

Original Paper

Issues and Prospects of e-health in Pakistan

Qamar Afaq Qureshi¹, Najam Afaq Qureshi², , Dr. Muhammad Zubair Khan², Dr. Allah Nawaz¹ Dr. Bahadar Shah³,

¹Gomal University, Pakistan ²Sarhad University, Pakistan, , ³Hazara University, Pakistan

Abstract

Background & objectives: In connection with access to information in developing countries, information flows through existing networks of communication is a main theme in the current IS literature .

Methods:Information-intensive infrastructure is a requirement for information dissemination due to the shortage of network infrastructure in the majority of developing states. It is verified by many researchers that information managing technologies with their main purpose of 'handling information' have the advantage to enhance already existing technologies by making better information-communication a priori to new ICT innovations .Presently health information system infrastructure is deficient in resources to meet the demands and needs of increasing population in developing countries. Health care systems of developing countries have major barriers like poverty and lack of technological sophistication.

Results:The basic difficulties or barriers in using information technologies include poor or inadequate infrastructure, insufficient access to the hardware and inadequate or poor resources allocation. By eliminating these barriers population health status can be improved in developing countries.

Interpretation & conclusion: This study aims to determine the main issues and prospects for e-health in the current situation of developing countries like Pakistan and the way forward for policy makers to manage all issues in future for more effective and rational decision-making in healthcare organizations.

Key words: e-health; challenges; prospects; developing countries; Pakistan

1. Introduction

E-health is a latest platform for handling many healthcare issues. E-health systems have presented so many gadgets which are being used by both developed and developing states. Healthcare related IS and hardware is now

inexpensively obtainable all over the world. On the other hand successful adoption and use of e-health systems depends on the suitable infrastructure (Khoja et al., 2012). The readiness and awareness of doctors and physicians about the usage of IT-applications in hospitals can be

developed and maintained by providing proper tools and devices and proper training on regular intervals for more rapid access to information on internet. For handling users-related issues and maintaining regular use of ICTs in health organizations, healthcare providers must be given opportunity to take part in information systems development process and include the IS-contents according to their requirements (Rezai-Rad et al., 2012).

Concentrating on information-centered ICT applications in developing countries is comparatively a new sphere and subject in the domain of health informatics (Kimaro & Titlestad, 2008). Sound evidence-based literature extracted on influence assessments or outcome measurements is still lacking regarding ICTs-applications in the healthcare sector (Rezai-Rad et al., 2012). Published evidences are presently available on this topic and are at pilot or the proof-of-concept stage. In many cases, the statements are not individual analyses, rather are based on collective skills and practices, consensus statements, and policies (Soar et al., 2012).

The significance of the concepts of 'information', 'information

first' has been advocated by many IS researchers for the successful adoption and use of the IT-applications in any organization and involvement towards the 'information-centered ICT' concept is a major example (Nyella & Mndeme, 2010). Furthermore the ICT-applications may only bring small direct benefits for poverty alleviation and the possibility for ICT-applications depends on both financial and access to cultural, political and educational resources. And finally, the access to social assets and increasing confidence and support through locally contextualized social networks built through community-based initiatives is more crucial than looking for access to new information from digital ICTs (Khoja et al., 2012).

Many studies reveal that doctors and physicians in developing countries are not given an opportunity to be take part in information system development process, consequently IS/ICTs do not possess the features which are according to the needs of healthcare providers (Rezai-Rad et al., 2012). Although e-health systems in developing countries is not a new concept any longer but there is sluggish usage of internet among healthcare providers due to lack of the capability to read, be

aware of and use a variety of technical terms on internet (Hogan & Palmer, 2005). Furthermore the little use of internet among healthcare professionals of developing nations like Pakistan is mostly because of improper tools and devices and shortage of proper training programs regarding eHealth systems (Malik *et al.*, 2008).

Doctors and physicians in developing countries complaint that IS and particularly the interfaces are not user friendly. In addition IT- applications in healthcare sector are inflexible in nature consequently create users' related problems. The software in the hospitals of developing countries do not have the contents in native languages regarding e-health systems (Chetley, 2006). E-health projects in developing countries generally unsuccessful due to a shortage of IT-professionals and their knowledge and expertise in e-health systems (Kimaro & Nhampossa, 2005). IT-professionals require training and education in order to effectively use all e-health applications. Training should be a frequent feature and healthcare professional must be given the training at least once a year (Qazi & Ali, 2009).

2. e-Health in Pakistan

In all bad surroundings and situations, Pakistan is making its efforts for the war on terror and people of the country are facing many challenges and even die in this war in bomb blasts. Healthcare system is a requirement for developing countries like Pakistan. At present, in Pakistan near about seventy five percent of population resides in rural areas where road and transport facilities are inadequate, shortage of healthcare providers in rural areas, professional physicians and surgeons are least interested to go in far flung areas because of poor infrastructure, patients being carried on their own way to arrive at the city hospital for an instant healthcare or diagnoses which could have without difficulty been treated at their own locations provided medical consultations are available (Saleem, 2010). The majority of cities in Pakistan facilitate telecommunications links, more than 1800 cities of Pakistan have access to 531,787 broadband connections and 400 cities are on Fiber Optic, giving possibility to access universal health information. Implementation of any information system at the start is not up to the mark but it will also provide solutions usually in

emergency situations (Ansari et al.,2012).

