Determining the Role of Information Technology in Improving the Health System

Mehri Asadi Vasfi
IT Security Institute, ICT Department, Malekashtar University of Technology, Tehran, Iran
Email: m.asadi.eng.iaun@gmail.com

Ali Asadi
M.A student of marketing management, University of Isfahan, Isfahan, Iran
Email: a.asadi201220@yahoo.com

Mohammad Reza Ansari
M.A Student of Industrial Management, University of Isfahan, Isfahan, Iran
Email: Mr.anssari64@yahoo.com

Ali Mircholi
M.A student of marketing management, University of Isfahan, Isfahan, Iran
Email: Ali_mircholi@yahoo.com

Abstract

Nowadays technology is progressing all over the world in a rapid pace so that we cannot ignore the status of information technology since it plays an important role along with the attempts which governments and private organizations make in order to reduce cost, time and error, increase user utilities and organize the society’s statistical information.

Since information technology affect the information in all organizations of different societies and these organizations also affect each other, the healthcare industry would be influenced by these changes since the changes made by the penetration of information technology in this part is inevitable.

Therefore; in this research we study some effects of IT by electronic insurance card on the health system. Effects which can coordinate and unify the information in hospitals’ information systems, provide easy and safe access, reduce data errors and generally improve the healthcare services. Telemedicine, virtual reality, healthcare information systems and health intelligent cards all are possible by combining information technology with the health system.

Keywords: Information Technology, Health System, Electronic Health Card, Electronic Healthcare system
Introduction

Information is the source of knowledge and awareness in human beings, thus the aim of utilization of information technology is to increase human awareness and order and facilitate the performance. The information technology is consisted of three words: technology (applying science) – processing (managing information) – and information (processed data). Based on what is said information technology may be considered as a science which is essential for managing and processing of information. In other words, information technology is known as the science of processing, maintenance, gathering, storing, distributing, transmitting and securing the information and data.

As we know in society every science is created to fulfill human’s needs, therefore the science of communications and information technology should be able to fulfill these needs. The communications and information science was created to fulfill needs such as maintenance and processing, assignment of duties, network management, information management, information development, development of engineering systems of information technology, and functional and financial development. On one hand, by creation of this science, people started to use the internet widely and this led to the creation of new electronic vocabulary such as electronic finance, electronic pay off, electronic banking, electronic government, electronic health and etc. Electronic health is the promise of information technology for the improvement and progress of health systems in different nations.

Today electronic health has become the most important subject in progressed and progressing countries which aim at establishing electronic governments. As Kirshbaum states, there are many definitions for electronic health. It can be regarded as an electronic communication device to improve functionality and efficiency in treatment or healthcare services or as a device to enable the consumers to get information about their treatment or healthcare services or a vehicle to enable suppliers to give better services in the most efficient way (Kirshbaum, 2002). Based on other definitions we can regard the electronic health as utilization of Internet principles, methods and technologies to improve healthcare, and finding new ways to conduct and control the healthcare professionally, which is to increase the power and effectiveness of relationships between patients, physicians, supervisors, administrators, payers, laboratories, pharmacies, and suppliers. This can be regarded as an electronic revolution in healthcare and health system (Beaulieu & Beinlich, 2003). Therefore, regarding the effects which information technology has on health system and fundamental changes which it makes in its structure, the authors of this article try to study and introduce these effects.

Literature review

So far, ample studies have been done in this area by progressed and progressing countries some of which will be mentioned through the article.

Rahul Philip points to intelligent card and its characteristics in Europe in his article. He states that the Patient Data Card or PDC is of utmost importance in urgent situations since it helps the
medical team to recognize the patient and get informed of the patient’s health information such as blood type, previous treatments, crucial and chronic sicknesses, and allergies and then take an action based on these information. Furthermore; these cards hold managing and identifying information, treatment history, the electronic version information and security operations. Rahul Philip mentions superiorities for these cards some of which are the management of patient’s information, simplification of medical-healthcare operations, making electronic versions, and helping handicapped patients (Rahul Philip Mampallil, 2006).

Ming-Liang Lee divides the main policies of health which are exactly in line with the information system policies of national health insurance into two categories:

- Improving the national health information network; educational performance for the health sections’ employees; founding national health centers; improving medical and health researches; the ability to perform international transactions related to health and healthcare services and trying to be confirmed by the world health administration.
- Reforming the national health system; improving patient registration systems; taking actions as to financial responsibilities to ensure the condition of insurance program; improving the payment system methods; getting to an appropriate level of mobile care services to prevent taking advantage of healthcare resources and price incompatibilities.

