

1-1-2010

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Recommended Citation

Huang, Wilfred; Seitz, Juergen; and Wickramasinghe, Nilmini, "Manifesto for E-Health Success" (2010). *PACIS 2010 Proceedings*. Paper 25.
<http://aisel.aisnet.org/pacis2010/25>

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MANIFESTO FOR E-HEALTH SUCCESS

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Abstract

While healthcare is the biggest service industry on the globe it has yet to realize the full potential of e-health, which is in stark contrast to other e-business initiatives such as e-government and e-education, e-finance or e-commerce. This is due to many reasons including the fact that the healthcare industry is faced with many complex challenges in trying to deliver cost-effective, high-value, accessible healthcare and has traditionally been slow to embrace new business techniques and technologies. The goal of this paper is to develop a framework to assess a country's e-health preparedness with respect to embracing e-health (the application of e-commerce to healthcare) and thus enable a country to identify as well as address areas that require further attention in order for it to undertake a successful e-health initiative.

Key Words: healthcare, e-health, tele-medicine, healthcare information systems, infrastructure, framework

1 INTRODUCTION

Superior access, quality and value of healthcare services have become a global priority for healthcare to combat the exponentially increasing costs of healthcare expenditure. E-Health in its many forms and possibilities appears to offer a panacea for facilitating the necessary transformation for healthcare. While a plethora of e-health initiatives keep mushrooming both nationally and globally, there exists to date no unified system to evaluate these respective initiatives and assess their relative strengths and deficiencies in realizing superior access, quality and value of healthcare services. Our research serves to address this void. Specifically, through extensive meta- and archival analysis of major e-health initiatives globally, coupled with some site visits we have developed a framework for assessing e-health preparedness. Three key components of our study include: 1) understanding the web of players (regulators, payers, providers, healthcare organizations, suppliers and last but not least patients) and how e-health can modify the interactions between these players as well as create added value healthcare services. 2) the development of an e-health preparedness grid that provides a universal assessment tool for all e-health initiatives and 3) the development of an e-health manifesto, a declaration of policy, intent and the necessary components of successful e-health initiative. Our paper serves to develop a framework that can be applied to various countries throughout the globe to assess their e-health preparedness. Such a framework will then enable a systematic assessment of the areas that e-health initiatives should best target as well as the necessary steps and critical success factors that must be addressed including technological, infrastructure, education or policy. In this way it will be possible to successfully move forward with many synergistic e-health initiatives and thereby also ensure appropriate diffusion of needed e-health solutions as well as supporting contemporaneously continuous improvement.

2 HEALTHCARE

Healthcare is a growing industry. Between 1960 and 1997 the percentage of Gross Domestic Product (GDP) spent on healthcare by 29 members of the Organization for Economic Cooperation and Development (OECD) nearly doubled from 3.9 to 7.6 % while the growth between 1995-2005 was on average 4% with the US spending the most (nearly 2.5 times more than any other country) and this is expected to reach 19.5% GDP by 2017¹. Hence, reducing this expenditure as well as offering effective and efficient quality healthcare treatment is becoming a priority globally. Technology and automation have the potential to reduce these costs (Ghani et al., 2010; America Institute of Medicine, 2001; Wickramasinghe, 2000); thus, e-health, specifically the adoption and adaptation of e-commerce technologies throughout the healthcare industry, appears to be a powerful force of change for the healthcare industry worldwide.

Healthcare providers are grasping at many opportunities, especially in response to legislative mandates, to incorporate IT and telecommunications with e-commerce strategies to improve service and cost effectiveness to their key stakeholders. Many such e-initiatives including the e-medical record are currently being implemented in various countries. However these do not seem to represent a coherent and universal adoption of e-health.