There has been an explosion in knowledge and information management activity, mainly in healthcare sector over the previous few years. By and large, hospitals and medical schools have started using the services of doctors who possess computer and computerization skills. These organizations have also obtained complicated information systems to collect and retrieve accumulated knowledge. Ehealth system includes many elements such as telemedicine, tele-education, telematics for better management of healthcare and research (Kijsanayotin , Kasitipradith & Pannarunothai ,2010). There are four areas where health informatics is performing an escalating role in healthcare development: a) administrative, b) education and training, c) quality improvement and d) the recovery of efficiency of health care services (Bhutto et al., 2010).

In Pakistan 72% of population lives in rural areas and 28% of population lives in urban areas. Condition of health can be determined effortlessly from the reality that there are 74 physicians per 100,000 persons in early 2000s. There are several rural areas where people have not seen a

capable and skilled health professional in their entire life (Bhutto et al., 2010). The municipal areas of Sindh are well equipped with health facilities; which are not enough for huge population but facilities are there, whereas rural Sindh does not have well equipped health facilities. Available possessions at urban areas can be shared as well as expanded to the rural areas with the help of digital connectivity. Particularly, Karachi capital city of Sindh holds very latest healthcare facilities (Durrani et al., 2012).

In urgent cases where instant medical treatment is very vital, current studies reveal that before time and particular pre-hospital patient management leads to the patient's survival. Especially in cases of serious head injuries, spinal cord or internal organs damage and pain, the way the events are treated and transported is critical for the forthcoming well-being of the patients .Bringing improvements in healthcare services and remain fit and healthy is one of the most discussed and key issues in our society. The acceptance of IT-applications in healthcare sector have very solid and successful attempt for the provision of improved healthcare services (Malik et al., 2008). But constant

guidelines must be developed and agreed across the board in connection with the processing of health-related data, with particular explanations regarding diagnostic notes, which stress and assure its protection and confidentiality, as well as free and open access, by the patients to their own data. Furthermore the potential technical knowledge difficulties can be neutralized by making sure that the IT-application is both technically possible and clinically suitable. In addition to that all citizens, doctors & physicians and policy makers must acknowledge and appreciate the adoption and use of eHealth systems (Bhutto *et al.*, 2010).

The significance of a health information system (HMIS) cannot be neglected in a country like Pakistan because health policies and planning in any country generally depend on the accurate and well-timed information on various health issues (Ali & Horikoshi, 2002). In Pakistan, before the 1990s, a number of vertical programs with categorical disease-specific information systems ended in disorganized data transmission, which made evaluation of program usefulness difficult for managers. In 1991-92, the Ministry of Health (MoH) started an

assessment study of existing HIS and transformed the reporting systems into a comprehensive National HMIS through a consultative procedure (Qazi & Ali, 2004). However, there is need to develop integrated disease close watch infrastructure and technical competence in tropical countries on the reporting and scientific evidence necessities of the sanitary agreement under the WTO (Singer & deCastro, 2007).

Health information is information about people's health and what they, government, and others are doing about it. It explains the occurrence, frequency, and reasons of major diseases, as well as accessibility and efficiency of curative activities (Ali & Horikoshi, 2002; Khalid *et al.*, 2008). Under the transfer of power initiative, Pakistan's MoH has advocated strengthening of health information systems for more informed decision-making in planning, managing, checking and control of healthcare services for improved service delivery in the districts. However, the efforts at increasing information systems have generally proved unproductive and sometimes counterproductive. Analyses of the malfunctioning often fail to notice the perceptions of

stakeholders as an important factor (Ansari et al., 2012).

Given the large health infrastructure in Pakistan both public and private, supplying to a population of 137 million people, there had been a need to build up and start a national health management information system which is able to collect, process, analyze and provide criticism on all health related data including information on input, process and output indicators (Gururajan et al., 2008). The national feedback reports on the new HMIS admit a slow development in scope and reporting reliability, but also note the continued need for improvement in the quality and usage of information at various levels. A study carried out in 2000 pointed out that the information produced via HMIS was unrelated and the data did not help managers to make decisions (Bhutto et al., 2010).

Ministries of Health are approving Computer Software in order to get better health data collection, stretch, storage, analysis and distribution in their Health Information Systems (Khoja et al., 2008). Computer software are obtained through various means including buying on-shelf software, indenture based software, and donated software.

Most of the Software acquired through these means is not distributed with their source codes in that they are proprietary software. However, the data elements of Health Information Systems are changing regularly due to changing disease patterns; incoming and outdated drugs, and changing health policies (Ishtiaq et al., 2012).

As software requires to be re-designed from time to time to take on changing requirements arises there is a need to think about efforts on open source software. With Open Source Software development method, the software is distributed with their source code which means that a Ministry of Health can uphold its software with no unique developers (Mostafa et al., 2011). The characteristics of Open Source Software development approaches seems to be appropriate in developing software for Health Information System in that health information systems institutions has full access to their software source codes and thus can bring in any changes according to their requirements instantly. In the case, the Ministry has no ICT capacity (say human resources) to be able to change the software; the software can be restructured by any computer expert and not

necessarily the ones who have developed that software (Durrani *et al.*, 2012).