With establishing the national health insurance Bureau in 1995, most of people got access to a wide range of medical cares including disease prevention and treatment, clinic care, hospital services, and hospitalization and etc.

The Bureau of national health insurance introduces its visions and missions to conduct this projects as follows:

**Visions of BNHI**

- Purchasing Health, not healthcare for the public.
- Trying to achieve universal coverage.
- Achieving excellent quality of care
- Care to disadvantaged groups
- Financial stability

**Missions of BNHI**

- Health insurance for the public
- Upgrading quality of healthcare services
- Establishing partnerships among the medical, pharmaceutical and healthcare community
- Using knowledge to create values
- Creating virtual competitor and upgrading service efficiency
Geylani Kardas in his study in 2005 mentions the advantages of intelligent card in healthcare system as information storing capability and rapid, easy and safe access to information. He also, has explained about applying information systems of healthcare which are based on intelligent health card.

In addition to these studies, there can be found other researches in progressed or progressing countries which we pointed in short to some of them in table one.

**Theoretical basics of the influence of information technology on health system by electronic insurance**

Healthcare institutions and organizations include complex, multi-operations institutions and compressed information organizations which need integrated and complicated financial management of information systems. This unity and integrity was hardly obtained by using information systems in all hospitals in 1980's and 1990’s. Based on the categorization done by Andreas Revanoglou and Constantinos J. Stefanou, the information systems of healthcare organizations consist of:

- Order entry system
- Patient flow systems
- Patient records systems
- Administrative information system
- Pharmacy and materials management information systems
- Human resources management information systems
- Personnel presence card system
- Financial and cost accounting information systems
- Patient relationship management system
- Picture archiving and communication system (PACS)
- Laboratory information system (LIS)
- Operation theatre systems
- E-procurement system of medical supplies
- Telemedicine system
- E-learning system
- Web-based SCM information systems

The appearance of these systems in health system and fundamental changes of the structure of these institutions has some advantages which will be explained in short in this article.

**Quality**

Storing the patients’ information including health information, allergies and previous procurements and etc, enables physicians to be informed of patient’s sensitivities and allergies and prevents them from prescribing incompatible and dangerous medications for the patient.
Rapid access to the patient’s procurement information in urgent accidents- in which time and right actions are so essential- helps the physician to take true actions.

Table 1: the historical of executive country that implement electronic healthcare project

<table>
<thead>
<tr>
<th>Committee</th>
<th>U.s</th>
<th>Australia</th>
<th>Canada</th>
<th>Germany</th>
<th>Norway</th>
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<td>ONCHIT&lt;sup&gt;4&lt;/sup&gt;</td>
<td>National Health Information Group&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Office of Health and the Information Highway&lt;sup&gt;2&lt;/sup&gt;</td>
<td>German Institute of Medical Documentaion and Information</td>
<td>Ministry for Health and Social Affairs, KITH&lt;sup&gt;1&lt;/sup&gt;</td>
<td>the Smart Card Division of the Information System &amp; Service Sector of TECO Electric &amp; Machinery Co</td>
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<td>Name of major initiative</td>
<td>Health Connect</td>
<td>Canada Health Info way</td>
<td>Better IT for Better Health</td>
<td>More Health for Each bit Say @h! Te@mwork 2007</td>
<td>BNHI&lt;sup&gt;5&lt;/sup&gt;</td>
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<td>Expected year of complete implementation</td>
<td>2016</td>
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<td>2007</td>
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<td>Providers participating in EHR</td>
<td>Hospitals, physicians, pharmacists, laboratories, group practices, home health, clinic, IHS&lt;sup&gt;6&lt;/sup&gt; clinics, SNF&lt;sup&gt;8&lt;/sup&gt; s, FQHC&lt;sup&gt;7&lt;/sup&gt; s, healthcare</td>
<td>hospitals, GPs, GPs, physicians, specialists, nurses, pharmacists, labs, optometrists, nursing home</td>
<td>hospitals, GPs, specialists, nurses, pharmacists, labs, dentists, insurance company</td>
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<sup>1</sup> Directorate for Health and Social Affairs  
<sup>2</sup> Canada Health Info way Inc  
<sup>3</sup> Within the Australian Health Ministers Council and through the National Implementation Steering Committee  
<sup>4</sup> Office of the National Coordinator for Health Information Technology, U.S. Department of Health and Human Services  
<sup>5</sup> Bureau of National Health Insurance  
<sup>6</sup> Indian Health Service  
<sup>7</sup> federally qualified health center  
<sup>8</sup> skilled nursing facility
Furthermore, with electronic prescriptions, errors caused by physician’s handwriting or taking the wrong dose will be minimized and consequently the quality of healthcare services would increase.

