National Health Information Management/Information Technology Priorities - An International Comparative Study

by

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ABSTRACT

This thesis research contributes to national health Information Management/Information Technology (IM/IT) planning and therefore strategy development and implementation research, as well as to health information science. An examination into the national health IM/IT plans of several countries provides knowledge into identifying the typical IM/IT priorities that selected countries are focusing upon for healthcare improvement. Second, a systematic literature review of the current challenges, barriers and/or issues (referred to as 'challenges' hereafter) facing IM/IT priority implementation in healthcare settings provides insight on where nations should perhaps be focusing their attention, in order to enable more successful healthcare IM/IT implementations. Lastly, a study on national health IM/IT priorities contributes to the body of evidence that national level IM/IT direction is necessary for better patient care and health system reform across the world.

In this investigation, the national health IM/IT priorities, which are reflected in the national health IM/IT strategic plans of five countries were assessed. To this end, the study: 1) Developed a set of measures to select four countries to study in addition to Canada; 2) Described the national health IM/IT priorities of Canada and four other countries; 3) Performed a systematic literature review of the challenges to overcome for successful implementation of IM/IT into healthcare settings; 4) Developed and administered a questionnaire where participants were asked to give their opinions on the progress their country has achieved in dealing with such challenges; and 5) Performed an analysis of the questionnaire results with respect to the countries' national health IM/IT priorities.

The systematic literature review uncovered a large number of challenges that the health informatics and healthcare community face when attempting to implement IM/IT into healthcare settings.

The priority comparison highlighted that there is no right or wrong answer for what countries should focus their national health IM/IT energies upon. The findings indicate that nations focus their resources (time, money, personnel etc.) on the priorities they feel they should, whether those stem from needs analyses or politics. However, by learning about what other nations are prioritizing, a country can use that knowledge to help focus their own national health IM/IT priorities.

The questionnaire results drew attention to the most frequently encountered challenges the five countries face in moving their national health IM/IT agendas forward. The feedback from the respondents provided individual reflections on how IM/IT implementations are actually progressing in their country, where problems are being encountered, including the nature of those problems, and in some cases, respondents offered insight on how to better deal with the challenges they face. The findings indicate that nations encounter similar problems in implementing IM/IT into healthcare settings.

Currently, the world is facing many of the same healthcare system issues: shortages of healthcare processionals, long surgical and diagnostic imaging waitlists, 'skyrocketing' pharmaceutical drug pricing, healthcare funding practices, and challenges with implementing healthcare IM/IT priorities to name a few. If countries are facing similar health system problems, then it would be logical to assume that solutions to deal with such problems would be similar across nations.

Thus, it is recommended that international fora and conferences be held to further discuss the types of health system IM/IT priorities that countries are implementing at a nation scale, the kinds of challenges they face and the solutions or conclusions that they have formulated in response to these challenges.

Search Terms: National Health Information Technology, National Health Information Management, International Comparative Analysis, National Health Priorities

Supervisor: Professor D.J. Protti, (School of Health Information Science)

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Dedication

This is dedicated to my parents Mano and Hardial and my thesis supervisor and friend, Professor Denis J. Protti.

CHAPTER 1

1.1 INTRODUCTION & DEFINITIONS

This thesis research contributes to national health Information Management/Information Technology (IM/IT) planning and therefore strategy development and implementation research, as well as to health information science. An examination into the national health IM/IT plans of several countries provides knowledge into identifying the typical IM/IT priorities that selected countries are focusing upon for healthcare improvement. Second, a systematic literature review of the current challenges, barriers and/or issues (referred to as 'challenges' hereafter) facing IM/IT priority implementation in healthcare settings provides insight on where nations should perhaps be focusing their attention, in order to enable more successful healthcare IM/IT implementations. Thus, other nations interested in progressing with IM/IT in healthcare should be able to use this document as a source of information and knowledge to learn about other countries' progress. Lastly, a study on national health IM/IT priorities contributes to the body of evidence that national level IM/IT direction is necessary for better patient care and health system reform across the world.

IM and IT offer possibilities for the future of healthcare that extend beyond the agricultural and industrial revolutions of the past. In this study, the definition for health IM is based on the American Health Information Management Association's online description: "Health [IM] improves the quality of healthcare by insuring that the best information is available to make any healthcare decision" [50].

In addition, Health IT is based on a modified definition from the online Wikipedia dictionary as follows:

> [Health] Information technology (IT) or [health] information and communication technology is the technology required for [health] information processing. In particular, the use of electronic computers and computer software to convert, store

> , protect, process, transmit, and retrieve [health] information from anywhere, anytime" [51].

In addition, health information technology encompasses Electronic Health Records (EHRs). In this thesis, the British National Health Service definition for the Electronic Health Record is used:

> [The] electronic health record is used to describe the concept of a longitudinal record of patient's health and healthcare -- from cradle to grave . . . In theory the EHR is therefore a combination of the bulk of the primary care EHR for a patient together with linking information from other record systems for that patient." [52]

Healthcare administrators, planners and politicians, as well as healthcare professionals (HCP) increasingly recognize [1] that health information is essential to healthcare planning and delivery of services. The term health information (according to the New Zealand Ministry of Health) is defined as follows:

> Health information, in relation to an identifiable individual, means information about the health of that individual, including his or her medical history, any disabilities that individual has, or has had, and any [healthcare services] or disability services that are being provided, or have been provided, to that individual [49].

The *Romanow Commission on the Future of Health Care in Canada* stated that, "Electronic Health Records are one of the keys to modernizing the health system and improving access and outcomes for Canadians" [2, p.16]. The Fyke Commission on Medicare for the province of Saskatchewan titled *Caring for Medicare - Sustaining A Quality System,* declared that, "the Electronic Health Record is the cornerstone of an efficient and responsive healthcare delivery system, quality improvement and accountability. Without it the prospects for a patient-friendly health system, optimal teamwork, and efficiency are dim" [4, p.68]. In addition, the *Kirby Senate Committee* noted that, "not only can an [EHR] system greatly improve quality and timeliness in

healthcare delivery; it can also enhance healthcare system management, efficiency and accountability" [2, p.16]. In addition, health decision-making practices are in a transition phase with movement towards "collaborative, interdisciplinary, and evidence-based approaches," opposed to decision making by a sole healthcare practitioner. HCP cannot make informed clinical decisions without relevant and reliable clinical information and knowledge. In addition, if healthcare IM/IT is not able to aid HCP in their daily activities, then they are seen as barriers rather than enablers for better healthcare [1]. To be able to provide healthcare services, health information must be accurate, available, up-to-date, and readily accessible to HCP and others who deliver services [2].

There is a growing need for IM/IT in nearly all aspects of the healthcare sector. The current Canadian healthcare system is characterized by:

> Paper-based information management; limited integration of local applications and data; limited connectivity and information sharing among providers; varying technological capability across the health system; fragmented and incomparable data; a lack of commonly used data or technical standards; and under investments in technology and automation [3, slide 18].

Canada Health Infoway (Infoway) has noted that, "the desire to implement EHRs to support clinical care and retrospective data analysis is common throughout the western world" [2]. A number of countries have recently invested in national health IM/IT priorities (i.e. building blocks, workstreams or initiatives) that are reflected in their national health (IM/IT) strategic plans. Some of the more noteworthy examples that the thesis drew from include Australia, Canada, Denmark, England, Good European Health Record Project, Ireland, Malaysia, New Zealand, Scotland, Turkey, United States and Wales.

