Critical Success Factors for E-Health

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INTRODUCTION

Within the umbrella of e-commerce, one area, e-health, has yet to reach its full potential in many developed countries, let alone developing countries. Each country is positioned differently and has varying potential and preparedness regarding embracing e-commerce technologies generally and e-health in particular. Given the macrolevel nature of many issues pertaining to the development of e-health (Alvarez, 2002), in order to be more effective in their e-health initiatives, it is important for countries to assess their potential, identify their relative strengths and weaknesses, and thereby develop strategies and policies to address these issues to effectively formulate and implement appropriate e-health initiatives. To do this effectively, it is valuable to have an integrative framework that enables the assessment of a country's e-health preparedness. This article serves to develop such a framework that can be applied to various countries throughout the globe, and from this generate an e-health preparedness grid. In so doing, we hope to facilitate better understanding of e-health initiatives and thus maximize their power.

BACKGROUND

Reducing health care expenditure as well as offering quality health care treatment is becoming a priority globally. Technology and automation have the potential to reduce these costs (Institute of Medicine, 2001; Wickramasinghe, 2000); thus, e-health, which essentially involves the adoption and adaptation of e-commerce technologies throughout the health care industry (Eysenbach, 2001; Wickramasinghe, Misra, Jenkins, & Vogel, 2006), appears to be a powerful force of change for the health care industry worldwide.

Health care 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 government involvement (i.e., a public health care system) at one extreme to little government involvement (i.e., a private health care system) at the other extreme, with many variations of a mix of private and public in between. However, given the common problem of exponentially increasing costs facing health care globally, irrespective of the particular health system one examines, the future of the health care industry will be partially shaped by commonalties such as the universal issue of escalating costs and the common forces of change including (a) empowered consumers, (b) e-health adoption and adaptability, and (c) a shift to focus on the practice of preventative- vs. cure-driven medicine. Additionally, there will be four key implications, namely, (a) health insurance changes, (b) workforce changes and changes in the roles of stakeholders within the health system, (c) organizational changes and standardization, and (d) the need for health care providers and administrators to make difficult yet necessary choices regarding practice management.

THE GOALS OF E-HEALTH

In order to develop a robust framework, it is imperative to understand the many goals of e-health. These goals, taken together, perhaps best characterize what e-health is all about (or what it should be about; *Journal of Medical Internet Research* [JMIR], 2003). Specifically, significant goals of e-health include the following.

Efficiency: One of the promises of e-health is to increase efficiency in health care, thereby decreasing costs. One possible way of decreasing costs would be by avoiding duplicative or unnecessary diagnostic or therapeutic interventions, through enhanced communication possibilities between health care establishments, and through patient involvement (Health Technology Center, 2000). The Internet will naturally serve as an enabler for achieving this goal in e-health.

Quality of care: Increasing efficiency involves not only reducing costs, and thus is not an end in and of itself, but rather should be considered in conjunction with improving quality, one of the ultimate goals of e-health. More educated consumers (as a result of the informational aspects of e-health) would then communicate more effectively with their primary care providers, which will, in turn, lead to better understanding and improved quality of care.

Evidence: E-health interventions should be evidence based in the sense that their effectiveness and efficiency should not be assumed but proven by rigorous scientific

evaluation and support from case histories. Web-accessible case repositories facilitate the timely accessibility of such evidence and thus help in achieving the necessary support of a diagnosis or treatment decision. The evidence-based medicine goal of e-health is currently one of the most active e-health research domains, yet much work still needs to be done in this area.

Empowerment of consumers and patients: By making the knowledge bases of medicine and personal electronic records accessible to consumers over the Internet, e-health opens new avenues for patient-centered medicine, enables patient education, and thus increases the likelihood of informed and more satisfactory patient choices (Umhoff & Winn, 1999).

Education of physicians and consumers: Online sources (continuing medical education for physicians, and health education and tailored preventive information for consumers) make it easier for physicians as well as consumers to keep up to date with the latest developments in the medical areas of their respective interests. This, in turn, is likely to have a positive impact on the quality of care vis-à-vis the use of the latest medical treatments and preventive protocols.

Extension of health care: Extending the scope of health care beyond its conventional boundaries, in both a geographical sense as well as in a conceptual sense, leads to enabling such techniques as telemedicine and virtual operating rooms, both of which are invaluable in providing health care services to places where it may otherwise be difficult or impossible to do.

Ethics: E-health involves new forms of patient-physician interaction and poses new challenges and threats to ethical issues such as online professional practice, informed consent, privacy, and security issues (Healthcare Advisory Board, 2002). However, this is not an intrinsic feature of e-health but rather a feature of the Internet technology, which is the foundation for all e-business initiatives; therefore, e-health along with e-government, e-insurance, e-banking, e-finance, and e-retailing must all contend with these ethical issues. Given the nature of health care, these issues could be more magnified.

Equity: To make health care more equitable is one of the aims of quality identified by the American Institute of Medicine (2001) generally and is one of the goals of e-health. However, at the same time there is a considerable threat that e-health, if improperly implemented and used, may deepen the gap between the "haves" and the "have-nots," hence the need for a robust framework to ensure the proper implementation of e-health initiatives. In particular, some of the key issues for equity revolve around broad access and familiarity with the technology.

PREREQUISITES FOR E-HEALTH

In order to actualize and thereby support the key goals of e-health presented above, it is necessary to have four critical prerequisites for any successful e-health initiative, namely, ICT architecture and infrastructure; standardized policies, protocols, and procedures; user access and accessibility policies and infrastructure; and finally government regulation and control. These will now be briefly discussed in turn.

ICT Architecture and Infrastructure

The ICT infrastructure typically includes phone lines, fiber trunks, submarine cables, T1, T3, OC-xx, ISDN (integrated services digital network), DSL (digital subscriber line), and 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, Internet hosts, ISPs (Internet service providers), and available bandwidth and broadband access. To offer good multimedia content and thus provide a rich e-health experience, one would require 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 to a broadband cable network that will cover 98% of Singaporean homes and offices (Wickramasinghe, 2007a).

Standardization Policies, Protocols, and Procedures

E-health by definition spans many parties and geographic dimensions. To enable such far-reaching coverage, significant amounts of document exchange and information flow must be accommodated. Standardization is the key for this. Once a country decides to undertake e-health initiatives, standardization polices, protocols, and procedures must