

# ‘Enabling Technologies’ and ‘User-Participation’ as main Factors for Success of E-health Systems in Developing Countries like Pakistan

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## Abstract

IT-applications in healthcare offers a novel way for improving the standard of healthcare services especially in developing states. In Pakistan both Government and private sector healthcare institutions are trying to take advantage of IT-applications for healthcare services just to come up with the rational-decisions for many healthcare-related problems in the country. ICTs for healthcare services provide opportunities for improvement by providing better, reliable and secure services to the patients, healthcare providers, staff and other stake holders both inside a hospital and also to distant patients where no physical healthcare infrastructure is available. This paper evaluates the effects of two key factors (enabling technologies and user participation) to see their influence on success of e-health systems in hospitals of Pakistan. The healthcare organizations having proper hardware and software and user participation in the development of IS ensures successful adoption and use of e-health systems in healthcare organizations anywhere including developing states.

**Keywords:** Enabling Technologies, User-participation, E-health System, Developing Countries

## 1. INTRODUCTION

Majority of the countries are at some point of health sector improvement, and are trying to provide diversified and fair access to quality healthcare services at the same time minimizing or at least controlling the increasing cost of healthcare services. Health reform practices have many aspects and there is no particular model being adopted by all countries (Wootton & Bonnardot, 2010). ICTs play a crucial role to improve access and quality of healthcare services while having costs. Improving healthcare services means improvement in public health and medical programs planned to provide voluntary, emergency and long-term clinical care; educating people; improving nutrition and hygiene; and providing more sanitary living conditions. These in turn eventually include huge social and economic changes, as many health challenges go well beyond the health sector (Laurinda et al., 2012).

As pointed-out by many researchers, information & communication is one of the essential pillars in any healthcare organization which can take advantages by making use of IS/ICTs (Ishtiaq et al., 2012). There are three broad categories where ICTs can be harnessed for improving health service:

1. Executing the healthcare systems such as; patient records and hospital management, delivery of healthcare via directly using ICTs in a healthcare organization. Though, the actuality is that IT-applications for patient record remained unsuccessful in many instances even in developed states.
2. While in developing nations these new technologies have not been extensively scattered and used by the majority of the world's poor who correspond to a considerable portion in development.
3. Consequently, most of the e-projects cannot continue because of the failure to achieve their future planned goals and eventually become unsustainable.

## 2. LITERATURE REVIEW

### 2.1 IT-applications for healthcare

ICTs are crucial for developing and maintaining public health inspection and security systems. IT-applications in healthcare organizations makes it possible to collect, analyze and distribute the information about different diseases, their attack-agents and main risk factors along with various other healthcare related events to the healthcare professionals for their decision-making (Lazarus et al. 2008). Since these surveillance and security systems carry a variety of information therefore are very helpful in finding out about the main causes, symptoms

of the disease that has affected the public at a very early stage of the disease for more appropriate treatment (Sengupta, Calman & Hripcsak, 2008).

E-health systems are capable of generating very useful information which can be shared between different healthcare workers from all the levels of health services organizations. Telemedicine is one of such IT-applications whereby telecommunications technologies are used to give all sorts of clinical and treatment information (Stanberry, 2006). Regardless of the fact that the usage of universally and cheaply available interactive technologies such as internet and video-conference is the main feature of telemedicine but there is very low investments in these technologies especially in developing countries. Furthermore besides having attractive features of telemedicine there is a very limited support and acceptance of this technology by the healthcare professionals in developing states. To induce the recognition of the telemedicine among healthcare providers, they must have fuller level organizational support and motivation to adopt the change in their healthcare practices and perform their tasks in a more efficient manner for ultimate satisfaction of the patients. Furthermore the willingness to use the telemedicine by the doctors can effectively be gained via government e-policies for example making available all infrastructural facilities to generate an environment where future of telemedicine may become visible (Shaqrah, 2010).