In this study, a strategic plan is defined as:

> A document used by an organization to align its organization and budget structure with organizational priorities, missions, and objectives. A strategic plan should include a mission statement, a description of the agency's long-term goals and objectives, and strategies or means the agency plans to use to achieve these general goals and objectives. The strategic plan may also identify external factors that could affect achievement of long-term goals. [26]

This definition is from the United States Balanced Scorecard Institute, an organization focused on assisting managers and administrators in deploying strategic plans and helping organizations to improve their strategic performance [26]. In addition, the term 'National' refers to the cross-jurisdictional and cross-sectoral (e.g. provincial/territory in Canada, state/territory in Australia, counties in Denmark, etc.) health IM/IT priorities that require co-ordination.

The main purpose behind national health IM/IT priorities is to ensure that health information (e.g. patient identifiers, diagnostic and therapeutic data etc.) is accurate and available to those who need it, so that citizens throughout a nation can receive adequate services and patient health outcomes can be improved. IM/IT priorities are the 'areas of focus' (in order of importance) that nations have identified as necessary for moving their national health IM/IT agendas forward. Therefore, such IM/IT priorities must enable HCP to have the information they need at the right time and in the right format, so that they are able to provide patients with necessary care. Patients as well, need access to their health information, so that they may be proactive in their healthcare. Healthcare administrators need health information to plan for healthcare services, programs and funding allocations. In addition, not all citizens of a country remain fixed in one location. At any given time there are people immigrating or emigrating from any given region. Citizens who remain fixed in one region, also access healthcare services from other regions of their nation as well. Some citizens even access services from different nations in cases where certain services are unavailable to them in their home country (the issue of cross border access to health information is beyond the scope of this study). In Canada, the three territories do not have children's hospitals; therefore, residents of the Yukon, Nunavut and Northwest Territories have to cross provincial/territorial boundaries in order to get the specialty children's care they require. As such, health information must also be

able to cross provincial/territorial boundaries. Movement of such information is not practical without healthcare IM/IT. Furthermore, Grimson et al state that, "The inability to share information across systems and between care organizations is just one of the major impediments in the healthcare business's progress toward efficiency and cost-effectiveness" [35, p. 49].

Use of modern IM/IT to improve healthcare services is advocated by organizations such as the Institute of Medicine in the US, Health Canada, the New Zealand Ministry of Health, the Australian Health Information Council, and England's National Health Service amongst others. In addition, Iakovidis states that, "All those that are in some way concerned with development [on] decisions [for] implementation [of healthcare IM/IT] are therefore strongly encouraged to take the time to review the international developments and carefully examine as many pilot sites as possible" [34, p.113]. There is interest in the subject from many nations, as some are looking to each other for input and are examining each other's progress.

Little comparative research has been performed in the area of national health IM/IT priorities, which are reflected in national health (IM/IT) strategies, as publishing of such documents largely began post-2000. Dr. Harry McConnell, Chief Executive Officer of the International E-Health Association in his 2004 article titled *International efforts in implementing national health information infrastructure and electronic health records* states that,

> Many countries are developing national strategies [to implement IM/IT into healthcare]. Efficiency, quality of care and medical error along with new opportunities presented by the technologies themselves has driven this process internationally. Many countries have had spectacular failures costing billions of dollars alongside some amazing successes. There has been very little dialogue internationally about what works and what does not work despite the fact that many government and international agencies have placed this key priority on their agendas [36, p.33].

1.2 REVIEW OF LITERATURE ON IM/IT STRATEGIC PLANNING

This thesis study began with a review of the literature on strategic planning, with an emphasis on IM/IT strategic planning in healthcare. National health IM/IT strategic plans are a recent undertaking as noted above, thus specific literature on this type of strategic planning is minimal. Therefore, this section highlights the literature on general strategic planning (largely from a business perspective, as strategic planning is grounded in the business profession) and IM/IT strategic planning for healthcare organizations. A total of 14 publications were reviewed to gain an overview on (IM/IT) strategic planning processes. The materials were largely from online academic journals such as the Harvard Business Review and the Journal of Health Information Management (JHIM) accessible on the Internet. The authors introduced in this section focus on strategic planning as opposed to strategic thinking processes, which are outside the scope of this paper.

'Strategic Planning' is a term commonly used in the healthcare industry. The term means different thing to different people. In fact, the question asked by some people is "What does strategic planning encompass and what is it needed for?" During the past four decades, many articles and reports have been written about strategic planning, and numerous presentations have been given at national and international meetings and conferences. Strategic planning as a concept has been around since the 1960s. There are many definitions for strategic planning. In his online paper *New Directions in IT Strategic Planning*, Murch favors the definition: "Strategic Planning is the process by which the guiding members of an organization envision its future and develop the necessary procedures and operations to achieve that future" [55]. Mintzberg, considered a leader in the field of strategic planning views strategic planning as 'strategic programming' meaning, "the articulation and elaboration of strategies, or visions, that already exist" [56, p.107].

Mintzberg looked at why organizations need strategies in his paper The *Strategy Concept II: Another Look at Why Organizations Need Strategies*. He pointed out that supporters

of strategic planning argue that organizations "need strategy to set direction for themselves" and that strategy is "needed to focus effort and promote coordination of activity" [57, p. 25-26]. In addition, he claims that, "strategy is needed to define the organization" and that "strategy is needed to reduce uncertainty and provide consistency" to satisfy needs for order and stability [57, p. 27-29]. Mintzberg himself does believe that strategies allow organizations to focus their resources, take advantage of opportunities and knowledge and reflect organizational learning but he feels that, "strategies are to organizations what blinders are to horses: they keep them going in a straight line, but impede the use of peripheral vision" [57, p.31]. Thus, Mintzberg appears to view strategic plans as continuous documents that require re-assessment and revisions in order to respond to changing environments and therefore prevent the 'blinders effect'.

In the context of healthcare, Martin feels that,

> The complexity of the underlying healthcare processes; the cost of reengineering these processes; the cost of integrating IT into the reengineered processes; the cost of buying, implementing, and integrating the technologies themselves; and the very high costs of making system acquisition mistakes all indicate a heightened need to develop and implement an effective IT strategic plan. [58]

In one study, Martin identified three IT strategic planning models. The organizational pull model is the traditional model where an organization's business objectives drive the IT requirements. The technology push model centers IT as the component that will expand an organization's business scope. In his study, Martin developed his own model, the Component Alignment Model (CAM), which involves seven components[1]. Keeping these seven components aligned is the fundamental concept underlying the CAM model. Martin went further to say than an IT strategic plan should guide the IT activities and investments of healthcare organizations and the plan should be integrated with strategic initiatives and business directions while providing the opportunity for IT to be used as a

[1] The seven components included were: the external environment (i.e. forces affecting the healthcare organization), emerging health IT, the organizational mission, the organizational infrastructure and processes, the IT infrastructure and processes, the business strategy and the IT strategy.

tool to enable healthcare organizations to "deliver information as a strategic resource" [58, p.9]. In agreement with Mintzberg, Martin believes that it is important to note that strategic planning is a continuous process, as organizational environments change. What the current state of the organization is today may not be the state six months from now or even three months from now.

