Assessing the Business Value of Australia's National e-health Solution

Full Papers

Peter Haddad
Deakin University and Epworth HealthCare
peter.e.haddad@gmail.com

Imran Muhammad
Deakin University and Epworth HealthCare
drimran.work@gmail.com

Nilmini Wickramasinghe
Deakin University and Epworth HealthCare
nilmini.work@gmail.com

Abstract

The objective of this study, which represents part of a bigger research project, is to evaluate the business value of the Australian national eHealth initiative, namely My Health Records (previously the personally controlled electronic health record (PCEHR)). This research is predominantly qualitative, with data collected through a series of semi-structured interviews with different stakeholders of My Health Records, a survey that targeted the users of the system (Australia citizens), another survey that targeted the health services providers, including general practitioners (GPs), specialized doctors, nurses, and other physicians. To evaluate the business value of the PCEHR, we use the model of Business Value of IT in Healthcare. Our findings show that the My Health Records has the potential to provide quality, continuous, safe, and un-fragmented healthcare delivery, subject to a number of technological, organizational, and human requirements.

Keywords

Healthcare, ehealth, business value of IT, My Health Record

Introduction

Healthcare systems, globally, have a number of challenges in common. These relate to unsustainable increase in cost, uneven quality of care, and even persistent barriers to universal access (Bloomrosen and Detmer 2010). These, combined with the increasing population, aging, and new lifestyles, have represented a call of urgent action to policies- and decision-makers to start developing alternative options to put the healthcare industry on the right track, which leads to a safe, effective, patient-centered, timely, efficient and equitable healthcare system. (IOM 2001).

Information and communication technology (ICT) is seen as an enabler of new healthcare delivery models (Wickgrmasinghe and Schaffer 2010). The evolution of ICT in the healthcare industry has led to what is called e-health. The World Health Organization (2003) defines e-health as "the leveraging of the information and communication technology to connect providers and patients and governments; to educate and inform healthcare professionals, managers and consumers; to stimulate innovation in care delivery and health system management; and to improve our healthcare system".

More recently, an increasing number of developed countries are adopting e-health solutions to enhance both the quality of care and the cost-effectiveness of healthcare delivery operations. In the Australian context, My Health Record (previously the Personally Controlled Electronic Health Record [PCEHR]) is the national e-health initiative since 1993. Given their high cost and their promised outcomes, evaluating the business value of e-health solutions is thus key. The problem that faces the endeavor to study the impact of e-health solutions is apparently their complexity. In order to avoid this, we use the model of BVIT (Haddad, Gregory, & Wickramasinghe, 2014) which is briefly explained in the section 1.3. Before

this, we review the terms "value" and 'business value" in the healthcare context.

The reminder of paper is organized as follows: it starts with reviewing the concepts of 'value' and 'business value of IT' in the context of healthcare, and the Business Value of IT Model (Haddad et al. 2014) and its application in this study. Australia's e-health initiative, namely My Health Record, is then summarized. The methods used in this study, the results, and interpretation these results are then presented.

Value in the Healthcare

Porter and Teisberg (2006) define value, as a concept, as the output achieved relative to the cost incurred, suggesting that measuring value is essential to understanding the performance of any organization and driving continuous improvement. Value in healthcare can also be defined as the patient health outcomes achieved per dollar spent. Determining value and measuring it, though, depend on the perspective one uses. i.e. from a patient's perspective, healthcare values include the healthcare outcomes, quality, the safety of the delivery process, and the services associated with the delivery process. From society perspective, benefits might include the availability of healthy and productive people who contribute to society in many ways (Porter and Teisberg 2006).

Healthcare commentary often revolves around universal availability and cost control, i.e. access and cost. People are not likely to want the lowest cost; the central issue should really be the creation of a healthcare system that provides the highest value (Rouse and Cortese 2010).

The Business Value of IT in Healthcare

Business value of IT is commonly used to refer to the impact of IT on the organizational performance (Melville et al 2004). Defining the organizational performance in healthcare is different from it in other industries (Haddad et. al 2014). Cost reduction, profitability improvement, productivity enhancement, competitive advantage and inventory reduction are a number of performance measurements in other industries (Melville et al 2004). This is not the case in the healthcare industry, where organizational performance extends well beyond that to cover patient outcomes and healthcare quality (Haddad et. al 2014).