Developing countries don't have a considerable number of both healthcare providers and general public as users IT-applications in healthcare. Many of the approaches being used are still at a relatively new stage of implementation, with insufficient studies to establish their relevance, applicability or cost effectiveness (Martinez et al., 2005). This makes it difficult for governments of developing countries to determine their investment priorities (Chandrakhar & Ghosh, 2001). However, there are a number of pilot projects that have demonstrated improvements, such as a 50 percent reduction in mortality or 25-50 percent increases in productivity within the healthcare system (Greenberg, 2005).

EHR means electronic documentation of current and historical health, tests, referrals and medical treatments concerned with the health of a person (WHO, 2006). This system holds the information about a specific individual in connection with his/her demographics, medical history, and the kind of disease he/she is suffering from (Thakkar & Davis, 2006; Thielst, 2007). Many previous research studies have highlighted that EHR is such a well-organized and effective system that considerably reduces the chances of medication errors and generates access to patients' information in an improved manner for example during a crises or an emergency situation regardless where ever the location of the patient is, EHR provides easy and relevant access to the patients' information (Ouma & Herselman, 2008).

HIT means the use of computer in the form of physician digital assistance, electronic health records, computerized physician order entry system by doctors, patients, hospitals, laboratories, x-ray facilities and all other stake holders (Mishra et al., 2009). Health information technology is very significant part of continuously changing environment of healthcare system. Healthcare information can be communicated in a better and effective manner by making use of e-health systems and which can be used in evidence based decision making process. Advantages of HIT consist of lesser paper work in healthcare organizations consequently reducing the chances of medical errors, eliminating the duplication of medical tests and thus reducing the overall cost of healthcare services (Das, 2010).

## **2.2 Benefits of ICTs for healthcare services**

The introduction IT-applications in the organizations has renovated the processes and structure of many organizations all over the world both in developed and the developing states (Chetley, 2006). One of many industries that have adopted the IS/ICTs for more improved performance of tasks is healthcare industry commonly known as e-healthcare. There are a number of advantages to the populous and the government via e-healthcare. The major benefits are:

1. Improves doctors' efficiency: EHR as being one of the major components of eHealth technologies, generates improvement in the doctors' efficiency as patients' records are readily available via this e-Health information system, healthcare professionals have faster and greater access to a patient's medical history, physicians can diagnose more accurately, doctors are able to attend maximum patients (Eysenbach, 2001).
2. Improved quality healthcare: The adoption and use of e-health systems in healthcare organizations improves the quality of healthcare services for the patients. For example various healthcare websites are

useful for both patients and the doctors. With the help of healthcare-related websites patients can look for and find the medical-related information thus improving their knowledge in connection with health and self-treatment. Furthermore physicians can search and find useful information for their learning and research (Sharma et al., 2005).

3. Stronger doctor-patient relationship: Internet is yet another major component of e-health and provides quicker access to any type of information. Internet has made it possible to search and use any type of information very cheaply. It also develops a stronger patient-doctor relationship as both can share sensitive patient information (Sharma et al., 2005).
4. Savings in cost: The adoption and use of various e-health technologies bring savings in the cost of rendering healthcare services for example telemedicine whereby telecommunications technologies such as internet and video-conference are used to give all sorts of clinical and treatment information especially in remote areas (Rhidian & Hughes, 2003).
5. More informed decision making, enhanced quality of healthcare, lives-saving through remote consultations, and more accurate diagnoses are some of the benefits of e-health systems. In the presence of these benefits more and more countries are investing huge amounts in IS/ICTs for healthcare practices especially the developed countries but the developing nations are still far behind in adoption and use of IT-applications in healthcare organizations (Mosse & Sahay, 2005).