Gunasekaran and Garets view strategic planning for healthcare organizations as an enterprise-wide process with an overall purpose aimed at meeting the health system's mission [59]. In agreement with Martin, they stress that, "The IT strategic planning process should be done both in coordination and in support of the organization's overall strategic planning process" [59, p.33]. In contrast to Martin's CAM model, Gunasekaran and Garets propose an IT strategic planning process that incorporates four steps that they believe "[drives] and [demonstrates] business value from IT operations" [59, p.33]. The four steps, (in order) are to: identify enterprise and departmental business priorities, align business priorities with technology strategies, develop a tactical plan to tie technology management to business operations and develop IT-enabled business metrics to assess and manage ongoing enterprise performance. It is evident that this is a model based on a business perspective. In agreement with Martin, Mintzberg and others, these authors believe that IT strategic planning is a continuous process that should be modified for changes and re-visited regularly. [59]

In alignment with Gunasekaran and Garets, Dufner et al state,

> In the business world, strategic objectives and use of [IT] to achieving objectives are tightly coupled; [IT] must be weighed as a part of the process of establishing strategic objectives. Consideration [for] the use of IT to achieve strategic goals and objectives is a fundamental part of the process of selecting the strategic objectives that contribute the most value to the organization [21, p. 415].

In speculation, it would appear that the business priority model proposed by Gunasekaran and Garets could apply to national health IM/IT priorities for healthcare. Thus, the four steps for healthcare IT strategic planning processes would become: identify national and jurisdictional healthcare priorities, align health IM/IT priorities with technology

strategies, develop a tactical plan to tie technology management to healthcare delivery operations and develop IT-enabled healthcare performance metrics to assess and manage ongoing national and jurisdictional performance. Similarly, the CAM model could be applied to healthcare IM/IT priorities, as could other IT strategic planning models.

1.3 RESEARCH METHODOLOGY

A research methodology outlines the methods that were used to collect data in a research study. Methodologies are difficult to formulate and are usually developed by experts who are viewed as leaders in their field. This thesis research used case study research methodology. Two authorities in the case study methodology field are Robert Yin and Izak Benbasat. Case study research was selected for this thesis because according to Benbaset et al, case research is useful for studies that are in early stages or where the experiences of the participants are important and the context within which they 'work' is important [53]. This study used electronic questionnaire (i.e. survey research) as one of the data collection methods. Thus, the 'experiences' of the respondents and the environment they work in influence their responses to the questionnaire. Yin defines the case study research method "as an empirical inquiry that investigates a contemporary phenomenon within its real-life context;" [6] national health IM/IT priority development and strategic planning are a recent 'phenomenon' for countries. In addition to questionnaire, the data collection technique of literature review was used for locating documents and the analytical technique of multiple case comparison was used to contrast the countries and synthesize the findings. How these methods were used in this study are described further in subsequent chapters.

1.4 RESEARCH QUESTIONS

This research study aims to answer three questions. The first question looked at the national health IM/IT priorities of the five selected countries. It is important to know which priorities the five countries are focusing their national health IM/IT efforts on in order to gain an understanding of the direction these nations are headed in. The second question looked at the challenges facing IM/IT implementation in healthcare settings. This question is important because without having a reasonable understanding of the current challenges facing successful IM/IT implementation, strategies to deal with the challenges may not be fruitful. The third question aimed to link the first two questions together i.e. here are the national health IM/IT priorities of five countries and here are the challenges of implementing IM/IT in healthcare, therefore, how are the countries' priorities addressing the challenges?

1. What are the national health IM/IT priorities of Canada and the four selected countries?

2. What are the main challenges, barriers and/or issues to implementing IM/IT in healthcare settings?

3. How are the five selected countries' priorities addressing (i.e. level of progress) the main challenges to implementing IM/IT into healthcare?

These research questions aim to enable readers to develop an appreciation of the national health IM/IT priorities of five countries, the current challenges to implementing IM/IT into healthcare settings, and lastly, how the five countries are really addressing the challenges they face with respect to implementing their IM/IT priorities.

1.5 RESEARCH STUDY DESIGN

Phase 1: This phase involved the development of a set of measures to select four countries to study, in addition to Canada. The measures were established in conjunction with the MSc Supervisor, Professor Denis Protti. Four countries in addition to Canada were selected, as an in-depth analysis of five countries rather than a superficial study of ten countries (for example) was deemed to be more informative. Unfortunately, the requirement for English language documentation eliminated many countries where English is not the native language.

***Phase 2*:** This phase involved the examination and discussion of the national health IM/IT priorities of the five selected countries.

Phase 3: This phase involved a systematic literature review of the challenges to overcome for successful implementation of IM/IT into healthcare settings.

Phase 4: Developed and administered a questionnaire where participants were asked to give their opinions on the progress their country has achieved in dealing with such challenges to implementing IM/IT into healthcare settings. Due to the open-ended nature of the questionnaire, an effort was made to include detailed comments from the respondents. This data added a richness to the qualitative value of the thesis.

Phase 5: This phase involved the actual analysis of the questionnaire results with respect to the countries' national health IM/IT priorities. Contributions were received from international health sector administrators, personnel, as well as academics. Because of the limited scope of this thesis, only the priorities of the five countries were compared and not the entire strategic plans.

CHAPTER 2

2.1 COUNTRY SELECTION PROCESS

2.1.1 DATA COLLECTION

There are many countries that could have been examined in this study; however, due to time constraints and other limitations, a reasonable number of countries had to be chosen. Hence, the measures described below were established to select four countries in addition to Canada to study:

1. Availability of timely and relevant English language material was essential. As national level IM/IT priority assessment and planning is a recent undertaking and as IT changes rapidly, the majority of pre-2000 material was considered outdated for this thesis study.

2. Access to people to interview refers to the accessibility of colleagues to call upon for further information. In addition, this measure was important, as clarification on health IM/IT priorities, goals, projects, implementations, etc. was needed.

3. The amount of national level involvement with IM/IT implementation; for example, is the national government's role to implement standards, procure IT, roll out infrastructure, implement the systems (pharmacy, laboratory, diagnostic imaging), etc.?

4. The amount of provincial/regional/county level involvement with IM/IT implementation; for example, is the regional government's role to procure IT, roll out infrastructure, implement systems (pharmacy, laboratory, diagnostic imaging), etc.? Double points were awarded for this measure because of Canada's health system structure with the provinces being responsible for providing healthcare services to the public, excluding Aboriginals and the military. Thus, for a nation to be similar to

Canada, a high degree of regional involvement is necessary, despite a national body setting the direction for healthcare IM/IT.

5. Committing funds to priorities is one method of assessing 'intentions' for progress versus 'realities'. Thus, how much money is committed to health IM/IT should be available in press releases and/or the strategic plan in publicly administered health systems, where possible, the amount of funding was disclosed.

6. Geography – Canada is the nation that is the standard of reference for comparison and the intent of this thesis study was in part, to examine healthcare IM/IT priorities in Canada. Thus, selecting countries with a geography that is similar to Canada (if possible) is desirable to draw similarities and make relevant comparisons.

7. Population Size – Similar to the Geography measure, selecting countries with a population size that is alike to Canada (if possible) was desirable.

8. Publicly Administered Health System – Canada has a publicly administered healthcare system and therefore it is important to compare other countries with a similar system.

The selection measures were weighted equally. The English language material measure is the most important selection measure and is therefore listed first; the 'access to people to interview' measure is listed as the second selection measure, as it was seen to be important to collecting additional information. The remaining measures were listed in related groups (e.g. IM/IT initiatives implementation role: national and regional, geography and population size).

Materials from approximately 60 nations were searched. Much of the literature used was "grey literature", primarily government documents and publications accessible on the World Wide Web (WWW), as there was little peer-reviewed material available because national health IM/IT planning is a recent undertaking. Current national health IM/IT

priorities are typically found in the most recent edition of a country's health (IM/IT) strategy or plan – even though the document may not be called that.