The impact of IT in healthcare has long been studied. Most of the current studies on this share same limitations in common: 1) looking at IT as a whole, without objectively classifying them according to agreed standards, 2) limited scope. i.e. the impact of specific IT system on a specific outcome.

This research serves to address this gap by proposing a framework that conceptualizes the business value of IT in healthcare. This framework was designed and has been tested elsewhere (ibid). For the purpose of this paper, we will test the mapping between our framework and the national e-health initiative in Australia; namely the My Health Record. The following section summarizes the main features of this model.

The Conceptual Model of Business Value of IT

In order to develop a framework to evaluate the business value of IT, we first needed to classify IT systems according to their business objectives. This is the heart of the theory of IT Portfolio by Weill and Broadbent (1998) who classified IT investments into four categories: Infrastructural, Transactional, Informational, and Strategic. Each of these IT systems has distinctive business objectives and different industries adopt them to different levels according to their actual needs. At the same time, we recognized the need of socio-technical aspects when studying the healthcare industry. This is obtained from the works of Rouse and Cortese (2010) that looked at the healthcare delivery from a socio-technical perspective, and divided it into four layers: the healthcare ecosystem, the system structure, the delivery operations, and clinical practices. We designed our framework by combining these two theories/frameworks together, and by performing a rigorous literature review to divide these components to build more detailed structures as Figure 1 depicts.
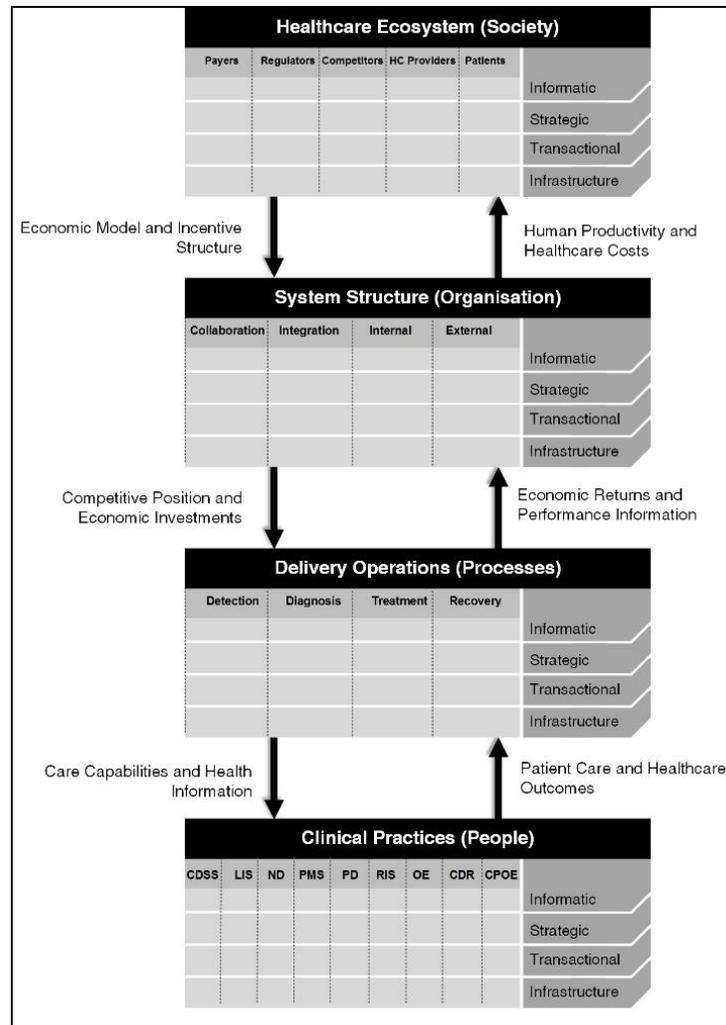
Figure 1.The Model of Business Value of IT in Healthcare