**Availability of information**

Using intelligent cards for storing the patients’ procurement and personal information and also establishing connection between medical systems provides us with us on time access to patient’s information or other information researches.

**Integrity and unity of information**

The Unified and shared environment of storing does not necessarily mean that such environment is unified physically and geographically. Rather, the environment of database has unity logically. The situation of database depends physically on the construction of database. The database can be unified and shared on the logical level while it is distributed and unfocused physically.

In real world the patients’ records are distributed in different hospitals, therefore the restoring of these distributed information is difficult when a patient is examined by a physician which is in a hospital other than the one having his records. There are two methods to solve this problem: 1- the patient can hold these records and 2- his information records can be conveyed by information networks.
The reliability of information

The unity, integrity, stability and consistency of the main information in acceptable formats in certain times lead to reliability of information given to patients and physicians. Because one of the features of database is reducing the degree of extra increase in the information of these systems.

Applicability and flexibility of information

Designing the portal of health system which enables access to all parts of health centers at all times for the users, enables many users to use the system in a certain time. This system, also, provides user-friendly operations including designing pages in a way to simplify using the system for the user so that he can design the pages based on his needs and execute incoming and out-going orders.

Efficiency

Storing urgent or other information of patients on health cards provides on time access to information for users in a few seconds.

Safety

Encoding and decoding methods of information such as using DES and DSA keys with digital signatures while using the information or assigning distinct IDs and PINs for each patient holds the safety in a system.

The capability to be tested and users’ trust

Regarding the selected safety methods and monitoring the flow of operations done by the users and also confirming users’ identification information such as signature, ID or PIN while using the system, the testability and users’ trust would be studied.

Management and reduction of cost

The application of information technology in every situation is first of all expensive (the primary expenses for installation and maintenance of systems), but after that it will be very beneficial for the organization. This plan is not an exception. It’s beneficial for managers and at the same time for users since for outpatients the cost of repeated tests, bills and registrations, and arranging time for visiting the physician, and other expenses (such as costs of applying for insurance card, transportation for arranging a time, time spent to arrange a meeting with the physician and etc.) will reduce.
### Speed

This system will provide physicians and public with access to information by technologies like intelligent health card, mobile, and computer. Users can contact medical centers and observe their procurement information, procurement and insurance bills, reservations, test results and etc. in every time and place. Furthermore they can request for their prescribed medications through the Internet or observe physicians’ information in the hospital’s database.

### Management of patient’s information

The physicians and hospital clerks can use mobile or PDA to contact the hospital’s information system to access information about patients.

### User friendliness

Using graphic user interfaces enables users to check information in their favorite environments and simple perform the orders. Simple keys on the page help medical staffs to easily do operations such as receiving intelligent patient card and restore EMR information.

In addition to the aforementioned cases after interviewing the experts many more advantages were revealed such as:

- Perfectness of patient’s information in healthcare file, better access to specialist physicians and provides the possibility of contact by E-mail, improvement of healthcare management system in rural areas, recording medical information for researching users, reduction of effective procurement costs, better permanence of information, reduction of unessential medical visits, solving the problem of needing more space for keeping medical files, reduction of patients’ waiting time while visiting the physician, facilitating treatment in urgent case, improving the public general health, reduction of paperwork and facilitating the payment, facilitating the process of compiling prescriptions and sending them in order to receive insurance payment, on time awareness of potential breakout of epidemic diseases in the country, better management of periodic illnesses, reduction of unessential costs and improvement of process and methods we pointed in short to some of them in table two.

### Table 2: the effective elements that create by using information technology and electronic insurance at health system

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**Comparing as-is status with to-be status**

By implementing the electronic insurance card, the health system will be changed that we determine the scenario of them by flowchart at figure 1 and figure 2.
This time registers at her/his book
The prescription is written
The patient enters the physician’s room after a long time
The physician receives some information from patient
The physician survey some cases
The prescription is written

Will the physician visit the patient next time

The patient needs to turn
The secretary searches the empty queue time in her/his book
Does this time appropriate for the patient
This time registers at her/his book
The patient go to the nearest pharmacy for buying medicine
Does this pharmacy have all of medicine
The patient pay medicine’s cost and receive her/his medicine

end

Figure 1: as-is status of the patient refer to clinic to buy medicine
After some time the patient enters the doctor’s room