As most nations' healthcare is provided through a government's Ministry or Department of Health, websites, where available, were accessed and viewed. Search terms such as "Sweden Ministry of Health", "England Department of Health", "New Zealand Ministry of Health", etc. were entered into Google to find government health websites. Ministry websites are generally located within the first five hits of a web search. Websites not in English or without an English link were not searched for health IM/IT materials. Where available, documents such as national health strategies and national health IM/IT strategic plans were downloaded. In addition, the Healthcare Informatics Online journal Table of Contents for January 1997-2005 was reviewed for materials (Appendix A lists the nations that were searched for national healthcare IM/IT information).

The PubMed 'Journals Index' was searched to identify peer-reviewed literature. See Table 1 for a list of applicable PubMed journals. See Table 2 for a list of search terms, search limits, and the number of hits. The ABI Proquest Online information service was also searched to identify peer-reviewed materials. See Table 3 for a list of applicable Proquest journals. See Table 4 for a list of search terms, search limits, and the number of hits. Two searches were performed to retrieve materials to assist with the country selection process in each database; search one yielded few useful publications because the search terms were not specific, thus, a second more useful search was conducted with more 'successful' search terms. To determine inclusion/exclusion, publication titles were first assessed for their connection to national health IM/IT strategic planning and priorities. Publication abstracts that dealt with health IM/IT strategic planning and priorities at a national level were reviewed for potential use.

In addition, to Internet, PubMed and Proquest sources, some strategic plans and publications were obtained directly from the thesis supervisor, via his contacts and connections in other nations. The journals listed in Table 5 were also viewed. Lastly, some materials concerning the country selection process were retrieved from electronic

health newsletter subscriptions services such as Canada's Health Edition and England's E-Health Insider. In the end, approximately 150 articles/publications were acquired on national health IM/IT priorities and strategic plans.

After assessing the materials acquired, the ten most promising countries in the area of national health IM/IT with materials available in English were selected for comparison to determine the four countries to be included in the thesis study in addition to Canada. The nations included in Table 6 (next page) all had national level health IM/IT strategic planning documents available in the English language. In addition, these countries also had extra materials available to further explain their national health IM/IT implementation priorities and health system developments.

Table 6: Selected Countries for Comparison to Determine the Four Nations in Addition to Canada to be Included in the Thesis Study - Low = 1, Medium = 2, High = 3, L/M = 1.5, M/H = 2.5

COUNTRY/ MEASURE	CAN	AUS	ENG	DEN	NZ	US	WAL	TUR	SCO	IRE
Availability of timely and relevant English language material	M	H	H	M	M	L	M	L	L	L
Access to people to interview	H	M	H	M	M	H	M	L	M	L/M
IM/IT initiatives implementation role - Degree of national role for IM/IT implementation	M	M	H	M	M	M/H	M	H	M/H	H
IM/IT initiatives implementation role - Degree of provincial/regional/county role for IM/IT implementation (double points: H = 6, M = 4, L = 2, L/M = 3, M/H = 5)	H	H	L	H	H	L/M	M	L/M	L/M	L/M
Have funds been committed to the national health IM/IT priority initiatives? (Yes = 1, No = 0)	Y	Y	Y	N	N	Y	Y	Y	N	N
*Geography - degree of similarity to Canada	N/A	H	L	L	L	H	L	L	L	L
**Population Size - Degree of similarity to Canada	N/A	H	M	L	L	L	L	L	L	L
Publicly Administered Health System (Yes = 1, No = 0)	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
TOTAL	N/A	21	16	15	15	14.5	14	12	11.5	11.5

*6 - 10 million sq km = high, 1 - 5 million sq km = medium, <1 million sq km = low
**For pop. similarity, within 15 mil. of the Canadian population qualifies as High, within 25 mil. qualifies as Medium, the rest as Low

Availability of timely and relevant English language material - reflection of the time since initiatives were started, additionally, how much English 'useful' language material was available, opposed to just materials that reflect a nation's intentions but no plan. For instance, Infoway in Canada only began in 2001 whereas the UK has been working on health care IT aggressively since 1998, thus, the UK has more materials and planning documents available. Post 2000/2001 start date for initiatives adds to a M designation. Australia for example started Health Online in November 1999.

2.1.2 RESULTS

A grading system of High, Medium and Low was used to rank the countries in Table 6. A 'high' ranking was awarded three points; 'medium' two points and 'low' one point. Additionally, for two selection measures, a ranking system of Yes and No was used. A 'yes' ranking was awarded one point and a 'no' ranking was awarded zero points. The four countries with the highest total number of points selected were: Australia, England, Denmark and New Zealand (Denmark and New Zealand tied for third place).

The five countries (United States, Ireland, Scotland, Turkey, and Wales) were not selected in part to the low volume of English materials available and the 'newness' of their national health IM/IT priorities[2]. The first national health IM/IT strategic plans to emerge from these countries were published in 2004, with the exception of Wales (summer 2003), thus few materials were available. In addition, most of these countries' national health IM/IT priorities involved a higher degree of national responsibility for implementation in contrast to Canada, which is the standard nation for comparison. Although, England's strategy involves a high degree of national role, England ranked high on other selection measures to offset this difference. Lastly, low ranks for population size and geography (except for the US), yielded low total scores for these nations. The US's overall rank was low in part because it has the only non-publicly administered healthcare system of these 10 countries. Appendix B provides an in-depth analysis of how the countries rated under each selection measure. These findings serve as a knowledge base for others interested in examining national health IM/IT developments in these countries.

[2] It is important to note that it is not always possible to access certain documents due to their confidential nature.

2.1.3 INTRODUCTION TO THE FIVE SELECTED COUNTRIES: Canada, Australia, England, Denmark and New Zealand

This section involves a brief introduction to the five countries included in this study that were selected based on the eight selection measures described in section 2.1.1. It is important to note that there is significant variability in the formatting, content (i.e. IM/IT priority details), approaches, and length of the five countries' strategic plans. For example, the Infoway plan is 26 pages in length, England's plan is 32 pages, Denmark's plan is 60 pages, New Zealand's plan is 87 pages and Australia's plan is 155 pages. Details about each countries' national health IM/IT priorities are provided in the next chapter.

2.1.3.1 The "national" jurisdiction in ***Canada*** that is promoting and funding the movement for the use of IM/IT in the Canadian healthcare system is Canada Health Infoway (Infoway), which was established in 2001. Although Health Canada and the Canadian Institute for Health Information (CIHI) are also involved in national IM issues, their roles are beyond the scope of this study, as the organization assigned the task of moving healthcare IM/IT (i.e. EHR) for the nation is Infoway. Infoway's *Building Momentum 2003-2004 Business Plan* appears to serve as a defacto national health IM/IT strategic plan, although this thesis drew more information from Infoway's *2003 Annual Report* and the *2003-2004 Annual Report and 2004-2005 Corporate Plan Summary*. In speculation, perhaps the business plan was not labeled a strategic plan because it was seen to have been an internally developed document, whereas strategic plans typically involve consultation from stakeholders, as in the example of the Australian and New Zealand plans, which list the names of the contributing individuals. Infoway's IM/IT priorities include: infostructure, registries, pharmacy, laboratory and diagnostic imaging systems, public health surveillance and telehealth [30]. Infoway works with jurisdictions (e.g. provinces, regions – who supply half of the project funds) but implementation of health IM/IT projects resides with the jurisdictions. Infoway has *C* $1.2 billion committed [37, p.16] for six years, thereafter, the Infoway organization is expected to disband and cease to exist.