My Health Record

Like all OECD countries, the Australian healthcare system is confronting major healthcare funding and delivery challenges. A further challenge relates to the fact that, even though the healthcare system in Australia has been considered highly ranked internationally because of high life expectancy and low infant mortality (Heslop 2010; Armstrong et al. 2007), this ranking is now under strain as the system is hard-pressed by an ageing population, increased prevalence of chronic disease and its burden on healthcare service, and outdated infrastructure and organization models of healthcare delivery (Armstrong et al. 2007). In addition, healthcare inequalities also persist in Australia and the gap of service accessibility between rich and poor is widening markedly (Duckett & Willcox 2011). To address the aforementioned challenges, the Australian government decided to introduce a national e-health solution. The terminology adopted in Australia for electronic record keeping and its e-health solution is known as My Health Record (previously the Personally Controlled Electronic Health Record [PCEHR]) which sits between an individually-controlled health record and a healthcare provider health record (NEHTA and DoHA 2011). Thus, My Health Record has a shared use and mixed governance model (NEHTA and DoHA 2011). Specifically, My Health Record is a patient-centric secure repository of electronic health and medical records of an individual's medical history that would act as a hub for linking hospital, medical and pharmaceutical systems using a patient unique identifier (NHHRC, 2009:134). One of its key features is

that it captures information from different systems and presents this information in a single view to consumers and authorised service providers for better decision making about health and service delivery (NEHTA & DoHA 2011). This is thus a hybrid health information system that integrates web based personal health records with a clinical electronic health record system and allows shared access to both consumers and healthcare providers based on a shared responsibilities and mixed governance model. (Leslie 2011).

Figure 2. The position of My Health Record in the e-health solution spectrum

As we can see from the preceding overview, My Health Record is a patient-centric system where technology is going to be implemented in a complex clinical and organisational environment and users are going to include a different set of stakeholders including healthcare service providers, healthcare managers, government bodies, healthcare pressure groups and most importantly patients. Further, My Health Record is a patient centric system and is a model for essentially engaging patients in their healthcare and empowering them in this undertaking. It utilizes advances in technology most notably that of web 2.0 which makes it possible to engage users by providing them interactive user interfaces.

The Evolution of My Health Record

In Australia, work on a nationally coordinated electronic health record was initiated in 1993 with the creation of National Health Information Agreement (NHIA). The primary function of NHIA was to develop a strategy and tools for better coordination between the Australian government and State and Territory governments for the collection and exchange of healthcare data and information (Bartlett, et al., 2008). The establishment of the National Health Information Management Advisory Council (NHIMAC) resulted and occurred in 1998. A subcommittee of NHIMAC under the name of The National Electronic Health Records Task Force in (1999) in response to the House of Representatives "Health On-Line" Report was also established (Bartlett et al., 2008; Slipper & Forrest, 1997).

The task force created a road map for an Australian national EHR. The recommendations of the taskforce within a health information network for Australia were initially pursued through the HealthConnect and MediConnect Programs. The HealthConnect program was a partnership between Federal government and State governments for leveraging different e-health programs with common standards, whereas MediConnect was a joint e-Health program of DoHA and the Health insurance Commission (HIC). In 2004 HealthConnect and MediConnect were merged into one brand name of HealthConnect, which later in 2005 was recast as a change management strategy by the Federal government. All efforts were focused on national health IT projects and a new committee was established under the name of The National Health Information Group (TNHIG) which later was named National E-Health Information Principal Committee (NEHIPC) which had the task of advising (AHMC) and (AHMAC) of nation approach on nation IT projects in 2003. Responsibilities for the development of the national E-health project were shifted to the National E-Health Transition Authority (NEHTA) created in 2005. NEHTA's responsibility was to provide essential foundations including healthcare identifiers (for individuals, providers and provider organisations), secure messaging, the national security and access framework and national clinical terminologies (for example Australian Medicines Terminology) for providers and patients by 2009. In 2008 (Deloitte a consulting firm was engaged to prepare a blueprint for the national strategy of eHealth development and deployment project. In 2009, the Federal government with all State and Territory governments announced the introduction of Health Identifiers and later in 2010 the introduction of Health Identifiers Act strengthen their position on the E-Health approach. Later with the budget of $AUD446.7 million dollars, the government has successfully achieved the goal of having

Healthcare Identifiers (HI) services for all Australians by July 2012. The HI service includes 16 digit reference numbers for consumers and is known as the Individual Healthcare Identifier (IHI), Healthcare Providers Identifier-Individual (HPI-I) as well as healthcare Provider Identifier- organisation (HPI-O). This service will be common for all E-Health services like e-pathology, e-discharge summaries, e-referrals and e-medication management as well as personally Controlled Electronic Health Record. The e-health system has now commenced and patients can be registered and they can obtain their health identifier from Medicare.