3. Issues & Prospects

Pakistan health services and health signs are usually poor especially in the far flung and rural areas. Out of 1000 infants 76.6 persons of them die and the death rate under age 5 is 10.1 %. Malaria occurrence is 0.75 per 1000 persons, whereas, TB incidence is 181 persons per 100,000. The health expenses have been very low and not adequate to give good health to people. For example the development spending was Rs. 14.272 billion for the year 2007-08, and the recent expenditure was Rs. 3.791 billion. Improved health enhances the output of the labor force, strengthens their economic conditions and eventually enables them to lead a superior life. To achieve better, competent, effective and industrious workforce, governments promote the healthcare services. Moreover the present state of affairs of the human resource, a small adjustment in public sector expenses on healthcare services can have a strong influence on the workforce and thus the economic development.

E-Health is slowly but surely becoming popular throughout the

world. This is ordinary and the routine in the developed countries but developing nations are so far initializing to implement and use eHealth systems for better healthcare services (Sarkar, 2008). The appearance and advent of IS/ICTs have opened new views for the countries to handle their problems consequently the developing countries are also making efforts to implement these tools and gadgets. On the other hand, there are several difficulties and barriers which needs to be removed away prior to taking full benefits of IT-applications for healthcare (Chanda & Shaw, 2010).

E-Health is the adoption and use of ICTs that includes the internet for more improved and better delivery of healthcare services (Eng, 2001). Another writer remarks that e-Health is a new and very potential subject and field of medical informatics, referring to the organization and delivery of healthcare services and information using the Internet and interrelated technologies (Pagliari *et al.*, 2005). It is also noteworthy that the majority of the studies about eHealth and its successful adoption and use have been carried-out in both developed (Eysenbach, 2001; Alvarez, 2004; Pagliari *et al.*, 2005) and developing states (Mosse & Sahay

2003; Braa et al.2004; Chanda& Shaw, 2010).

A number of aspects and features have been exposed as the crucial factors in creating or destroying the functions and tasks of e-Health system everywhere. Though, the research indicates that 'top-management-support' and 'government-ePolicies' play leading role in all the matters concerning to the planning, development, adoption and use of new ehealth systems along with their maintenance on continual basis(Scott et al., 2002). This becomes extremely important in case of the developing countries like Pakistan. The developing nations have extra issues of 'digital-literacy' of all the government authorities, developers of the systems and definitely the future users of ehealth applications (Lang & Mertes, 2011).

It is not just the willingness and acceptability of the all the expected users in an organization which controls and decides the success and failure of the e-Health initiatives rather it also contains the approach and stance of government (external authority) as well as the top management of the organization (internal executives) (Kimaro & Nhampossa,2007). Keeping in

view the specified responsibility and function of top management, it is not unexpected that the interest and support of the executives in an organization has been one of the most generally talked-about organizational factors for the successful implementation of eHealth projects (Hussein et al., 2007).A lot of studies on the role of top management support for the success of e-health systems have been conducted (Sajjad et al., 2009; Qaisar & Khan, 2010).

E-Health policy is fastened with the availability of resources along with the professionalism is needed for the proper utilization of the resources, implementing plans and receiving the results. Lack of professional frame of mind and the attitude is apparently the bigger concern and matter for those developing states which have the resources (Scott et al., 2005).Government eHealth policies make an environment where the likelihood of using resources effectively is increased, the professionals find their suitable places and exercise faithfully and the future of IT-application in healthcare becomes clearly identifiable (Shaqrah, 2010).

In spite of the abilities and benefits of e-Health and

Telemedicine for sustainability of eHealth systems, some barriers, at different levels, are required to be overcome for health systems to take full advantage of these opportunities. These barriers are not uni-dimensional, concentrating on technical knowledge as assumed in the past, but somewhat a multidimensional concept, surrounding technical knowledge, economic feasibility, organizational support and behavior adaptation. The Telemedicine Alliance, a collaboration between the World Health Organization, the European Space Agency and the International Telecommunications Union studied e-Health and Telemedicine adoption trends through personal interviews with 54 European telecommunications experts, health policy makers, and healthcare providers (Rhidian, & Hughes 2003).

3.1 Specific Issues of Developing States like Pakistan

These Issues of Developing States are divided into following groups:

1. National Policies towards HIT: Efficient, effective and secure national policy can address the local health needs according to the changing environment is needed. These policies can be devised by policy makers and practitioners to assess and implement research evidences. Enforcing the legislation is difficult in developing countries and acceptance by the community for the transformation of any system is hard.
2. Poor eHealthcare design: Many e-healthcare systems are developed by Information Technology (IT) solution companies which operate for the purpose of getting profit. These companies are interested with the financial gain from e-healthcare products that they produce. They concentrate much in producing usable products for healthcare institutions and hence causing privacy, security and confidentiality to suffer. In order to resolve this, efforts to secure e-healthcare systems need to be taken from design of the systems to implementation in order for the developments that have been achieved so far to be rolled to the real world.
3. Organizational Barriers: Organizations and people play a very critical role in implementing and transformation of an information system. First of all there are no documented studies available regarding level and use, benefits, cost, risk analysis and other aspects of health technology in health sector of underdeveloped countries and if they are available for the developing countries they

are not well communicated. Secondly, people at higher positions and posts, whose needs of reporting are adequately being catered by the existing system, do not favor HIT as they think that the employment of new technology is wastage of both the money and time. Hospitals must address the apprehension of physicians because if by using HIT their professional responsibilities become difficult they will never support its use.