### **2.3 Success factors for ICTs in hospitals:**

#### **2.3.1 Enabling Technologies**

(Malik et al., 2008) have examined the physicians in Pakistan to evaluate the use of different digital tools in providing health facilities and services to the patients. They recognized that the availability of the needed computer hardware and software is critical in deciding the users' acceptance. The required hardware must be identified before the introduction of IT-applications in healthcare organizations. This means that at the start of the project an assessment should be made about the hardware already available and the hardware which is still required for introduction of ICTs. One of the major concerns with IT-applications is that the users often claim that ICTs are not user friendly. The interface design and structure of the data need therefore to conform to each other. The software-applications must be flexibility and adaptable to neutralize the software-related issues regarding technology while adopting ICTs for healthcare. Software issues include the lack of local content creation, the language used and the relevance of content to the local situation. Appropriate language is frequently neglected in ICT programs and little content is available in local languages for health programs (Chetley et al, 2006). Another researcher has reported that the selection of enabling technologies is puzzling decision because of the range available (Khoja et al., 2008).

In a literature review Durrani & Khoja (2009) it is highlighted that the use of tele-health in developing countries is stuffed with the problems of selecting the most appropriate technologies for their health requirements. The challenge is how can healthcare organizations can better communicate and collaborate within their employees, patients and stakeholders. Creating knowledge proposes the need for improved knowledge flow internally within the organization and externally to the patient and stakeholders. Leveraging knowledge through the connection and collaboration of others may lead to significant success factor in whether a learning organization is successful (Chou & Brauer, 2005). Two-way learning refers to groups of professionals and practitioners, often from the same or related background, are coming together to share ideas and experience and to deal with common problems and issues. Furthermore, the responsibility of government and technology platform in facilitating communication and collaboration at health care institutions are critical (Shaqrah, 2010).

#### **2.3.2 User participation and awareness**

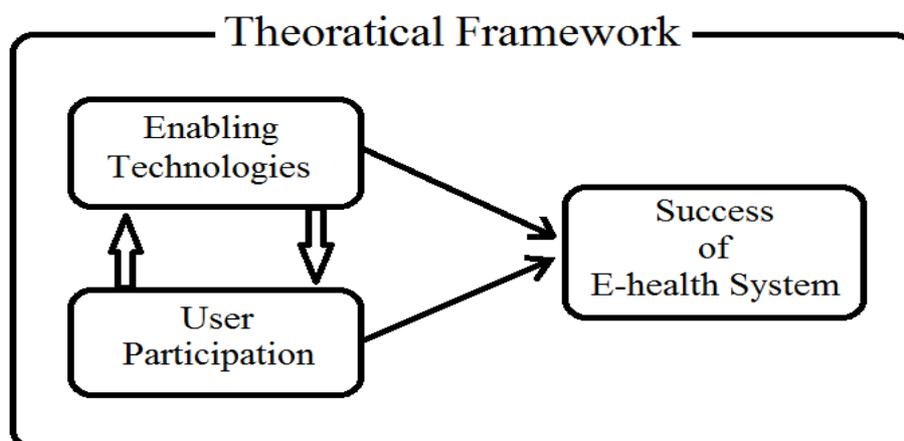
In design and adoption of technologies, users' participation improves system development and helps users to determine the effects of the system upon their work. A number of empirical studies have shown a positive relationship between the user participation and the success of the technologies, users' acceptance/satisfaction, and data quality (Macleod, 2007). He also added that individuals from all levels of organization must be considered for designing of technologies as it improves the quality of the information system because users provide complete and accurate requirements through information about the organizational activities by avoiding unnecessary features of the information systems (IS), by fostering feelings of ownership to the IS, by decreasing

resistance to change (Mustafa et al. 2010). The organizations whereby users' participation is given importance, it has got maximum chances for success of technology empirical studies have shown that the organizations whereby users and IT-staff are jointly responsible for development of information system, has greater success.