Methods

In order to assess the business value of My Health Record, we used a combination of methods to collect data in a predominantly qualitative study. After securing the necessary ethics approvals, we first conducted a series of semi-structured interviews with key stakeholders of My Health Record implementation and adoption including GPs, NEHTA representatives and eHealth experts. Because My Health Record is a patient centric system and is a model for essentially engaging patients in their healthcare and empowering them in this undertaking, we launched a qualitative survey to target the users group. i.e. Australian citizens. Due to the importance of the role health services providers play, we designed and distributed a qualitative survey to target GPs, specialist doctors, nurses, etc. Also, a systematic review for archival records, documents and online recourses was maintained during the research project. This included published academic papers, NEHTA reports, DoHA reports, web blogs, and Australian newspapers. Table 1 summarizes the methods used in this study.

Data collection technique	Data Source
Semi-Structured interviews	Key stakeholders of My Health record implementation and adoption including (GPs, NEHTA representatives eHealth experts, implementation partners)
Service Provider Qualitative Survey	GPs, specialist doctors, nurses, etc.
User group Qualitative Survey	Australian citizens
Archival Records and Documents/On-line and Newspaper reports	Published academic papers, NEHTA reports, DoHA reports, web blogs, Australian newspapers

Table 1. The Research Design for the Purpose of this Paper

Findings

Mapping My Health Record to the Model of BVIT

Stage one of the analysis included an examination of the components of My Health Record and mapping them to the model of BVIT. These consisted of a combination of the basic technologies of unique identification, authentication and encryption to facilitate safe and secure method of healthcare information exchange. Mapping this comprehensive system to the IT Portfolio showed that My Health Record is mainly an informational IT system with supporting infrastructural and transactional components as well as strategic vision to transform the healthcare delivery structures in Australia. From a socio-technical perspective, My Health Record covers all components of the healthcare delivery structure in Australia. This covers the health ecosystem, health organizations, delivery operations and clinical processes. Table 2 depicts the mapping between My Health Record and the model of BVIT.

	Component	My Health Record
IT Portfolio	*Infrastructural*	Utilizes the Internet for information sharing. In so doing, the shared network is distributed amongst all uses. It also uses a wide range of supporting infrastructural IT systems that support identification, authentication and encryption to facilitate safe and secure method of healthcare information exchange.
	Transactional	Enables patients to digitize their own health records. In so doing, it

			has the principal capabilities to computerise data entry, reduce costs resulting from repetitive paper works, and increase healthcare efficiency by building better integrative spheres between different stakeholders in the Australian healthcare system.
	Informational		The core functionality of My Health Record is to facilitate the exchange of digitized medical information between different stakeholders on an agreeable basis. This is facilitated by integrating patients records entered via a dedicated web-based portal (called Consumer Portal) and the national eHealth record system. The national eHealth record system itself has a mutual information sharing structures with other different health providers.
			Because My Health Record is a patient-centric system, patients are allowed full control over their records. They have full permissions to read, write, and change their records, as well as sharing these records with others. At the same time, healthcare providers have the ability to read patients records, and write according to agreeable bases with patients.
			Thus, My Health Record is a sophisticated informational IT system that involves a web of players, and its centre point is the patient.
	Strategic		My Health Record could have a strategic nature, in terms of its role in transforming the shape of healthcare delivery in Australia. This is not the case all the time, as national e-health initiatives are now common around the world with increasing numbers of countries adopting these systems. Furthermore, our analysis shows that the system is clearly a complimentary to the core of healthcare delivery and operation.
Healthcare Delivery	*Healthcare Ecosystem*	Patients	Patients are the central point of My Health Record.
		Payers	The Australian Government Through its specialised bodies.
		Regulators	The Australian Government Through its specialised bodies.
		Providers	Healthcare providers benefit from the system through having access to patients' records, and the ability to write on patients records based on agreements with their patients (Consumers).
		Competitors	On a national level, the system is the only solution of this type for e-health records. Globally more countries are developing (and using) their own e-health records like China (EHR), Germany (e-HC), UK (NpfIT: Ceased in 31st March 2013) (Muhammad, Zwicker and Wickramasinghe 2013).
	System structure		My Health Record is designed to sit between an individually controlled health record and a healthcare provider via a shared governance model (Muhammad, Zwicker and Wickramasinghe 2013). Furthermore, the main authority is the person himself/herself, whether or not grant access to healthcare professionals. Thus, collaboration between different players in Australian healthcare is needed, so is integration between My Health Record as a solution and current e-health records available for healthcare providers, both internally and externally.
	Delivery Operations		It is hoped that using the system will improve healthcare outcomes in Australia by having higher level of collaboration between different stakeholders in Australian healthcare sector, and reduce cost by avoiding unneeded visits to general practitioners (GP), unnecessary hospital admission and further medical operations and