4. Social and Cultural Barriers: Digital divide and e-readiness are major social and cultural barriers in establishment and use of health information system. These barriers include lack of stakeholder's interest, less motivation, anxiety to adapt and use new technology. Health care personnel are difficult to convince for use of new health technologies. As they are more comfortable with their conventional approach and routine practice so it is complicated to transform health information system from paper based to digital format (Durrani et al., 2012).

5. Infrastructure-related Issues: Most of underdeveloped countries do not have required technological infrastructure to establish national health information system hence cannot promote HIT in private and

public hospitals. Reshaping infrastructure of existing health system is very crucial. Most developing countries do not have adequate required infrastructure such as computer hardware, software, wired and wireless communication channels, Internet, and skilled professional human resource. The availability and operation of these components of digital Infrastructure are necessary for establishment and promotion of HIT in under developed countries. Strong infrastructure is required for the strong health information system to improve existing health system by planning and introducing new health care interventions which results in achieving better health goal. There are poor or inadequate resources allocation for implementation and use of the health technology in the developing countries.

6. Hardware/Software: HIT requires specialized software and hardware to improve public health by making evidence based decisions. Often these software and hardware tools are costly and require sufficient training for proper operation.

7. Poor Availability of Internet: Poor internet availability is a vital infrastructure barrier. Health care specialists have poor access to real time information

and the available information is not according to the local situation. This available information cannot be used for evidence based decisions. Without having a proper local area network and internet facility inter-organizational and intra-organizational communication is not possible. This is a backbone for any information system.

8. Lack of Professionals & their Trainings: A computerized information system requires skilled personnel for its effective operation. Training is one of the aspects for use of any new technology. Deficiency of skilled workforce can be overcome by providing appropriate training in the required area. A proper training module in constructing architecture of a reliable database should be available. If it is not implemented then outcomes or results gained by such type of databases gives unauthentic results which can neither be used for decision making process nor for evidence based practice. Training requires cost as well as time.

9. Cost and Time Constraints: Major problem in organizing workshops and trainings for establishment and implementation of HIT in under developed countries is financial and time constraint. Transformation of any system is a

difficult task and cannot complete in short time period. Barriers like lack of skilled workforce, infrastructure, and cost along with other effects like initial decrease of productivity due to adjustment with new technological environment and system itself impose strong limits to the introduction and adoption of new health technologies. It requires years and years for transformation process to complete.

10. Educational Barriers: Professional education in health informatics is badly ignored and missing in curriculum of medical institutes for undergraduates. Although module of education related to IT use in research is included in postgraduate curriculum but it is the need of the hour to include this area in medical professional education at graduate level. Transformation of our existing paper based health system into computerized information system is not possible without providing the basic IT knowledge to health professionals.

11. Fear of losing Control over Data: The shift from traditional healthcare to e-healthcare involves the transformation of records from paper-based to digital format. These records are referred to as Electronic Healthcare Record (EHR). Grimson (2001) defines and characterizes the next generation

EHR as the longitudinal cradle-to-grave records readily accessible and available over the Internet. These records will be linked to clinical protocols and guidelines to drive the delivery of healthcare to the individual. The presence of these records over the Internet facilitates record sharing between physicians. However, patients usually feel that they are losing control of their data hence resisting e-healthcare adoption.

3.2 Prospects of e-Health in Pakistan

The healthcare facilities in Pakistan has got better and increased in figure each year but this increase is not proportionate to the population growth. Therefore; the healthcare facilities are not that enough which can fulfill the needs and necessities of a large population. Persons particularly in rural areas face more difficulties of poor health than the people living in urban areas. Likewise, there has been a rise in expenses on healthcare planning and implementation but these expenditures on more and expanded healthcare setups are not enough for the population which is growing faster than the increase in the expenditure (Saleem, 2009). Moreover, there is also an increase in the number of doctors, dentists and physicians

every year. The increase in doctors and dentists number is more than the population growth which has decreased the number of patients/people for each doctor and dentist for treatment.

In the present times of management, a practical and structured information system is more or less a need and main concern of many organizations especially the healthcare institutions. In Pakistan, the old techniques and methods for data collection and analysis must be changed if the information in healthcare sector is to be used correctly for more effective healthcare-related activities and decisions. The Ministry of Health, Government of Pakistan, in alliance with the provincial health departments and international agencies developed a National HMIS during 1990-93 (Ali & Horikoshi, 2002). The facility based HMIS is one of the most influential tool for the planning and management of healthcare services. In view of the existing huge health infrastructure, stretched all over the country in terms of health facilities, services, staff, drugs and supplies etc. there has been a requirement to start a well-organized information system responding to the information needs of various decision making

levels of the healthcare organizations (Durrani & Khoja, 2009).