2.1.3.2 Australia has been involved with national level IM/IT initiatives since 1999 with the advent of the Australian National Health Information Management Advisory Council (NHIMAC). In the last six years, a number of other organizations such as the Australian Health Information Council (AHIC) and the National Health Information Group (NHIG) have been involved with national health IM/IT implementation. The most recent planning document (at the time of this study) is the April 2004 *National Health Information Management and Information & Communication Technology Strategy*[3] drafted by the Boston Consulting Group, which explicitly lists national priorities. On July 29, 2004, the newly developed National E-Health Transition Authority (NEHTA) was assigned the task of moving the Australian health IM/IT agenda and therefore the strategy forward. Australia's *HealthConnect* system is the national system of EHRs currently being piloted in some states with future planned national implementation. The Australian government has committed *A* $128 million (approx. *C* $125 million) for HealthConnect over five years and a total of *A* $13.75 million (approx. *C* $12.93 million) over the next three years to NEHTA. IM/IT implementation is largely regional, similar to Canada.

2.1.3.3 England began 'the push' for use of IM/IT in their National Health Service (NHS) in 1992 with their first IM/IT Strategy for health. In 1998, *Information for Health (IfH) An Information Strategy for the Modern NHS 1998–2005* was published. The latest English plan is *Delivering 21st Century IT Support for the NHS National Strategic Programme* released by the Department of Health July 2002. This plan led to the creation of the National Programme for IT (NPfIT), which was renamed to Connecting for Health (CfH) in March 2005 and is deemed to be the largest IT project in the world. The CfH programme has a budget of more than £6 billion (approx. *C* $13.4 billion), which covers a period of 7-10 years [22] and involves four main IM/IT priorities: infrastructure, EHRs, patient scheduling (i.e. booking) system and electronic prescribing.

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[3] This Boston Consulting Group strategy serves as the foundation for creation of a 'formal' Australian strategy. The *Directions for Health Information Management and Information and Communications Technology (IM&ICT)* in *Australia* is due for release in 2005 but as of June 2005, it had not been released.

The programme is very specific in terms of what outcomes it hopes to achieve for patients.

2.1.3.4 Denmark's *National IT Strategy 2003-2007 for the Danish Health Care Service May 2003* is available in English. This publication replaces the former *National Strategy for IT in the Danish Hospital System 2000-2002*. MedCom is the Danish healthcare data network and the status, plans and projects underway in the country are outlined in *Medcom IV Status, Plans, and Projects* published in December 2003. MedCom originated in the Danish county of Funen in 1994, and is primarily a county-based initiative and continues to operate with little influence from national bodies. MedCom is a messaging system that enables HCP to send prescriptions, laboratory requests/results and discharge summaries for example, across a national network. The focus of the Danish strategy is to get the hospital sector operating similarly to the primary care sector. Their four priorities include: EHRs, national registries and databases, access to information and program evaluation. Neither the most recent Danish national strategy or any other related documents reviewed provided information on the funding available for the national health IM/IT priorities in Denmark.

2.1.3.5 The ***New Zealand*** Ministry of Health released the *New Zealand Health Strategy* in 2000. In October 2001, the Ministry published From *Strategy to Reality – The (Working Together to Add Value) WAVE Project*. This document is New Zealand's national health IM/IT plan. The New Zealand strategy is similar to Canada, Australia and Denmark in that it largely targets IM/IT implementation at the regional level. The WAVE strategy is unique in that it is a series of recommendations (79 in total); the current state, issues and debate, along with the future state and recommendations are made for each of eight workstreams (i.e. IM/IT priorities) that are included in the programme - Strategy, Knowledge, Electronic Health Records, Data Architecture, Privacy, Systems Infrastructure, Investment and Organisational Design. Neither the WAVE strategy nor any other related documents reviewed provided information on the amount of funding available for national health IM/IT priorities.

CHAPTER 3

3.1 IM/IT PRIORITIES OF FIVE COUNTRIES

3.1.1 OVERVIEW OF THE NATIONAL HEALTH IM/IT PRIORITIES OF FIVE COUNTRIES

One of the challenges to implementing healthcare IM/IT is defining what exactly it should be capable of doing. The functions that technology can perform are numerous; hence, a country must define what IM/IT priorities (usually in the form of initiatives, building blocks or workstreams) they would want their healthcare technology to address. Each of the five countries included in this study have a different "vision" for the role that IM/IT will undertake in their nation, yet each country shares similarities with the others.

To be able to compare the five countries, it was necessary to first identify where each country is headed in order to formulate criteria for comparison. Research question one asked what the national health IM/IT priorities of Canada and the four selected countries are. The following sections describe the major priorities of each country. This information is mainly derived from the most recent national health IM/IT strategy documents of each country, which are publicly available on the Internet.

It is important to realize that these strategic plans are very different from one another, as there is tremendous variability in the 'formula' of how they were written. They were all uniquely developed and do not follow any prescribed format. As noted above, the plans vary in-terms of formatting, content, approach, and length; additionally, the 'focus' of this section is priorities, not the status/progress of detailed 'projects'. In the cases of Canada (57 projects) and Australia (363 projects) details were not provided on the projects but information on the priorities (i.e. Infoways' 'building blocks' and Australia's 'national priorities') was described. In contrast, England has only four priorities and New Zealand has eight, thus more details were provided to balance the level of content

disclosed for each nation. Denmark has 29 projects grouped under four priorities, thus some of the projects are identified in the context of the priorities.

3.1.1.1 Canada Health Infoway's priority is to have "the basic elements of [an] interoperable EHR solution in place in half the country within seven years[4] [37, p.4]; [advancing] development of telehealth applications is also part of *Infoway'*s mandate" [37, p.1]. Infoway works in partnership with jurisdictions (i.e. provinces, regions) and also works on national projects such as infostructure development (e.g. standards).

> Infoway and its Members have defined an EHR as a secure and private lifetime record of an individual's key health history and care. The record is available electronically to authorized healthcare providers and the individual anywhere and anytime in support of care. [37, p.4]

Infoway identified seven key building blocks (i.e. priorities) in its *2003-2004 Annual Report* (the 2003 annual report had only five building blocks) for compatible EHR systems. It is important to note that Infoway does not provide detailed information on the progress of projects. Following the building block descriptions is detailed information on the types of Infoway projects underway. The seven building blocks consist of:

1. *Infostructure:* Infostructure includes common solutions architecture, common and reusable services and standards fundamental to ensure the integration and interoperability of a diverse set of clinical systems. Associated with this is a strong focus on the care record itself, for the sharing of clinical data among clinicians.

2. *Registries:* Electronic, searchable directories that uniquely identify patients, healthcare providers and facilities in order to correctly link information electronically.

[4] Infoway began implementing its business plan in 2002/2003.

3. *Drug Information Systems:* Allow physicians to view their patients' prescription drug profile and electronically send prescriptions. Allow pharmacists to view orders on-line and electronically confirm that a prescription has been filled.

4. *Diagnostic Imaging Systems:* Allow specialists and physicians to send and view their patients' test images and reports on-line, including X-rays, ultrasounds, MRIs and CT-scans.

5. *Laboratory Information Systems:* Allow specialists and physicians to view (no indication of order entry) their patients' lab results and reports on-line.

6. *Public Health Surveillance Systems:* Provide real-time ability to share and analyze health information critical for managing public health problems.

7. *Telehealth:* A combination of information and communication technology to deliver health information, services and expertise to patients over distances. [30]

Public health and Telehealth are the two new building blocks added by Infoway. The *2003-2004 Annual Report* points to the fact that public health surveillance was added as a priority in order to better manage public health problems such as SARS (Severe Acute Respiratory Syndrome) and other infectious diseases; telehealth is part of a new mandate for Infoway.