Healthcare has been shaped by each nation's own set of cultures, traditions, payment mechanisms and patient expectations. Therefore, when looking at health systems throughout the world, it is useful to position them on a continuum ranging from high (essentially 100%) government involvement (i. e. a public healthcare system) at one extreme to little (essentially 0%) government involvement (i. e., private healthcare system) at the other extreme with many variations of a two tier system (i. e. mix of private and public) in between. However, given the common problem of exponentially increasing costs facing healthcare globally, irrespective of the particular health system one examines, the future of the healthcare industry will be partially shaped by commonalities such as this key unifying problem and the common forces of change including: i) empowered consumers, ii) e-health adoption and

¹ OECD Health Data 2009

adaptability and iii) shift to focus on the practice of preventative versus cure driven medicine, as well as four key implications, including: i) health insurance changes, ii) workforce changes and changes in the roles of stakeholders within the health system, iii) organizational changes and standardization and iv) the need for healthcare providers and administrators to make difficult, yet necessary choices regarding practice management.

3 E-HEALTH

E-health is a very broad term that encompasses various activities related to the use of many e-commerce technologies and infrastructures most notably the Internet for facilitating healthcare practice. The World Health Organization (WHO, 2003) a major world health body defines e-health as “being the leveraging of the information and communication technology (ICT) to connect provider and patients and governments; to educate and inform health care professionals, managers and consumers; to stimulate innovation in care delivery and health system management; and, to improve our healthcare system”. In contrast, a technologically oriented definition of e-health is offered by Intel which refers to e-health as "a concerted effort undertaken by leaders in healthcare and hi-tech industries to fully harness the benefits available through convergence of the Internet and healthcare."

A more comprehensive definition of e-health would need to incorporate the healthcare, business and technological perspectives; hence we define e-health as an emerging field in the intersection of medical informatics, technology, public health and business. Thereby, e-health entails the delivery of health services and health information enhanced through the Internet and other related e-commerce technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a paradigm shift, and a commitment for networked, global thinking, to improve healthcare locally, regionally, and globally by using information and communication technologies. Finally, the "e" in e-health does not only stand for "electronic," but implies a number of other "e's," which together perhaps best characterize what e-health is all about (or what it should be about) refer to table 1.

E's in e-health	Description
Efficiency	Support cost effective healthcare delivery
Enhancing quality	Reduce medical errors
Evidence based	Support evidence based medicine
Empowerment	Help patients to be more active and informed in their healthcare decisions and treatments
Education	Help physicians and patients understand the latest techniques and healthcare issues
Extending the scope	Do not limit healthcare treatment to conventional boundaries
Ethics	Including but not limited to privacy and security concerns
Equity	Decrease rather than increase the gap between “haves” and “have nots”

Table 1. *The e's in e-health (adapted from Eysenbach 2001)*

4 A FRAMEWORK FOR ASSESSING E-HEALTH POTENTIAL

By taking into consideration all the e's of e-health and after a thorough analysis of various e-health initiatives as well as an in depth assessment of critical success factors necessary to effect successful e-health projects the following framework shown in figure 1 is proposed to assess the e-health potential and preparedness of countries. Our framework highlights the key elements that are required for successful e-health initiatives and therefore provides an elegant tool that allows analysis beyond the quantifiable data into a systematic synthesis of the major impacts and pre-requisites. The framework contains four main pre-requisites, four main impacts, and the implications of these parameters to the eight e's of e-health. By examining both the pre-requisites and the impacts we can assess the potential

of a country and its preparedness for e-health as well as its ability to maximize the eight e-health implications.