The relationship between the ICTs and better healthcare service delivery has been discussed significantly (Ferraro, 2008; Nowak, 2008). The present studies have focused on the introduction of particular technologies, such as the cell phone or the Internet, but few have examined empirically the relationship in detail (Fraser *et al.*, 2007; Kollmann *et al.*, 2007). One probable method of tackling this dispute is appraisal and evaluation of user needs before adoption and use of eHealth systems. However, user studies which can be very helpful and productive for adoption of IT-applications in healthcare sector but unfortunately these studies are not always carried out at the right time in design and development cycle (Saleem, 2010).

A lot of healthcare organizations implement telemedicine technology for the development of healthcare services and increase usefulness & effectiveness. The willingness of healthcare organizations and the availability of the suitable

conditions are driving forces for the implementation and use of telemedicine. Earlier studies showed that a telemedicine program can be disobeyed by organizational culture and work processes (Wootton, 2008)

One main obstruction in e-Healthcare implementation, either in developed or developing states is privacy, secrecy and security concerns of e-Health systems. The American government, for example, for the year 2009 reserved 19 billion dollars for IT-applications in healthcare sector. However, in spite of this massive investment, e-healthcare adoption in the USA is still hesitant. Its expected users for instance doctors and physicians are not convinced about the security issues and concerns of information systems in healthcare organizations therefore they resist the implementation and use of the same. Furthermore, patients are also worried about the privacy of their medical records. This has been influenced by a number of existing cases involving violations in e-healthcare information systems. However, we disagree that adoption of eHealth systems is not a financial problem as such. It goes beyond, to include human faith and belief. Therefore, in spite of concentrating on securing funds for e-healthcare

implementation, developing states have to think about the human factor as well (Durrani & Khoja, 2009).

Though we suggest the use of Free and Open Source Software (FOSS) (from operating system to EHR software) but due to shortage of money, these products are linked with many challenges. As these products are “free”, its users do not have any support and maintenance from development teams. The government of developing countries needs to set aside sufficient finances for staff training in the healthcare sector. If e-health is to succeed in developing nations it needs to be taken care of. We need to develop our own local abilities and infrastructure, based on local demand.

The shared understanding and collaboration is a coordinated, synchronous activity that is the outcome of a continued effort to construct and uphold a shared conception of a problem. Cooperation is working jointly to achieve shared goals surrounded by joint and supportive activities individuals look for results which are advantageous to themselves and helpful to all other group members. Methodically and thoroughly structuring those basic elements into group learning

circumstances helps ensure joint efforts and makes possible the closely controlled implementation of joint learning for lasting success (Kaplan, 2000). The advantages of collaborative learning are that persons bring different ideas in a collaborative environment and work on the way to the growth of a shared understanding and building usual knowledge (Tan, 2005). At present, the existing understanding seems to be that collaboration is a synonym for high-quality learning and good educational technology; more or less any web-based application is labeled as collaboration (Heinzlmann et al., 2003).

Ever increasing charges for healthcare services and fast increase and development of the knowledge have led the doctors and physicians to work in a collaborative way and share knowledge and skills. It is usually understood that healthcare professionals working in a collaborative style, can deliver healthcare services in a successful and well-organized manner. Collaborative learning process can exchange of ideas within little groups not only enhances interest between the participants but also generates and encourages critical thinking. Collaboration in healthcare organizations requires

establishing a platform, and governmental responsibility to support sharing knowledge and experiences among healthcare workers (Durrani & Khoja, 2009).

Collaboration and healthcare teams are very common in hospitals for durable and lasting healthcare facilities, but teams are often not available to providers in the community where the majority of practitioners work separately. Collaboration makes group members more adaptable and ultimately replaceable as the group as a learning community shares knowledge and experiences. Collaborative learning in healthcare organizations need to make and establish the environment that supports and encourages sharing of knowledge such as: government policy, IT infrastructure, top management support, and business process management to give doctors and physicians the capability of discussion and reflection (Scott et al., 2005).

Pakistan's ministry for healthcare has forecasted that Pakistan is grasping important benefits from the up-and-coming information economy. This is reflected in the current infrastructure investment and other hi-tech developments. In spite of this development, it seems that Pakistan is very slow

in healthcare services provision. The slow adoption and use of IT-applications in the developing states like India and Pakistan is because of lack of management support (the perceived complexity and cost (Li et al., 2005, Houston et al., 2003, Lu et al., 2003); sensitive character and make-up of information and logistics contained in a healthcare facility, nature and type of risk involved, demands for high quality of healthcare, high litigation cost and lack of infrastructure, the level of absorption and assimilation with existing health systems(Li et al., 2005) and the requirement for other resources to support technology infrastructure (Davenport, 2005, Lu et al., 2003). While there is an increase in the usage of new technologies but there are limited studies on the perceptions and awareness of doctors and physicians about the adoption and use of IT-applications in healthcare sector (Eastes, 2001, Li et al., 2005).

Earlier studies that have used existing models to predict behavior determinants of adoption of technologies in healthcare have demonstrated their inadequacy. Further, the uptake of wireless and handheld tools and devices is either on a very small level on an individual level but are not at organizational levels in Pakistan.

There is limited research available on determinants and factors that are critical to understanding user perceptions of technologies specific to healthcare on a larger scale. Therefore, any knowledge of these factors of adoption of new technology will help the healthcare administrators to develop suitable policies in order to handle the ever-increasing demands of healthcare services. This is more valid in the case of Pakistan because of the demands placed on the healthcare services and rising interest in wireless technologies in the health domain.

