinical processes and required information. Cost reduction is a major concern of communication technologies in healthcare industry. In the traditional healthcare paper-based methods, there was a significant delay in providing healthcare services. But in current information technology era, it has been replaced by latest computer-based patient records using portable computers. Moreover, expert information-based systems enhanced the availability of patient's information to healthcare personnel with real-time access [10]. This advancement added tremendous facilities and utmost care to the patient's life. This also cares the patient 24 hours 7 days a week [12].

3. CATEGORIES OF TECHNICAL SOLUTIONS

In this age of wisdom and modernity, ironically the greatest predicament that exists is that the cost of living and saving lives has become higher, and unfortunately life itself has lost its worth to us [1]. Through the latest information technology, the data collection mode of healthcare industry has changed to "collect-once, use multiple times" mode. Most of the healthcare industries depend on the following areas for accomplishing their objectives:

A. Data Warehousing and Data Mining – Data mining is extraction of useful information from the data. Clinical databases store large amount of information about patients and their medical history record. Access to this data for healthcare practitioners could discover new medical knowledge. Different expert systems are used by many doctors for diagnosis of complex diseases and treatment.

B. Computer-based Patient Records (CPR) – It refers to digitizing and storing all of the medical record of a patient in an organized fashion. In this paper, we use electronic health records and electronic medical records interchangeably. A good deal of notice has been given to this area in hospitals, first-aid centers, clinics etc. These electronic records are convenient for

patients and doctors equally as it considerably eliminate fatal medical errors and contribute its part in public health.

C. Document Imaging – It includes the process of scanning and storage of paper based record in digital form. The advantage is the ability to share and access more useful information by healthcare personnel and researchers around the globe.

D. Internet Solutions – With the development of internet and intranet, healthcare sector is capable to integrate clinical and financial information from a large array of locations without investing in building expensive infrastructures.

E. Expert Information Systems – The regulatory body of any healthcare unit designs healthcare regulations to help in delivering reliable and careful information to the patients and these rules are updated on annual basis to adjust any new changes that needs to incorporate. *Expert Information Systems* (EIS) apply and follow this suit of rules to assist the administration in analyzing the quality of services provided by these industries.

F. Telemedicine – This technique is a combination of information and telecommunication technologies by which information about healthcare flows between different locations to help track public health problems. Different ICT channels including audio visual links and technologies are involved in this technique.

4. HURDLES IN HEALTHCARE IMPLEMENTATION

A. Lack of Industry Standards – Technological barriers in the healthcare sector includes lack of general adoption of industry standards. This is considered as a prominent problem in the plethora of advanced information communication technologies [3]. A standard can be defined as refined framework or format or convention that is followed by the healthcare operational bodies and functional units in facilitating patients [3, 4]. Most of the developed standards till today are broadly categorized into two groups; proprietary standards and consensus standards. The proprietary standard can be defined as a standard that arise when a maximum market share for a particular product is being hold by a single vendor. On the other hand, consensus standard is not concerned with a single vendor but it is developed by group of buyers, vendors, and employees of diverse fields including government officials.

The above-mentioned standards help in exchanging electronic information successfully in order to facilitate the flow of information efficiently among heterogeneous operating systems [4, 6]. These standards also provide the ability to expedite various health related transactions without human interference. If these standards are not followed then this facility cannot be achieved or can be achieved by a price of high cost. Before the emergence of ICTs, each industry was operating individually without being following any standard and forming a centralized group to cooperate in providing state of the art facilities in the healthcare sectors. After a decade, the healthcare industry agreed and used to follow the ever growing fast internet based medium and communication protocols to cover the gap between slow and fast information flow among different stake holders [11]. Different user-friendly interfaces helped in facilitating healthcare bodies in providing up to date facilities in a less expensive way.

B. Human and Social Hurdles – Apart from the technological obstacle discussed earlier, some other barriers also need to address. Also, from human and social perspective, the adaptation of ICTs by the healthcare industries is a challenging task. The implementation of advanced information technologies in healthcare industry support complete personal and financial transactions effectively. These technologies need the physicians to be well aware of the use of internet and minimum level of basic computer operations. In the same way, the patients are also expected to accept the changes made in the use and storage of the medical information. So, the healthcare ICT community is responsible for resolving both patient and physician concerns about the adaptation of the new technologies. Following are some of the major concerns that need to be addressed.