		procedures in terms of detection, diagnosis, treatment and recovery (Australian Government 2010; Haddad and Wickramasinghe 2014).
	Clinical Practices	My Health Record is designed to present information captured from different systems to healthcare consumers and their authorized healthcare professionals according to the shared responsibilities and mixed governance model (Leslie 2011). Thus, the system is fed by different clinical information systems like nursing documentation (ND), laboratory information systems (LIB), radiology information systems (RID); etc. and then grants access to this data together by the consumers the their authorized healthcare professionals (Haddad and Wickramasinghe 2014).

Table 2. Mapping My Health Record to the Model of BVIT

The Business Value of My Health Record

The way My Health record is structured makes it a patient-centric system. In theory, this gives the consumer (patient) a better position in shaping their care. This is vital in the light of the way healthcare is delivered to patients. One interviewee who works closely on building better connections between patients and health providers noted that patients normally don't have the opportunity to discuss the type of care they receive: "*we had a very long journey from where we are to where we need to be, understanding what the patient wants to get out of their visit. What product did they want? We decide on their behalf what they're going to get, largely. Even in the sittings where we discuss what they want, we don't document what they want*". It can deliver the benefit of giving the patient "*more control of who has access to their information and they can add their own bits of comments to explain their condition in details*" as another interviewee noted.

The need of such a system and the value it can deliver depends on the settings. In the normal conditions, My Health Record does not look to be needed by patients, while the need of a national integrative e-health system raises when people tend to change their health service providers. Face-to-face medical consultations seem to be the preferable model for Australian people. 73% of the users group said they had not used any means of communication to interact with their health service providers, 21% said they had interaction with their GPs over the phone and 2% communicated through email. During the transitional phase of changing the healthcare providers maintaining a smooth and reliable transfer of patient records seems to be unreachable. Only 14% of the participants from the users group said their medical records were automatically transferred to the new service provider, compared to 35% said they did not know what happened to their records, and 16% said their records never reached to their new service provider.

The fragmentation in the communication between different healthcare providers "*stands against the continuity of care, resulting insufficient healthcare delivery and minimizing the value delivered to patients and their communities*" as one interviewee noticed. According to another interviewee, this system can eliminate this problem, as it "*has a big role in giving other practitioners access to information about the patients with the patient's permission, of course, but about their care*". Not only this, but it also has the potential to "*reduce that repetitive questioning that patients often go through*" as one interviewee suggested, and to provide "*the quality of continuity and a safer environment for patient because everybody understands what the plan of care is, the practitioners can support that plan of care and the patient should have access to that as well, so that they know what the practitioners are doing*".

Although My Health Record has the potential to better engage patients in their care, there exist obvious gaps in the requirements of a successful implementation of a major IT system like My Health Record. The awareness about the system and the readiness of patients themselves (as users) to use this system, did not seem to be available according to our data. 83% of the participants from the users group said they had never used any health IT system to monitor and control their health, and only 18% of the participants said they knew that My Health Record was coming, but their understanding about it was either none or very limited.

The value of any IT system cannot be realised if it is not used. In order to leverage the highest potential of My health Record, 74% of the users believed incentives for the users should be introduced to start

adopting the system, and 68% said that there must be an alignment between the system values and patients' values. The system must be easy to use and intuitive for 60% of the users to use the system.