The culture of Pakistani environment has always encouraged the use of technology. This is high on the programs and plans at country and federal level government. The healthcare sector in Pakistan is operating in an environment of strong regulatory framework, cost reduction, high competition, and expectation of high quality of services, high demand on the healthcare sector, limited resources, and the demand for providing high quality of care - anytime anywhere. Factors such as familiarity, infrastructure, cost, clinical process, quality of care, management support, policies and procedures, security, availability of appropriate wireless application, trust and knowledge

of the technology will facilitate the adoption and hence the use of wireless handheld devices in Pakistani healthcare environment.

4. Discussions

The process of developing and implementing IS in the context of developing countries is a challenging endeavor. This challenge mainly emanates from existing adverse situation of the installed base that is characterized by uneven infrastructural development across regions, inadequate skilled manpower, lack of integration of exiting standards, work practices, and varying political commitment and organizational support at different levels (Raghupathi & Wu, 2011). Simply acquiring and implementing e-Health technology alone would be insufficient to accomplish clinical performance and, subsequently, drive adoption and diffusion. E-Health technology should be integrated effectively with the organizational change and improvement (Asangansi et al., 2008). The improvement in processes requires the optimization of clinical functions and processes which should be supported by the technology and not driven by it. By doing this it is likely to generate significant patient outcomes and financial

improvements with health organizations. This is estimated in terms of attracting more patients, saving effort and time (Bhutto *et al.*, 2010). Furthermore, in the context of developing states like Pakistan, the cost constitutes an important factor which will affect the integration and, subsequently, the success of eHealth systems in a particular setting. Although cost aspects are not directly explored, however, efforts to save time, reduction in inaccuracies and high quality information are real components of the cost (Somu & Bhaskar, 2011). While existing research suggests that wireless technology has the power to decrease scheduling time and medical errors thereby enhancing the quality in patient care, there is bleak evidence on the comparisons of costs before and after the implementation of wireless technologies. It entails that there is a big space for further research to assess the hypothesis that costs have the potential to affect clinical usefulness and threaten widespread adoption (Juma *et al.*, 2012). Use of e-health systems in developing countries holds many threats, along with the expected advantages. The main risk of using ICTs is the unintentional broadening of the gap in health status and knowledge between various segments of the population, thus

escalating rather than addressing healthcare inequalities. One method to stay away from this divide is for government authorities and hospitals in developing countries to evaluate and make them ready for change before adoption and use of IT-applications. This process of preparation for eHealth related change is also termed as eHealth readiness (Durrani *et al.*, 2012). eHealth readiness is determined by assessing the comparative status of governments, healthcare organizations, or expected users in those areas most critical for acceptance and success of programs using ICT (Rezai-Rad *et al.*, 2012).

5. Conclusions

Literature reveals that e-Health systems are the future of every healthcare service being provided in the advanced, developing and poor states. Developing states are interested and busy in the improvement of healthcare-sector and that is why these nations keep on to decentralize their political and healthcare systems, they need to make available all the required payments and grants for the weak and insufficient resources and powerless abilities and qualifications of the urban areas. Although the speed and tempo of introducing digital systems for

healthcare is altogether different from advanced to developing countries like Pakistan, all the states are making all out efforts to adopt these systems. This attitude is based on the fact that the ICTs have offered such options that were almost unimaginable so far. E-Health systems are helping the developing and poor states in resolving their long standing problems in healthcare facilities and services. Furthermore, the research tells that once a country is capable to introduced e-Health system, its success depends on the users' 'e-Readiness' for willingly using the new systems. A huge body of research is underway to explore the dynamics of users' readiness. There are several variables which determine the users' attitude however the most powerful and unavoidable determinant is the 'digital-literacy' of the prospected users. Research shows that as the computer literacy of the e-Health users (like doctors) increases, the possibility of successful e-Health operations also increases.

References

1. Ali, M. & Horikoshi, Y. (2002). Situation analysis of health management information system in Pakistan. *Pakistan J. Med. Res*, 41(2).
2. Alvarez, A. J. S. (2004). Challenges of information systems implementation in organizational change management: Insights from the health sector in Ecuador. *Electronic Journal on Information Systems in developing Countries*, 16(6):1-16.
3. Ansari B.I.H., Shaikh A.A., Khan R.A. & Hamirani N.S. 2012 Telemedicine Enlightenment: A
4. Smart Health Care System for Rural Areas. *Journal of Emerging Trends in Computing and Information Sciences*, Vol. 3, No. 2
5. Asangansi, I. E., Adejoro, O. O., Farri, O., & Makinde, O. (2008). Computer use among doctors
6. in Africa: Survey of trainees in a Nigerian teaching hospital. *Journal of Health informatics in developing countries*, 2(1).
7. Bhutto R. A., Khoumbati K. R. & Kalhor M. S. (2010). Evaluating the existing information-based healthcare systems (a case study). *Journal of Quality and Technology Management*, 1(1):91-98.
8. Bhutto R. A., Khoumbati K. R. & Kalhor M. S. (2010). Evaluating the existing information-based healthcare systems (a case study). *Journal of Quality and Technology Management*, 1(1):91-98.
9. Braa, J., Monteiro, E. Sahay, S. (2004). Networks of Action: Sustainable Health Information systems Across Developing Countries. *MIS Quarterly*, 28(3):337-362.
10. Chanda, K.L. & Shaw, J.G. (2010) The development of telehealth as a strategy to improve health care services in Zambia, *Health Information and Libraries Journal*, 27, 133-139.
11. Chetley, A. (2006). Improving health, connecting people: the role of ICT in the health sectors of