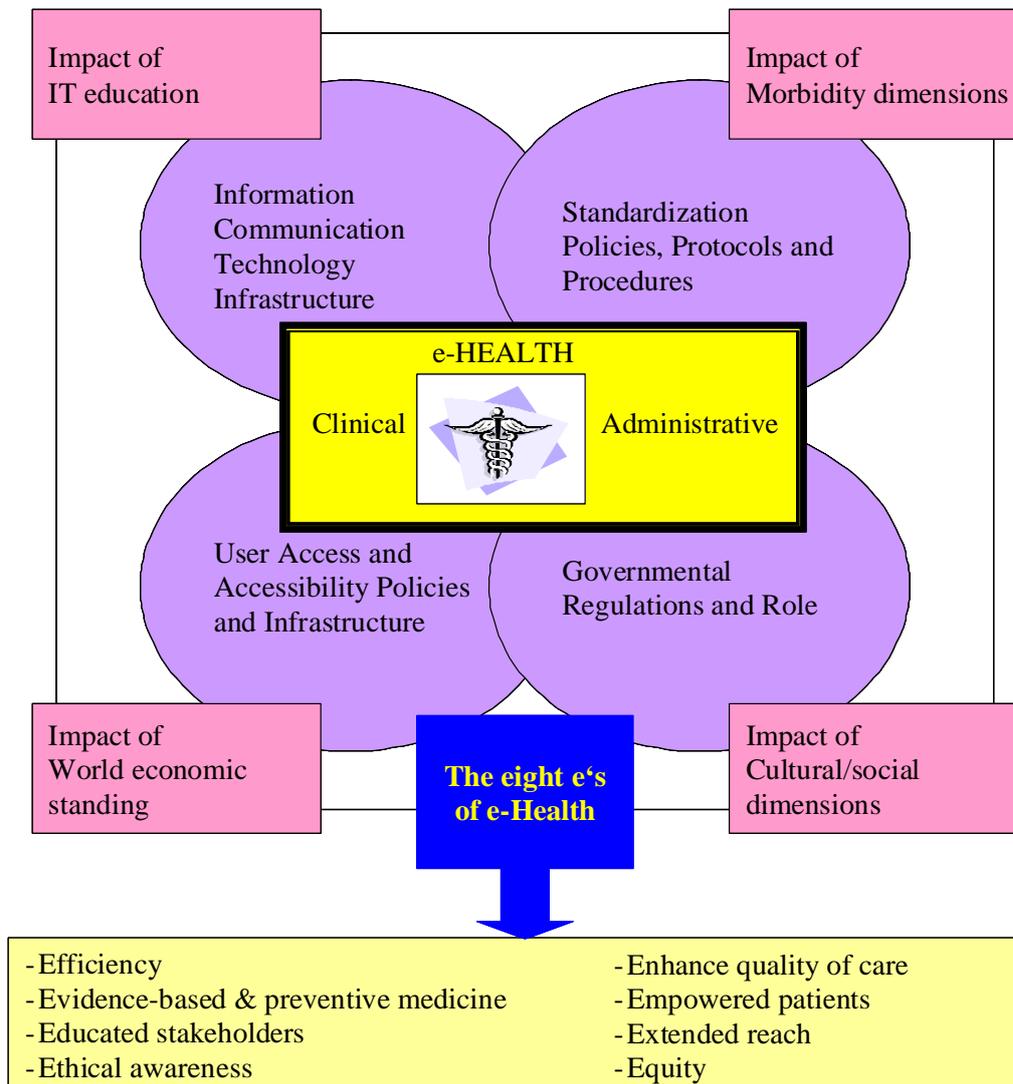


Figure 1. A Framework for Assessing A Country's/Region's E-health Potential (adapted from Wickramasinghe et al. 2005)

4.1 Information Communication Technology (ICT) Infrastructure

The ICT infrastructure includes phone lines, fiber trunks and submarine cables, T1, T3 and OC-xx, ISDN, DSL other high-speed services used by businesses as well as satellites, earth stations and teleports. A sound technical infrastructure is an essential ingredient to the undertaking of e-health initiatives by any nation. Such infrastructures should also include telecommunications, electricity, access to computers, number of Internet hosts, number of ISP's (Internet Service Providers) and available bandwidth and broadband access. To offer a good multimedia content and thus provide a rich e-health experience, one would require a high bandwidth. ICT considerations are undoubtedly one of the most fundamental infrastructure requirements.

Networks are now a critical component of the business strategies for organizations to compete globally. Having a fast microprocessor-based computer at home has no meaning unless you have high bandwidth based communication infrastructure available to connect computers with the ISP. With the explosion of the Internet and the advent of e-commerce, global networks need to be accessible, reliable, and fast to participate effectively in the global business environment. Telecommunications is

a vital infrastructure for Internet access and hence for e-commerce. One of the pioneering countries in establishing a complete and robust e-health infrastructure is Singapore which is in the process of wiring every home, office and factory up to a broadband cable network which will cover 98 % of Singaporean homes and offices (Samiee, 1988).