Infoway, according to the *2003-2004 Annual report* has 53 projects underway; 27 are national projects and 11 of these are infostructure projects involving common solution architecture, common and reusable services and standards. The other 16 projects include registries (5), diagnostic imaging systems (4), drug information systems (3), a laboratory information system (1), and telehealth (3). The 26 regional projects underway have been jointly developed with regions/provinces/territories and include registries (15), diagnostic imaging systems (6), drug information systems (4) and telehealth (1). [30] Details on some of the projects are highlighted in section 3.1.3.

Knowledge Management/Transfer and Change Management are two other initiatives for Infoway. "Ensuring knowledge transfer between those involved in the design, implementation, and use of EHR solutions across the country will both accelerate the overall initiative and help avoid unnecessary and costly duplication of effort" [37, p.11]. In addition, one of Infoway's objectives is to promote reusability of systems via toolkits for projects. Toolkits contain the basics for implementing a system. For example, Infoway has funded a project in the Fraser Health Authority for diagnostic imaging (the Health Authority of course also provided funding); upon completion of the project, the Fraser Health Authority must create a toolkit for their project that provides information on how they set up their diagnostic imaging system. The intent is that other jurisdictions will be able to use that toolkit to implement a similar diagnostic imaging system in their region but they will have the ability to modify the system, to suit individual needs.

Infoway is investing significantly in change management initiatives; in fact, "[each] Infoway investment will always include funding for change management and experts are integrated with project teams to ensure that this area gets proper focus" [37, p.12]. In addition, Infoway plans to maintain governance and accountability by having, "an independent third party evaluation to measure [Infoway's] overall performance in achieving [their] outcomes [at least every five years], the first of which must be completed by March 2006" [30, p.22].

3.1.1.2 In ***Australia***, the National Health Information Group (NHIG) and the Australian Health Information Council (AHIC) have responsibility for cross-jurisdictional and cross-sectoral health IM/IT priorities that require coordination. A strong case for focusing the national health IM/IT agenda on a few critical areas has been made and the role of national bodies is to deliver the fundamental building blocks to support greater system interoperability. [28]

Three fundamental questions assisted the NHIC and AHIC in deciding what national priorities to undertake and they are as follows:

1. What health [IM/IT] activities are currently in progress?
2. What are the priorities for national involvement in health [IM/IT]?
3. How can these national priorities best be pursued?

Three hundred sixty-three projects from 21 different jurisdictions were identified as projects involving the national body according to the *National Health Information Management and Information & Communication Technology Strategy (National Health IM & ICTs Strategy)* [28]. "A common approach – especially in privacy, health data standards and patient and provider identification and directories – [are clearly] regarded as immediate priorities for national action" [28, p. 50]. Another category of high priority initiatives includes areas of major planned investment such as clinical information systems, patient administration systems (known in North America as ADT systems) and the EHR [28]. The national team plans to do initial rollouts on the national priority activities over three years (2004-2006) followed by continuous ongoing rollout and support where needed (e.g. standards, EHR, etc).

The scope of activities involving national responsibility (i.e. IM/IT priorities) according to the *National Health IM & ICTs Strategy* plan includes

1. *Policies protocol and standards* - the possible scope of a national role is to develop national standards including integration, security[5], authentication, privacy, consent, identification and data standards

2. *Physical infrastructures* - the possible scope of a national role is to provide:

    a) Hosting and communications capabilities including data centers, call centers, and voice & data networks
    b) End user computing devices such as Personal Computers, Local Area Networks, and peripherals

[5] Security encompasses both data security (e.g. electronic and paper files) and system security (e.g. hardware and software) [45].

3. *End user applications* - the possible scope of a national role is to provide:

    a) General health information provisions including public and provider information (The *National Health IM & ICTs Strategy* did not provide a definition for the term general health information)
    b) Administration capabilities such as assistance with procurement, asset management, finance, human resources, claims and billing, patient administration systems, and performance management
    c) Communication and integration assistance such as telehealth, secure messaging & clinical information transfer and information capture/translation
    d) Clinical event information management involving clinical information systems, the EHR (pilot projects under Health Connect are underway and national implementation is to begin in Tasmania, South Australia and the Northern Territory), and e-Decision Support
    e) Monitoring and research assistance including registries and disease surveillance systems, data warehousing, statistical information analysis and population surveys
    f) User identification and authentication abilities such as patient and provider identification and authentication

4. *Change Management* – the national role is to provide business case development, capacity building, penalty and incentive mechanisms, and evaluation assistance (e.g. "developing a more standardized approach to evaluation methodologies could enable more accurate benchmarking of project and system outcomes" [28, p. 32]). [28]

5. *Broad Band rollout* – "broadband access should continue to be managed as a national cross-sectional initiative" [28, p. 53]. No further information was provided in the *National Health IM & ICTs Strategy*.

The NHIG and AHIC "believe that a common national approach is essential [in order] to make cost-effective progress towards system interoperability" [28, p.61].

3.1.1.3 England's NHS Connecting for Health endeavor is touted as being the largest IT project in the world. There are four main 'delivery workstreams' (i.e. IM/IT priorities) in the *Delivering 21st Century IT Support for the NHS National Strategic Programme*: IT Infrastructure, the electronic booking service, the EHR, and the electronic transfer of prescriptions service.

1. The new *National Infrastructure framework* (N3) is a continuity of NHSnet with increased bandwidth to enable one system for the entire NHS. In addition, the new infrastructure includes e-mail and directory services. The e-mail service is intended to be web-based with a single e-mail address for NHS employees working life. The system will also enable mobile access and a shared on-line calendar that will be available throughout the NHS. The directory service will be centrally managed and accessible by the entire NHS. [39]

2. The *electronic booking service* aims to allow patient and clinicians to book appointments in partnership. The goal of the service is primarily to improve choice, convenience, and reassurance for patients, reduce time wastage because of lateness by patients and/or clinicians, cancelled appointments, and failure of patients to attend appointments. [39] In England, patients' appointments for secondary care treatment will be booked by GPs electronically via computer systems. The electronic booking programme began in April 2002 (in a series of pilot projects that were conducted in 'enterprise communities') and is comprised of a two part framework: The 'electronic booking system' (the primary to secondary care or within secondary care booking agent) and the 'bookings management service' (a contact centre where patients discuss referral options). The pilot projects are expected to benefit patients by creating fewer delays for them, enable patients to book appointments conveniently and decrease the number of hospital visits because of the improved referral process. In addition, the NHS expects to benefit from: referrals that are more effective, improved communication between primary and secondary care and a reduction in the number of non-attended appointments by patients. [39]

3. The Integrated Care Records Service (ICRS), formally renamed to *NHS Care Record Service (NCRS)* in December 2003 [40] is the NHS's EHR. The purpose of the NCRS is to integrate patient information across all health and social care settings, designed around the individual patient and able to support care pathways as part of the National Service Framework. The goal is to have a single healthcare record for approximately 50 million people. The NCRS aims to incorporate both the organization-specific Electronic Patient Records and the cradle-to-grave Electronic Health Record. NCRS extends beyond the hospital setting as it strives to incorporate non-NHS organizations that provide healthcare services such as Social Care.

4. The goal of the *Electronic Transfer of Prescriptions (ETP)* project is to provide the means to enable the electronic transfer of prescriptions between prescribers, pharmacists and the Prescription Pricing Authority (PPA). Through this service, the NHS hopes to: increase patient convenience, deliver important administrative improvements, and improve patient safety by reducing the number of prescription errors. Several pilot projects were launched and three ETP pilots were completed in March 2003. [39]

In addition to the four main healthcare IM/IT priorities, "[there] is a comprehensive work programme to support confidentiality and consent issues. A national "model" for consent and access is being developed and will then be shared with suppliers to ensure it can be implemented in record systems" [23, p. 10]. In addition, options for authentication mechanisms are being explored, as well as interim encryptions facilities, which are already being provided. Enhanced broadband access capabilities and the development and implementation of standards are part of the national responsibility in England, as is training of HCP. [23] The *Delivering 21st Century IT Support for the NHS National Strategic Programme* plan does not provide information on how the programme will be evaluated; the entire project is expected to last approximately 10 years.