The physician receive patient’s information by electronic card from patient electronic document

The physician visits the patient

Will the physician visit the patient next time?

yes

The patient needs to turn

The secretary clicks on the empty queue link and present them to the patient and according to range of time that the patient needs, the secretary reserve that time for her / him

This time registers at system

The patient by ATM machine at the clinic, will search pharmacy that have all of medicines

Does the patient will buy medicine electronically

yes

The patient will pay cost of medicines electronically

no

The patient will buy medicine

yes

Does the patient want to receive medicines at pharmacy

no

Medicine will be sent to the patient by post

no

Pay the cost of medicines if he/she doesn’t it and receive them

End

Figure 2: to-be status of the patient refer to clinic to buy medicine when electronic insurance card implement
Bars and challenges

Based on a wide range of studies done on this topic and the advantages of applying the method, we still observe that some countries even the progressed ones couldn’t manage the project. These countries faced some problems and challenges which follows:

Lack of cooperation between different sections and organizations:

Some of the countries which are executing this project found out that the health system has different parts and lack of cooperation between different HIT systems is among one of the barriers of applying the system. This fact is so important especially in difficult and urgent situations which need patient care by several providers. [4]

Direct and indirect costs:

Installation costs is a main concern of the countries which apply the system. In addition, the foreseen costs change while furthering the project.[4]

Privacy and confidentiality concerns

General understanding of the safety of private procurement records is important for system installation. All the countries which are involved in HIT project are trying to develop safety standards and trust capacity. [4]

Cultural and organizational patterns related to receiving healthcare services:

Organizations which receive healthcare cannot be assured of permanent connections of information systems. The culture of some societies also doesn’t support sharing patient’s information. Old arguments and lack of trust among different experts or physicians and nurses prohibit the efficiency of information sharing. [8]

Standards and technologies:

The main challenge from technical view concerns memory, maintenance, connection and restoring of multimedia information in different technical platforms of heterogeneous database which are distributed physically.

Rules and legal conditions:

Rules and laws are needed concerning reliability of private information, and confirmation and restoring of information related to patients. Rarely does a rule let digital restoring and recording of patients’ information; therefore we cannot install this system in a wide range. They only could perform it in small examples and pilots. [8]
Financial and industrial subjects:

This fact is determined by existing requests for electronic health record systems. Furthermore the tendency of industries to fund in high quality recordings is determined.

Because the healthcare industry is regarded as a large industry which lacks high profitability due to loss of appropriate standards, a high percent of budget devoted to this field is consumed for communicational information and technologies which has little relevance with this industry.[8]

Lack of perspective and leadership:

Healthcare managers didn’t have a clear perspective and also there was no tendency for reengineering of healthcare processes among leaders and managers[8]

The capability of application and acceptance of system, planning and instruction:

Even in those places which have the newest technologies and the best internet networks, permanent users complain about difficulties with computers and systems’ speed. The lost time to enter the computer space, the speed of information restoring, unstructured input information which are not accepted yet by physicians, safety processes which take a long time for connection and impossibility of work culture in the country.

Conclusion

This system which is based on the electronic recordings of healthcare, internet and procurement systems is an essential tool to support peoples’ health and sharing their procurement information for this aim. These systems, are not independent systems in physicians’ offices or hospitals and clinics rather while they look independent and distributed physically, they interact and use a single ordered database. Access to restored information in these databases is possible by intelligent cards assigned to each person in procurement centers with the help of installed devices in these centers. In addition to using these devices, the patients can access to all provided utilities such as electronic purchase of medications, payment and insurance checks, getting complete and ordered information about physicians, specialists, hospitals and other procurement systems, searching physicians, arranging electronic date, and observing the visit time by entering the related portal at home, work or any other places immediately. In this project, the restoring of patient’s information in a standard form is one of the basic technical challenges for installing the healthcare electronic record systems. Though other challenges like the law, culture, management and acceptance by users exist in extensive using of information.

Regarding interviews with the experts and previous studies in projects done so far in other countries, we can conclude that for achieving success in the installation of procurement information system we should first provide the cultural and organization background which is
possible through extensive instruction of users. On one hand we should be able to coordinate all the related organization like procurement insurances, physicians, hospitals and clinics to convince them to use these systems and even encourage them to apply new systems. Furthermore we should with regulating new rules concerning information abuses, using safety protocols, regarding a special supervising group and providing safe and speedy internet networks remove any concerns for users regarding private information abuses, net disconnection, and low speed while using the system.

References