4.2 Standardization Policies, Protocols and Procedures

E-Health by definition spans many parties and geographic dimensions. To enable such a far reaching coverage, significant amounts of document exchange and information flows must be accommodated. Standardization is the key for this. Once a country decides to undertake e-health initiatives, standardization policies, protocols and procedures must be developed at the outset to ensure the full realization of the eight e's of e-health. Fortunately, the main infrastructure of e-health is the Internet which imposes the most widely and universally accepted standard protocols such as TCP/IP and http. It is the existence of these standard protocols that has led to the widespread adoption of the Internet for e-commerce applications.

The transformation to e-health by any country cannot be successfully attained without the deliberate establishment of standardization policies, protocols and procedures.

The standardization policies, protocols and procedures play a significant role in the adoption of e-health and the reduction of many structural impediments (Samiee, 1998).

4.3 User Access and Accessibility Policies and Infrastructure

Access to e-commerce is defined by the WTO (World Trade Organization) as consisting of two critical components 1) access to Internet services and 2) access to e-services (Panagariya, 2000); the former deals with the user infrastructure, while the latter pertains to specific commitments to electronically accessible services. The user infrastructure includes number of Internet hosts and number of web sites, web users as a percent of the population as well as ISP availability and costs for consumers, PC penetration level etc. Integral to user infrastructure is the diffusion rate of PCs and Internet usage. The United States and the United Kingdom have experienced the greatest penetration of home computers (Samiee, 1998). For developing countries such as India and China there is however, a very low PC penetration and tele-density. In such a setting it is a considerable challenge then to offer e-health, since a large part of the population is not able to afford to join the e-commerce bandwagon. Countries, thus have to balance local call charges, rentals, subscription charges etc., otherwise the majority of citizens will find these costs a disincentive. This is particularly significant for developing and emerging nations where access prices tend to be out of reach for most of the population. Upcoming new technologies hold the promise to increase the connectivity as well as affordability level and developing countries will need to seriously consider these technologies. In addition to access to PCs and the Internet, computer literacy is important and users must be familiar not only with the use of computers and pertinent software products but also the benefits and potential uses of the Internet and World Wide Web (Samiee, 1988).

4.4 Governmental Regulation and Control

The key challenges regarding e-health use include; 1) cost effectiveness; i. e. less costly than traditional healthcare delivery, 2) functionality and ease of use, i. e., they should enable and facilitate many uses for physicians and other healthcare users by combining various types and forms of data as well as be easy to use; and 3) they must be secure. One of the most significant legislative regulations in the US is the Health Insurance Portability and Accountability Act (HIPAA, 2001).

Given the nature of healthcare and the sensitivity of healthcare data and information, it is incumbent on governments not only to mandate regulations that will facilitate the exchange of healthcare documents between the various healthcare stakeholders but also to provide protection of privacy and the rights of patients. Some countries, such as China and Singapore, even control access to certain sites for moral, social and political reasons while elsewhere transnational data flows are hindered by a

plethora of regulations aimed at protecting domestic technology and related human resource markets (Samiee, 1998; Goff, 1992; Gupta, 1992). Irrespective of the type of healthcare system; i. e., whether 100% government driven, 100% private or a combination thereof, it is clear that some governmental role is required to facilitate successful e-health initiatives.

The significance of the preceding four pre-requisites on e-health initiatives will be modified by the impacts of IT education, morbidity, cultural/social dimensions and world economic standing as elaborated upon below.

4.5 Impact of IT Education

A sophisticated, well educated population boosts competition and hastens innovation. According to Michael Porter, one of the key factors to a country's strength in an industry is strong customer support (Porter, 1990). Thus, a strong domestic market leads to the growth of competition which leads to innovation and the adoption of technology enabled solutions to provide more effective and efficient services such as e-health and telemedicine. As identified earlier, the health consumer is the key driving force in pushing e-health initiatives; we conjecture that a more IT educated healthcare consumer would then provide stronger impetus for e-health adoption.