In order for My Health Record to generate value for all players in the web of Australian healthcare, a number of technological, principal, and human requirements have to be reached as Table 3 summarises.

Data Collection	Summary of Key Findings
Semi-Structured interviews with Key Stakeholders of the system implementation and Adoption including (GPs, NEHTA Representatives eHealth experts, implementation partners)	• Identifying the forces driving its adoption and use are important for its evaluation. • Stakeholders' (doctors, practice managers and patients) perceptions about the usability of the system were positive. • A well-defined and proven change management policies are needed for the successful implementation of the system. • The normative values on healthcare services is expected to be challenged by the system and can lead to failure if embodied system values are not aligned with the user values. • Lack of coordination between the system users and implementers was identified critical factor. • The study participants were agree that the design and architecture of the system is good and very well thought of but the way it has been implemented and the details around it hasn't been good.
Service Provider Qualitative Survey (GPs, Specialist doctors, Nurses)	• Demographic characteristics of service providers had impact on their decision of the system adoption and use. • Previous use of IT or HIT had impact on their adoption and use decision. • Service providers had positive intentions about the system adoption if certain conditions met. • Perceptions are that the system is key health reform enabler. • HIT use barriers can have negative impact on the system implementation and adoption. • Service provider's perceptions were found positive about the doctor patient relationship in case of the system adoption and use.
User group Qualitative Survey (Australian citizens)	• Demographic characteristics of service providers had impact on their decision of the system adoption and use. • My Health Record will enhance communication between consumers and service providers. • Majority of participants were in favour of the system implementation. • Security, Privacy and Governance were rated as most critical factors of system adoption.
Archival Records and Documents/On-line and Newspaper reports	• The importance of the system in the study context. • The difference between different terminologies used for electronic health records • The current state of the system implementation and adoption. • Identify the forces driving eHealth implementations and adoptions and barriers to its adoption. • evaluate the current healthcare delivery system of Australia

Table 3. The Key Findings in This Research.

Discussion and Conclusion

Analyses of different data collected during this research show that My Health Record can be classified as an informational IT system in the terminology of the theory of IT Portfolio by Weill and Broadbent (1998).

According to this theory, this system, as an informational IT system, should be capable to increase control over clinical information and healthcare delivery, facilitate better information sharing between different stakeholders across the spectrum of the Australian healthcare, create better integration between different layers of healthcare delivery, and improve healthcare quality. Our data demonstrate that the system still has long way to go before we can realise the aforementioned objectives. It has failed (or has not succeeded so far) in gaining its main users (both patients and healthcare providers). In order to do so, a number of technological, organisational, and human requirements should be met as we described in the previous sections. Once these requirements are met, the system will have better position to deliver more value for different players in the web of the Australian healthcare ecosystem. This includes the Australian Government (payer and regulator), patients, and healthcare providers. The promised values include continuity of care, less fragmented, safer, and more efficient healthcare system.

In another dimension, the results demonstrate the flexible and comprehensive nature of the model of BVIT. As we could map a sophisticated IT system with a large number of technological and socio-technical components to the layers of this model. This indicates that the model of BVIT is capable to be used to evaluate the business value of eHealth initiatives and programs globally according to their unique circumstances. The findings in this research extend the range and reach of the theory of IT Portfolio well beyond its current scope, which allows it to cover the complex industry of healthcare. This is enabled by adopting a socio-technical perspective when looking at the healthcare delivery, which in turn was adopted from the works of Rouse and Cortese (2010). Thus, this research examines the validity of their framework of Healthcare Delivery. According to our results, this framework seems valid and comprehensive to cover the healthcare ecosystem, the structure of healthcare organisations, the delivery operations, and the clinical practices. This research serves as one of the first, if any, to examine this framework in the Australian context. By their very own nature, informational IT systems are of high risk, as realising their business value is not always an easy undertaking (Weill and Broadbent 1998). From this point of view, this research has spotted a number of points that must be addressed in order to achieve the promised business value of My Health Record. This is of high importance practically, as different players in the Australian healthcare system share, to different levels, the same objective: having better patient outcomes by having an efficient, cost-effective, and prudent healthcare system. In conclusion, My Health Record, as an informational IT system that leverages different IT systems, has the potential to generate business value by 1) reducing fragmentation in the current healthcare system in Australia, 2) better engaging patients in their care, 3) enhancing patient safety, and 4) increasing the efficiency of different operations in the healthcare delivery. All these promised values are subject to technological, organisational, and human requirements highlighted in this research and the subject of our follow up studies.