3.1.1.4 Denmark has 29 national healthcare IM/IT initiatives that are to be dealt with according to their *National IT strategy 2003-2007 for the Danish Health Care Service*. The initiatives are grouped under four 'priorities' identified below. The 29 initiatives serve to "strengthen coordination of the [IM/IT] effort on a national level, and they aim at creating conditions [at] the local level for the efficient use of [IM/IT] in the healthcare service" [41, p. 32]. Denmark has said that they want each citizen to have a personal EHR by the end of 2005. The 29 initiatives focus on the following key areas: implementation of EHRs, security of e-information, development of a National Patient Registry and National Patient Index, creation of a Health Portal, development of communication standards, education of HCP, enhancements to IT Infrastructure and telemedicine.

1. *Electronic Health Records – Clinical workplaces in the healthcare service*

The EHRs presently used in Denmark are 'so-called first generation' solutions. The degree of integration with other IM/IT solutions in the hospitals varies because the MedCom program's (the national healthcare messaging network) focus has been on automating primary care HCP. There are 12 initiatives outlined in the Danish strategy under the Clinical Workplaces priority. The number one initiative is to have EHRs implemented in all Danish hospitals before the end of 2005. The responsibility for this initiative rests largely with the Danish counties (similar to Canadian provinces) and the Copenhagen Hospital Corporation (CHC), which is a public organization that took responsibility and ownership of seven hospitals that were independent and previously administered by the government. A major component of the EHR initiative is a design of a National Basic Structure for EHRs (BEHR), which is the joint responsibility of the Danish Ministry of the Interior and Health, the Danish National Board of Health, the National Association of Country Councils, and the CHC. Other initiatives under this priority include projects such as, development of an XML-schema for BEHR communication, clarification of legal, technical, security problems, training of hospital staff for EHR use and coordinated communication projects. [41]

2. *National Registries and Databases*

The National Patient Registry was developed and implemented in 1977. The Danish strategy points out that, "From an international point of view this is a unique registry featuring long-term comprehensive documentation, on the level of the individual, of this aspect of hospital activities" [41, p. 40]. There are five initiatives under this priority with the most important being online access to the National Patient Registry (to be renamed the National Patient Registry of Clinical Continuity). The current Registry is largely used for statistical purposes including wait times for example, and is based on the patients' contacts with the hospital system. Another initiative concerns the development of a National Patient Index to identify patients. Other initiatives under this priority involve the establishment of a Personal Electronic Medicine Profile to be accessed through a public health portal by HCP and the public and the creation of Integrated Health Care Quality Registries to be integrated with EHRs. [41]

3. *Coherent Access to Information*

The Coherent access to information priority encompasses eleven initiatives, the most important being the creation and development of a common public health portal as a source for accessing health information. At the present time, the Danish counties have different levels of EHR implementation, thus an initiative called Standardized Pull of Patient Data (SUP) was identified as a 'transitional' solution. As a result, web enquiries can be made to access health information and health records regardless of the county. SUP is only implemented in a few counties and therefore the dataset is only available in those counties. The dataset is also limited, meaning it is not the entire record. Some examples of other initiatives under this priority include: creation of a Concepts Database, the purpose being to evaluate and develop concepts in the healthcare service, the linkage of electronic home care records with hospital EHRs, the publishing of Information Security Guidelines, implementation of a nationwide Internet based infrastructure and continuity of international standardization work. [41]

4. *Follow-Up/Evaluation of the IT strategy*

   The last initiative, number 29, concerns appointment of a national strategy group for IT in the healthcare service that holds the responsibilities for following the national initiatives, disseminating results about progress levels on the initiatives and for development/updates to the Danish national health IT strategy. [41]

3.1.1.5 New Zealand's "WAVE [Working to Add Value through E-Information] programme's objective has been to produce an [IT] plan for the sector, with the aim of improving health outcomes - through the effective use of information, at the least cost;" [29, p.7] each of the eight workstreams (i.e. IM/IT priorities) are discussed below.

1. *Strategic Setting – Laying the foundation for IM/IT*

   The WAVE team felt that, "[planning] for the best use of health information must be guided by a set of national principles, including those developed for the implementation of a national health information systems infrastructure" [29, p. 10]. The Advisory Board sought out priorities in health information that would have the greatest impact with the least cost (Appendix C).

2. *Knowledge – Making patients better by improving patient safety and utilizing knowledge management*

   The focus of this workstream is patient safety, quality issues and proactive healthcare opportunities. The WAVE team identified tools for creating a knowledge environment such as defining knowledge management (KM), identifying stakeholders, and enabling KM applications through use of available tools [29].

3. *Electronic Health Records – Clinician talking to clinician*

   Unlike the other strategic plans, New Zealand's plan provided process oriented details on some of its projects. For example, a proactive stance on the development of EHRs is the approach used by WAVE. They are using a goal-oriented, timeline approach to manage their EHR deployment. [30]

4. *Data Architecture – Talking a common language*

   Development of data standards is a priority for New Zealand and national co-ordination to create, implement and promote standard data sets and coding standards have been enabled [29]. The 'highest' priority issues are the quality of National Health Index (NHI) numbers for patients (personal health numbers) and the need for a National Provider Index (NPI) to identify health professionals. [29]

5. *Privacy – A matter of balance*

   New Zealand's has well-developed privacy legislation, which is helpful to the healthcare industry. The focus for privacy is to "[ensure] information is used consistently with the purpose for which it was obtained and that that is understood by those from whom it was obtained" [29, p. 41]. Some privacy issues the WAVE team identified as requiring further consideration include: protecting information while making it available, informing the public about what information is being collected (and why), access and ownership of information issues, the NHI, and security. [29]

6. *Systems Infrastructure – Providing the electronic glue*

   According to the WAVE team, "Systems Infrastructure is a framework for the development of information management and technology capability; it represents the bridge between the customer's requirements and the required technical design" [29, p. 49]. According to the WAVE team, the systems infrastructure is necessary in order to

"get the healthcare community on-line, connected and managed in an organized, [cost-effective] manner;" [29, p. 49] security is fundamental to the architecture.

7. *Investment – Spending Wisely*

New Zealand has a history and strong tradition of achieving a lot, at little cost [29]. However, "[IM/IT] spending in New Zealand's health sector is rather mysterious. No one knows how much is actually being spent as the figures lie buried in different, often conflicting, accounting methods" [29, p. 57] In addition, "current investment is probably not delivering value for money because of a piecemeal approach and very limited co-ordination. There is still a strong focus on spending [IM/IT] money on governance and compliance, rather than on systems aligned to health goals, clinical efficiency and sector integration" [29, p. 57].

8. *Organizational Design – Building Capability*

The WAVE strategy states that although, "Some attempts have been made to co-ordinate systems at the sector level, there is no sector reference point for leadership and guidance;" thus, the current New Zealand health system "lacks any capability to co-ordinate, implement or design a coherent national information system [as different] parts of the sector [see] different bits of the issue" [29, p. 63]. Therefore, as a solution to this problem, the WAVE board recommends that an organizational entity that can manage the IM/IT needs of the healthcare sector be created.

The WAVE project does not have a completion timeline. Evaluation is mentioned for IM/IT spending and KMS projects but the interest in maintaining the project through the long-term and viewing it, as an ongoing phenomenon appears to be a method for continuous evaluation in itself.