4.6 Impact of Morbidity Rate

There is a direct relationship between health education and awareness and the overall health standing of a country. Therefore, a more health conscious society, which tends to coincide with a society that has a lower morbidity rate, is more likely to embrace any e-health initiatives. Furthermore, higher morbidity rates tend to indicate the existence of more basic health needs (WHO, 2003) and hence treatment is more urgent than the practice of preventative medicine and thus e-health could be considered an unrealistic luxury and in some instances such as when a significant percentage of a population is suffering from malnutrition related diseases is even likely to be irrelevant at least in the short term. Thus, we conjecture that the modifying impact of morbidity rate is to prioritize the level of spending on e-health versus other basic healthcare needs.

4.7 Impact of Cultural/Social Dimensions

Healthcare has been shaped by each nation's own set of cultures, traditions, payment mechanisms and patient expectations. While the adoption of e-health, to a great extent, dilutes this cultural impact, social and cultural dimensions will still be a moderating influence on any countries e-health initiatives. Another aspect of the cultural/social dimension relates to the presentation language of the content of the e-health repositories. The entire world does not speak English so the e-health solutions have to be offered in many other languages. The e-health supporting content in web servers/sites must be offered in local languages, supported by pictures and universal icons. This becomes a particularly important consideration when we look at the adoption and diffusion of evidence-based medicine as it will mean that much of the available evidence and case study data will not be easily accessible globally due to language barriers.

4.8 Impact of World Economic Standing

Economies of the future will be built around the Internet. All governments are very aware of the importance and critical role that the Internet will play on a country's economy. This makes it critical that appropriate funding levels and budgetary allocations become a key component of governmental fiscal policies so that such initiatives will form the bridge between a traditional healthcare present and a promising e-health future. Thus, the result of which would determine success of effective e-health implementations and consequently have the potential to enhance a country's economy and future growth.

In developing its e-health initiative, a good first step for any country is to assess its standing with respect to the four pre-requisites and four impacts discussed above. In this way it will be possible to evaluate its preparedness with respect to these parameters and consequently devise appropriate policies and strategies for an effective and successful e-health initiative. In the following section, we will attempt to provide a guideline that will facilitate such an evaluation.

5 E-HEALTH PREPAREDNESS GRID

By taking the four main pre-requisites as well as the four major impacts identified in our framework in figure 1; namely, the information communication technology infrastructure, the standardization policies, protocols and procedures, the user access and accessibility policies and infrastructures, governmental regulations and role as well as the impact of IT education, the impact of morbidity rate, the impact of world economic standing and the impact of cultural/social dimensions, we develop a grid for assessing e-health preparedness (figure 2) in which we can plot various countries with respect to these key parameters. The grid consists of four quadrants that represent the possible states of preparedness with respect to the key parameters for e-health success. The low preparedness quadrant identifies situations that are low with respect to all four pre-requisites for e-health potential. The medium preparedness quadrant identifies two symmetric situations; namely, a combination of high and low positioning with respect to the four pre-requisites for e-health potential. Finally, the high preparedness quadrant identifies situations that are high with respect to all four pre-requisites for e-health potential. This grid not only shows the possible positioning of a given country with respect to its e-health preparedness (i. e. low, medium or high) but also the path it must take, and more specifically the pre-requisite factors it must focus on, to migrate to the ideal state of preparedness; namely being high with respect to all four pre-requisites. The grid also underscores the moderating role of the four impacts irrespective of the relative positioning on the state of preparedness of a given country.