12. developing countries a framework paper. *InfoDev*, 31 May 2006.
13. Davenport, C. (2005). Analysis of PDAs in Nursing: Benefits and Barriers. *PDA CORTEX*.
14. Durrani H & Khoja S. (2009). A systematic review of the use of tele-Health in Asian countries. *Journal of Telemedicine and Telecare*, 15:181.
16. Durrani, H.; Khoja, S.; Naseem, A.; Scott, R. E.; Gul, A.; Jan, R. (2012). Health needs and eHealth readiness assessment of health care organizations in Kabul and Bamyán, Afghanistan. *Eastern Mediterranean Health Journal*, 18(6):663.
17. EASTES, L. (2001). Use of the personal digital assistant for point of care trauma documentation. *Journal of Emergency Nursing*, 27, 516-518.
18. Eng, T. R. (2001). *The eHealth landscape: A terrain map of emerging information and communication technologies in health and health care*. The Robert Wood Johnson Foundation.
19. Eysenbach, G. 2001. What is e-health? *J Medical Internet Research* 3:2 .
20. Ferraro, N. (2008) ³Africa's Portal to the Internet. *Informationweek*, February 4, pp. 36-42.
21. Fraser, H.S.F. et al. (2007). Information Systems for Patient Follow-Up and Chronic
22. Management of HIV and Tuberculosis: A Life-Saving Technology in Resource-Poor Areas. *Journal of Medical Internet Research*, (9)4, p. e29.
23. Grimson, J. (2001). Delivering the electronic healthcare record for the 21st century. *International Journal of Medical Informatics*, 64, 111-127.
25. Gururajan, R., Baig, A. H. & Kerr, D. (2008). Pakistani Healthcare Professionals Views and
26. Opinions About Use of Wireless Handheld Devices in Healthcare Environment. *Electronic Journal of Health Informatics*, 3(2):1-11.
27. Heinzlmann, P.J., Lugin, N.E., Kvedar, J. (2005). Telemedicine in the future. *Journal of Telemedicine and Telecare*, 11: 384 - 39.
28. Hogan, T.P., & Palmer, C.L. (2005). Information preferences and practices among people living
29. with HIV/AIDS: Results from a nationwide survey. *Journal Medical Library Association*, 93(4), 431-439.
30. Houston, T. K., Ray, M. N., Crawford, M. A., Giddens, T. & Berner, E. S. (2003). Patient
31. Perceptions of Physician Use of Handheld Computers. *AMIA Symposium Proceedings*. 299-303
32. Hussein R, Mohamed N, Shahriza N, Karim A. & Ahlan AR. (2007). The influence of organizational factors on information systems success in e-government agencies in Malaysia. *The Electronic Journal on Information Systems in Developing*.
33. Ishtiaq B., Ansari H., Shaikh A.A., Khan R.A., Hamirani N.A. (2012). Telemedicine Enlightenment: A Smart Health Care System for Rural Areas. *Journal of Emerging Trends in Computing and Information Sciences*, 3(2).
34. Juma K. ,Nahason M. , Apollo W., Gregory W. & Patrick O. (2012). Current Status of E-Health in Kenya and Emerging Global Research Trends. *International Journal of Information and*