References

Armstrong, B. K., Gillespie, J. A., Leeder, S. R., Rubin, G. L., & Russell, L. M. (2007). Challenges in Health and Health Care For Australia. The Medical Journal of Australia, 187(9), 485–489.

Bartlett, C., Boehncke, K., & Haikerwal, M. (2008). E-Health: Enabler for Australia's Health Reform (p. 66). National Health & Hospitals Reform Commission. Retrieved from http://www.health.gov.au/ internet/nhhrc/publishing.nsf/ Content/ 16F7A93D8F578DB4CA257 4D7001830E9/ $File/E-Health%20-%20Enabler%20for% 20Australia%27s %20Health%20Reform,%20Booz%20&%20 Company,%20 November%202008.pdf

Bloomrosen, M., & Detmer, D. (2010). Informatics, evidence-based care, and research; implications for national policy: A report of an American Medical Informatics Association health policy conference. Journal of the American Medical Informatics Association, 17(2), 115-123.

DoHA, & NEHTA. (2011). Concept of Operations: Relating to the introduction of a Personally Controlled Electronic Health Record System (Article) (p. 159). Retrieved from http://www.egov.vic.gov.au/focus-on-countries/australia/trends-and-issuesaustralia/e-health-australia/electronic-health-records-australia/concept-of-operationsrelating-to-the-introduction-of-a-personally-controlled-electronic-health-recordsystem.html

Duckett, S., & Willcox, S. (2011). The Australian Health Care System (4th Revised edition.). Oxford University Press.

Haddad, P And Wickramasinghe, N. (2014). Conceptualizing Business Value of IT in Healthcare to Design Sustainable E-Health Solutions. Americas Conference Information Systems (AMCIS) Savannah August 2014.

Haddad, P., Gregory, M., & Wickramasinghe, N.(2014). Business value of IT in health care. In L. A.-H. C. G. Nilmini Wickramasinghe & T. Joseph (Eds.): Springer (United States).

Heslop, L. (2010). Patient and health care delivery systems in the US, Canada and Australia: A critical ethnographic analysis. LAP LAMBERT Academic Publishing.

Institute of Medicine. (2001). Committee on Quality of Healthcare in America: Crossing the Quality Chasm: A New Health System for the 21st Century. National Academy Press, Washington DC

Leslie, H. (2011). Australia's PCEHR Challenge. Retrieved from ttp://omowizard.wordpress.com/2011/08/30/australias-pcehr-challenge/

Melville, N., Kraemer, K. & Gurmaxani, V. (2004). "Review: Information Technology and Organizational Performance: An Integrative Model of IT Business Value". MIS Quarterly, Vol. 28 No. 2, pp. 283-322.

Muhammad, I., Zwicker, M., Wickramasinghe, N. (2013). "Using ANT to Understand Key Issues for Successful E-Health Solutions". *46th Hawaii International Conference on System Sciences (HICSS)*, vol., no., pp.832,842, 7-10 Jan. 2013 doi: 10.1109/HICSS.2013.588

NHHRC. (2009). A Healthier Future for All Australians: National Health and Hospitals Reform Commission - Final Report June 2009. Australian Government Department of Health and Ageing. Retrieved from http://www.health.gov.au/internet/main/publishing.nsf/Content/nhhrc-report.

Porter, M. & Teisberg, E. (2006). "Redefining Healthcare: Creating Value-Based Competition on Results". Harvard Business School Press, Boston

Rouse, W.B. & Cortese, D.A. (2010). *"Engineering the System on Healthcare Delivery"*, IOS Press.

Slipper, P., & Forrest, J. A. (1997). Health on line: report into health information management and telemedicine / House of Representatives Standing Committee on Family and Community Affairs. Canberra: The Committee.

Wickramasinghe, N., and Schaffer, J.L. (2010). Realizing Value Driven e-Health Solutions. IBM Centre for the Business of Government. Washington DC.

World Health Organization, (2003). Website: http:// www.emro.who.int/ehealth/.