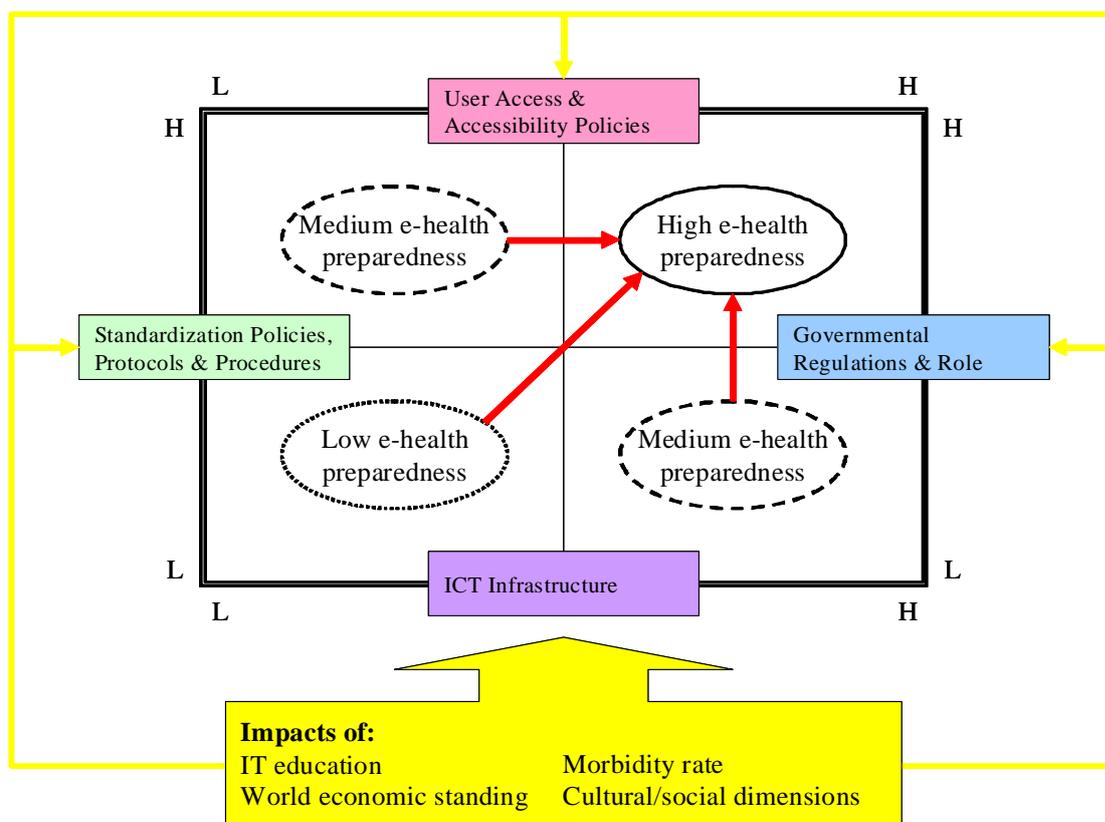


Figure 2. e-Health Preparedness Grid (adapted from Wickramasinghe et al., 2005)

6 CONCLUSION

E-commerce, as noted by the UN Secretary General's address, is an important aspect of business in today's 21st century. No longer then is it a luxury for nations, rather it is a strategic necessity in order for countries to achieve economic and business prosperity as well as social viability. One of the major areas within e-commerce that has yet to reach its full potential is e-health. This is due to the fact that healthcare generally has been slow in adopting information technologies. Furthermore, there is a shortage of robust normative frameworks that may be used as guidelines for assessing countries e-health preparedness and identifying the key areas and deficiencies that need to be addressed in order for successful e-health initiatives to ensue. In addition, e-health is more than a technological initiative; rather it also requires a major paradigm shift in healthcare delivery, practice and thinking. We have attempted to address this gap by developing a framework that identifies the major factors involved in assessing the e-health preparedness of countries and thereby, facilitating countries in focusing their efforts on the relevant issues that must be addressed in order that successful e-health initiatives follow (i. e., the eight e's of e-health are in fact realized). An outcome from our analysis indicates that the relative healthcare system (i. e. whether government driven, public or two tier) would appear to have less significance in establishing successful e-health initiatives; hence e-health initiatives are healthcare system independent and success or failure depends on ones state of preparedness. The first step in the development of any viable e-health strategy is to make an assessment of the current state of e-health preparedness and then how to either move to a state of higher preparedness (i. e., the high quadrant) or focus on maintaining a current high quadrant status – both of these will be possible through the use of our framework and thus its value. It is advised that next a country or region specific e-health manifesto is developed which serves to identify the important policy decisions and necessary areas that must be addressed before any e-health initiative should take place. Finally, in closing we note that with respect to the proposed framework other parameters also exist and could also be considered important in trying to determine and develop a successful e-health initiative; in this regard we preferred parsimony over complexity and call for future research in this vital area to investigate other possible parameters.

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