(McLeod et al. 2007) is of the opinion that software development proceedings in an organization must have full support of the developers and robust hardware and software must be acquired from the vendors of repute. The lack of participation and awareness also leads to unsuccessful introduction of the IT-applications in hospitals. This can be attributed to the lack of capacity and training available in the organization but also with the social and cultural issues affecting the organization. This often tends to lead to a lack of understanding of changes needed to accompany the innovation and stakeholders not willing to participate into this process. For maximum success an ICT project requires all participants to participate and view the innovation as adding value to existing systems; if the people using the system do not like, want, or support it, it will likely fail. There should be a mutual understanding of the meaning of the e-health systems before the introduction of the system by the project managers (Gladwin et al. 2003). Sharing learning and experiences should be encouraged to improve understanding of the different ways people learn, communicate and use information by developing links with others doing the similar ICT interventions. This is also important to get people participating in the use of the system, this is not something people are used to and changing in the way people view this is needed by awareness raising and training.

## 2.4 Theoretical framework

In this study literature survey from the existing sources was done. The below figure demonstrates the relationship between the independent variables (enabling technologies and user-participation) and the dependent variable (success of e-health systems). This model is the conceptual framework of the questions addressed in the current paper.



## 3. DISCUSSIONS

There has been an explosion in knowledge and information management activity, mainly in healthcare sector over the previous few years. By and large, hospitals 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. E-health system includes many elements such as telemedicine, tele-education, telematics for better management of healthcare and research (Kijisanayotin 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).

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). 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).

#### 4. CONCLUSIONS

Evidence-based procedures play a major role in efficient health information system quality, results and efficiency of health. Healthcare services and activities can be enhanced by having timely and accurate information for evidence based decisions at all levels of healthcare institutions (Ganapathy & Ravindra, 2009). Practical uses of IT-applications in healthcare sector empowers consumers of health services as they can easily access health information as well as decision tool and by the employment of HIT, healthcare providers can work together more easily when distance is a key factor. In past IT-applications were used for administrative activities and financial activities rather assisting and delivering healthcare services (Chisolm et al, 2010). Pakistan has a potential to take lead in healthcare management but it is only possible if the policy makers, decision makers and all stake holders sit together and lay down the steps and guidelines for an effective healthcare policy. It is very important to identify strategic objectives and the desired short term and long term goal before start spending on healthcare projects.

#### References

1. Ali, M. & Horikoshi, Y. (2002). Situation analysis of health management information system in Pakistan. *Pakistan J. Med. Res.*, 41(2).
2. Bhutto R. A., Khoubati 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.
3. Chandrasekhar, C.P. and Ghosh, J. 2001. Information and communication Technologies and health in low income countries: the potential and the constraints. *Bull World Health Org*, 79(9): 850-855.
4. Chetley, A. (2006), Improving health, connecting people: the role of ICT in the health sectors of developing countries a framework paper. *InfoDev*, 31 May 2006.
5. Chisolm, D.J., Purnell, T.S., Cohen, D.M. & McAlearney, A.S. (2010). Clinician Perceptions of an Electronic Medical Record During the First Year of Implementation in Emergency Services, *Pediatric Emergency Care* 26(2):107-110.
6. Chou, C, and Brauer, D. (2005). Temperament and satisfaction with health status among Persons with rheumatoid arthritis. *Clinical Nurse Specialist*, 19(5):94-100.
7. Das, D. (2010) Development of e-Health Application for Rural Community of Bangladesh. *Journal of Theoretical and Applied Information Technology*, 21(1):43-56:
8. Durrani, H. & Khoja, S. (2009). A systematic review of the use of telehealth in Asian countries. *Journal of Telemedicine and Telecare*, 15: 57–181.
9. 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.
10. Eysenbach, G. 2001. What is e-health? *J Medical Internet Research* 3:2.
11. Ganapathy K., Ravindra A., (2009). Telemedicine in India: the Apollo story, *Telemed J E Health*, 15(6):576-85.
12. Gladwin, J., Dixon, R., Wilson, T., (2000), Using external training materials to strengthen health information management in East Africa, *Information Research*, Vol. 5 No. 4, July.
13. Greenberg, A. (2005). ICTs for Poverty Alleviation: Basic tool and enabling sector. Stockholm: SIDA.
14. 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).
15. 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.
16. Kijisanayotin B., Kasitipradith N., & Pannarunothai S., (2010). eHealth in Thailand: the current status. *Stud Health Technol Inform*, 160(Pt 1):376-80.
17. Laurinda B. Harman, RHIA, Cathy A. Flite, RHIA, and Kesa Bond. (2012). Electronic Health Records: Privacy, Confidentiality, and Security, *American Medical Association Journal of Ethics*, 14(9):712-719.