1. Need for privacy maintenance: The bottleneck in adopting the advanced computerized techniques is the maintenance of private data of both the patients and physicians. The patients avoid such systems just because they cannot compromise their confidentiality. They cannot put their private data at risk by declaring it openly through electronic channels. Individuals belong to such school of thoughts percept that in this way they by themselves provide the ways to the thieves to illegally intercept and misuse their personal information. So, in light of the above concerns, the healthcare industries are required to ensure privacy and security to the individuals data to maintain their

level of confidence. Both the IT companies and the healthcare providers will need to work together to make sure that the collected information is only shared among the authorized bodies. This may also include the responsibility to ensure that the information is only used for the specified purpose and is protected from unwanted loss and may not be modified. It may also ensure that the same information may not be disseminated illegally without the permission of the concerned body. Much of the privacy protection techniques exist but the mostly used and effective one is the installation of firewalls or other similar practices to limit such threats from illegal access of information.

2. Lack of sufficient knowledge for using ICTs: Another big concern is the lack of practice and knowledge about the use of advanced information communication technologies by physicians and nurses. This new perspective unbelievably changed the conservative way of healthcare sector that was easy to use by the old age stakeholders. It needs the physicians and other healthcare practitioners to cope with the new situations of paper-less environment and move towards advanced technologies to 100% utilize these facilities. It will bring innovative transition from old age to the new advanced healthcare era. This needs that the healthcare and IT companies arrange specific trainings and workshops to enter into the advanced healthcare circle the physicians and other personnel working in medical field. It needs to convince physicians to make them assure that utilizing ICTs can vastly improve their efficiency and hence the quality of healthcare services. The IT companies are required to develop interactive technologies and equipment that make the physicians and other practitioners attractive towards this advancement and willing to adopt it.

5. RECOMMENDATIONS

1– There is a need to build and advance the already existing technologies by incorporating new features in them. This may also be achieved by making the combination of old and new technologies in some situations where there is a shortage of funds.

2– There is a need of developing a cooperative legal environment and other regulatory bodies that may ensure and allow the freely and smoothly flow of information among different organizations. The healthcare industry cooperates in a digital environment to operate effectively and efficiently.

3- The need to work in a group to develop laws and rules in order to implement for the secure transmission of information in a situation such as telemedicine among the legal participating bodies.

4- Involvement of both the public and private sectors to protect useful information from theft and illegal use. This will bring confidence in the users (patients and physicians).

5- Cooperating in developing user-friendly interfaces and training physicians about its use. Workshops and seminars arrangements would help in diverting from paper-based environment to paper-less environment.

6- Putting efforts to involve physicians and other healthcare practitioners in developing ICT projects by taking their feedback regularly. This stage refers to the testing and implementation phase of the aforementioned technologies.

REFERENCES

[1]. HL7 Version 3 Message Development Framework, <http://www.hl7.org/library/mdf99/mdf99.pdf>, accessed on Dec, 2015.

[2]. openEHR Community, <http://www.openehr.org/>, accessed on Dec, 2015.

[3]. European Committee for Standardization – Technical Committee on Health Informatics. <http://www.centc251.org/>, accessed on Dec, 2015.

[4]. CEN ENV 13606. Medical Informatics – Electronic healthcare record communication. European Prestandard ENV 13606, European Committee for Standardization, Brussels, Belgium, 2000.

[5]. CEN prEN 13606-1. Health informatics – Electronic health record communication – Part 1: Reference model. Draft European Standard for CEN Enquiry prEN 13606-1, European Committee for Standardization, Brussels, Belgium, 2004.

[6]. Integrating the Healthcare Enterprise. <http://www.ihe.net/>, accessed on Oct, 2015.

[7]. The HL7 Version 3 Standard: Clinical Data Architecture, Release 2.0, ANSI Standard, 2005.

[8]. HL7 Reference Information Model. http://www.hl7.org/library/data-model/RIM/model_page_non.htm, accessed on Oct, 2015.

[9]. D. Fensel, Triple-space computing: Semantic Web Services based on persistent publication of information, Proc. of IFIP Int'l Conf. on Intelligence in Communication Systems, Bangkok, Thailand, November 2004: 43-53.

[10]. The TripCom Project. <http://www.tripcom.org>, accessed on Nov, 2015.

[11]. R. Krummenacher, M. Hepp, A. Polleres, Ch. Bussler, and D. Fensel: WWW or What is Wrong with Web Services, Proc. 3rd European Conf. on Web Services ECOWS2005, Växjö, Sweden, November 2005: 235-243.

[12]. Della Valle E., Cerizza D., Bicer V., Kabak Y., Laleci G., and Lausen H. The need for semantic web service in the ehealth. In W3C workshop on Frameworks for Semantics in Web Services, 2005.