- Communication Technology Research*, 2(1).
35. Kaplan B & Litewka S.(2008). Ethical Challenges of Telemedicine and Telehealth. *Cambridge Quarterly of Healthcare Ethics*, 17, 401-416.
 37. Khalid, M., Akbar, A., Tanwani, A., Tariq, A & Farooq M. (2008). Using Telemedicine as an
 38. Enabler for Antenatal Care in Pakistan. *E-MEDISYS 2nd International Conference: E-Medical System TUNISIA*.
 39. Khoja S., Durrani H., Nayani P. & Fahim A.,2012; Scope of Policy Issues in eHealth: Results
 40. From a Structured Literature Review. *J Med Internet Res* 2012;14(1):e34
 41. Khoja S., Scott R., and Gilani S., 2008,E-health readiness assessment: promoting hope in the health-care institutions of Pakistan. *World Hosp Health Serv*, 44(1):36-8.
 42. Kijisanayotin B., Kasitipradith N., & Pannarunothai S., (2010). eHealth in Thailand: the current
 43. status. *Stud Health Technol Inform*, 160(Pt 1):376-80.
 44. Kimaro Honest C & Titlestad Ola Hodne. (2008). Challenges of user participation in the design
 45. of a computer based system: the possibility of participatory customization in low income countries. *Journal of Health informatics in developing countries*, 2(1).
 46. Kimaro, H.G. & Nhampossa, J.L. (2007). The challenges of sustainability of health information systems in developing countries: comparative case studies of Mozambique and Tanzania, *Journal of Health Informatics in Developing Countries*, 1(1), 1-10.
 47. Kollmann, A. et al. (2007). Feasibility of a Mobile Phone-Based Data Service for Functional
 48. Treatment of Type 1 Diabetes Mellitus Patients', *Journal of Medical Internet Research*, (9)5, p. 36.
 49. Lang A, Mertes A. (2011). E-health policy and deployment activities in Europe. *Telemed e-Health*, 17: 262-8.
 50. Li, Y.-C., Chang, I.-C., Hung, W. F. & Fu, HK. (2005). The Critical Factors Affecting Hospital
 51. Adoption of Mobile Nursing Technologies' in Taiwan. *Proceedings of 38th Hawaii International Conference on System Sciences IEEE*.
 52. Lu, Y.C., Kyung, Lee, J.J., Xiao, Y., Sears, A., Jacko, J. A. & Chapters, K. (2003). Why Don't Physicians Use Their Personal Digital Assistants? *AMIA Symposium Proceedings*, 405-409.
 53. Malik, M. A., Larik, N. M. &Khan, S. A. (2008). Use of information technology by practicing
 54. clinicians in Pakistan: a questionnaire survey. *Journal of Health Informatics in Developing Countries*, 2(2):2-5.
 55. Mosse, E. and S. Sahay (2003). Counter Networks, Communication and Health Information Systems: A Case Study from Mozambique. *In The IFIP TC8 & TC9/WG8.2+9.4 Working Conference on Information Systems Perspectives and Challenges in the Context of Globalization*. M. Korpela, R. Montealegre and A. Poulymenakou (Eds), Athens, Greece: 35-51.
 56. Mostafa R, Hasan G .M., Kabir A.M.A, & Rahman A., (2011). Proposed Framework for the

57. Deployment of Telemedicine Centers in Rural Bangladesh. *International Journal of E-Health and Medical Communications*, 2(1), 55-72.
58. Nowak, R. (2008). The E-Doctor Will See You Now', *New Scientist*, November 8, p. 24.
59. Nyella, E. & Mndeme, M. (2010). Power Tensions in Health Information System Integration in Developing Countries: The Need for Distributed Control, *Electronic Journal of Information Systems in Developing Countries*, 43(4): 1-19.
60. Pagliari, C., Sloan, D., Gregor, P., Sullivan, F., Detmer, D., Kahan, JP., Oortwijn,
61. W., MacGillivray, S. (2005). What is eHealth (4): A Scoping Exercise to Map the Field. *J Med Internet Res*, 7(1).
62. Qaisar, N. & Khan, H. (2010). E-Government Challenges in Public Sector: A case study of
63. Pakistan. *IJCSI International Journal of Computer Science*, 7(5).
64. Qazi, M., Ali, M. (2009). Pakistan's Health Management Information System: Health Managers' perspectives. *j pak Med Assoc*, 59(1).
65. Rezaei-Rad M., Vaezi R., Nattagh F. (2012). E-Health Readiness Assessment Framework in Iran. *Iran J Public Health*, 41(10): 43-51.
66. Rhidian, A., & Hughes, D. (2003). Clinical practice in a computer world: Considering the issues. *Journal of Advanced Nursing*, 42 (4), 340-346
68. Sajjad M, Saif M I & Humayoun A A. (2009). Adoption of Information Technology: Measuring Social Influence for Senior Executive's. *American Journal of Scientific Research*, Vol 3.
69. Saleem T (2009). Implementation of EHR/EPR in England: a model for developing countries.
70. *Journal of Health informatics in developing countries*, 3(1).
71. Saleem, T. (2010). Assessment Tools for Health Information websites: Using comparison of
72. NHS Direct and MedlinePlus for health information about heart failure as an example. *Journal of Health Informatics in Developing Countries*, 4(2), 20-34.
73. Sarkar, A (2008). *E-commerce adoption and Implementation in SMEs: an analysis of factors, supplementary proceedings*. Schools of Business and Computing, Christchurch Polytechnic Institute of Technology, Christchurch, New Zealand.
74. Scott JT, Rundall TG, Vogt TM, Hsu J: Kaiser (2005). Permanente's experience of Implementing an electronic medical record: a qualitative study. *Information in practice*.
75. Scott RE, Chowdhury MF, Varghese S. (2002). Telehealth policy: looking for global complementarity. *J Telemed Telecare*, 8 Suppl 3:S3:55-S3:57.
76. Singer, B.H. and M.C. de Castro (2007). Bridges to Sustainable Tropical Health', *Proceedings of the National Academy of Sciences*, (104)41: 16038-16043.
78. Soar, Jeffrey; Gow, Jeff; Caniogo, Vili (2012). Sustainability of health information systems in developing countries: the case of Fiji. *Health Information Management Journal*, 41(3):19.

79. Somu, G and Bhaskar, RK (2011). Adapting Information Technology (IT) in healthcare for Quality patient care-Study conducted in a Hospital in South India. *Journal of Health Informatics in Developing Countries*, 5 (2): 209-218.
80. Tan, J. (2005). *E-Healthcare information systems; an introduction for students and professionals*. Jossey Bass.
81. Wootton R. 2008. Telemedicine support for the developing world. *J Telemed Telecare*, 14(3): 109-114.