18. Lazarus R., Klompas M., Campion F., McNabb S J N., Hou X., Daniel J., Haney G., DeMaria A., Lenert L. & Platt R.. (2008). Electronic Support for Public Health: Validated Case Finding and Reporting for Notifiable Diseases Using Electronic Medical Data', *Journal of the American Medical Informatics Association*, 16(1):18–24.
19. Malik, M. A., Larik, N. M. & Khan, S. A. (2008). Use of information technology by practicing clinicians in Pakistan: a questionnaire survey. *Journal of Health Informatics in Developing Countries*, 2(2):2-5.
20. Malik, M. A., Larik, N. M. & Khan, S. A. (2008). Use of information technology by practicing clinicians in Pakistan: a questionnaire survey. *Journal of Health Informatics in Developing Countries*, 2(2):2-5.
21. Martinez, V., Villarroel, J., Seoane, J. & del Pozo, F. (2005). Analysis of Information and Communication Needs in Rural Primary Health Care in Developing Countries. *IEEE Transactions on Information Technology in Biomedicine*, 9(1).
22. McLeod, L. Stephen, G. MacDonnell and Bill, D. (2007) User participation in contemporary IS development: An IS management perspective, *Australasian Journal of Information Systems*, Volume 15 (1).
23. Mishra S.K., L. Kapoor, and I. P. Singh, (2009). Telemedicine in India: current scenario and the future, *Telemed. J E Health*, 15(6):568-75.
24. 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.
25. Mustafa H., Sori Z M., & Ahmad A C. (2010). A Study of User Information Satisfaction on Financial Management Information System. *International Research Journal of Finance and Economics - Issue 36*.
26. Ouma, S., Herselman, M. (2008). E-health in rural areas: Case of developing countries. Paper presented at the *Proceedings of the World Academy of Science, Engineering and Technology*.
27. Qazi & Ali (2004). Pakistan's health management information system: Health managers' perspectives. *Journal of Pakistan medical association*.
28. Rhidian, A., & Hughes, D. (2003). Clinical practice in a computer world: Considering the issues. *Journal of Advanced Nursing*, 42 (4), 340–346.
29. Sengupta, S., N.S. Calman, and G. Hripcsak (2008). A Model for Expanded Public Health Reporting in the Context of H IPAA. *Journal of the American Medical Informatics Association* (15)5: 569–574.
30. Shaqrah, Amin A. (2010) Adoption of Telemedicine among Health Care Services: The Strategic Adoption. *Journal of e-Health Management*, Vol. 19.
31. Sharma, S. K., Ahmed, N., Rathinasamy, R. S. (2005). E-healthcare: A model on the offshore healthcare delivery for cost saving. *International Journal of Healthcare Technology and Management*, V. 6 (3) p. 331-351 (321).
32. 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.
33. Stanberry, B., (2006). Legal and ethical aspects of telemedicine. *Journal of Telemedicine and Telecare*, 12(4): 166-175.
34. Thakkar, M. & Davis, DC. (2006). Risks, Barriers, and Benefits of EHR Systems: A Comparative Study Based on Size of Hospital, *Perspectives in Health Information Management*.
35. THIELST, C. B. (2007). The New Frontier of Electronic, Personal, and Virtual Health Records. *Journal of Healthcare Management*, 52(2).
36. WHO (2006). *Building Foundations for eHealth', Progress of Member States*. Report of the WHO Global Observatory for eHealth,
37. Wootton R., and Bonnardot L. M., (2010). In what circumstances is telemedicine appropriate in the developing world? *JRSM*, 1(5).

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