3.1.2 RESULTS

Following the brief introduction of the national health IM/IT priorities of the five countries, Table 10 was created to display a summary of the priorities by country.

Table 10: Summary of National Health IM/IT Priorities by Country

Priorities	Canada	Australia	England	Denmark	New Zealand
EHR	X	X	X	X	X
Standards	X	X	X	X	X
Registries/Indexes	X	X		X	X
Change Management/ HCP Training	X	X	X	X	
Privacy & Security		X	X	X	X
Physical Infrastructure		X	X	X	
Medications	X	X	X		
Public Health Surveillance	X	X			
Telehealth	X	X			
Knowledge Management	X				X
Laboratory	X				X
Diagnostic Imaging	X				X
Health Portal				X	X
Systems Infrastructure					X
Spending Wisely					X
Long-Term Organization Design					X
Patient Scheduling			X		

The priorities are examined in the next section beginning with the priorities that were most often identified (e.g. all five countries have the EHR as a priority).

3.1.3 DISCUSSION

There is no right or wrong answer for what aspects of IM/IT a country should prioritize. Table 10 compares the IM/IT 'areas of focus' for each country based on the most recently published national healthcare IM/IT strategic plan. Each priority discussed in this section includes some analytical remarks and a comparative evaluation. The synthesis elements point out uniqueness while keeping in view commonalities.

3.1.3.1 Electronic Health Records, Standards, and Registries

All five countries have made the EHR a priority for their healthcare system in their most recent national level healthcare IM/IT strategic plan. The Australian *National Health IM and ICTs Strategy* goes further to say that,

> Investment in Clinical Information Systems, Patient Administration Systems, and [the] EHR appears to be in line with identified priorities, and is broadly comparable to the Canadian and UK approaches. Differences here appear to be primarily [because of] differing jurisdictional responsibilities for these areas, rather than a different set of priorities. [28, p.51]

In addition, all five countries have made the development and implementation of standards a priority. Without standards for information integration, transfer, etc., systems are not able to communicate with one another. All of the countries except for England have made the development of registries and/or national indexes an IM/IT priority. England already has adequate registry systems in place, thus registries are not a priority. If people, providers and healthcare sites cannot be uniquely identified, personally identifiable information about treatment of care cannot find its way back to the appropriate HCP.

3.1.3.2 Change Management and HCP Training

All of the countries except for New Zealand addressed the 'change management' phenomenon. In the words of one Australian stakeholder, "We should be spending $8 on change management and technology uptake for every $1 we spend on system implementation. In reality this is often the first area to suffer at the hands of budget constraints." [28, p. 57]. The Australian strategy also points out that failures of many past Australian health projects were mainly the result of poor change management underestimating the magnitude of the task.

The Australian strategy provides the following definition for the term change management: "Overall coordination and execution of changes to work practices, skills and incentives to make use of Health [IM/IT];" [28, p.98] whereas the Infoway EHRS Blueprint defined change management as, "A set of principles, techniques and prescriptions applied to the human aspects of executing major change initiatives in organizational settings" [2, p.156]. These two definitions differ in that the Australian definition highlights 'changes to peoples' work practices', while the Infoway definition seems to focus on how to manage the changes being made to the people in an organization, not the actual work practices. In addition, the Australian definition focuses on incentives for IM/IT usage, whereas the Infoway definition said nothing about this.

In the New Zealand WAVE strategy, change management is identified once under the EHR workstream but no explanation on how to manage the forthcoming change process is provided. In addition, the New Zealand WAVE strategy provides no information on HCP training, which all other countries consider to be a key component of change management. The English strategy provides little information on how the NHS plans to train their staff. However, the strategy does highlight that the NHS will develop a Faculty of Health Informatics within the NHS University as part of their management structure in order to help provide a focus for increased training opportunities. [23] Under the Infoway plan, the jurisdictions are responsible for HCP training.

3.1.3.3 Privacy and Security

Three of the countries have made privacy and confidentiality a significant part of their strategic plan. Australia plans to implement further policies, protocols and standards to deal with privacy in the electronic realm. As mentioned earlier, England has a program to support confidentiality and consent issues. New Zealand has privacy as one of the eight main workstreams in addition to having well-developed privacy legislation. Denmark's strategy focuses on security issues but there is no explicit reference to protection of health information and/or privacy; although, four references to maintaining confidentiality are made in the strategy. In Canada, Infoway has tagged the privacy and confidentiality of patient data as a jurisdictional responsibility. Patient privacy and confidentiality are protected under both national privacy legislation and provincial privacy legislation in Canada; though they are complementary to one another, provincial legislation takes precedence.

Security is presumably a concern for these five countries but only Denmark and New Zealand provided an explanation about how they plan to implement security mechanisms. Canada, Australia, and England were not seen to have security as a priority in Table 10 because they only mention security in terms of implementing security standards. Denmark goes further by initiating a project that involves the publishing of information security guidelines. The project's "primary aim is to provide hospitals with guidance on how to meet specific legislative requirements on data security while ensuring a satisfactory overall level of security concerning patient information contained in the IT systems" [41, p. 49]. New Zealand has a comprehensive view of security, which encompasses both physical and technological security components. Security is part of 'WAVE's Systems Infrastructure' model. The WAVE strategy discusses the fact that, "the [health] sector lacks base knowledge about the threats and risks it faces, and the policy environment and trade-offs implicitly being made between increased functionality versus increased security" [29, p.51] are concerning. The WAVE board came to the realization that a unified approach to security is needed, one that is 90% behavioral and

10% technological and one that also provides a clear framework for systems/technology developers, vendors and managers [29].

3.1.3.4 Physical Infrastructure

Physical infrastructures[6] and broadband capability are national priorities for Australia and England. Australia plans to rollout infrastructure across the country to deliver interoperability across the health system and it is a building block for their national strategy [28]. Similarly, infrastructure is a building block for England's strategy and they are spending a significant portion of the allotted £6 billion on infrastructure but the actual amount to be spent on infrastructure has not been disclosed to the public. Physical infrastructure is also a priority for Denmark and the Danish national IT strategy states that, "[a] safe, nationwide infrastructure and comprehensive implementation of Internet based telecommunication reaching across boundaries in the healthcare sector will be established, [41, p.51] as an initiative under the means for coherent access to information priority. Canada Health Infoway has made infrastructure a jurisdictional responsibility and therefore has no infrastructure development projects in their business plan. New Zealand has systems infrastructure as a priority, which encompasses a "framework for the development of information management and technology capability" [29, p.49] including: open systems, data collection, standards, privacy, security and the ability to view information as a strategic resource. [29] This appears to be similar to physical infrastructure but with the added element of being very IM focused, opposed to Australia's infrastructure definition which is very IT focused.

3.1.3.5 Medications

Pharmacy related initiatives are national priorities for Canada, Australia and England. According to the *2003-2004 Infoway Annual report*, Infoway has funded four pharmacy

[6] The Australian strategy identifies the following items as physical infrastructure components: voice and data networks (e.g. communication links, switching equipment, hubs and routers that link provider systems in different locations to one another), call centers, data centers (e.g. contain physical hardware that runs health-related services and applications), end-user computing (e.g. computer systems and access devices such as desktop computers, printers, Personal Digital Assistants) [28].

related projects jointly with the provinces, as well as three separate national pharmacy projects. "In partnership with the Ontario Ministry of Health, Infoway will be investing in a system that allows physicians and healthcare professionals to view an on-line summary of patients' medications" [30, p.18] and Infoway is investing with Alberta Health and Wellness to implement a drug system that will include e-prescribing, adverse drug-reaction alerts and pharmacy services [30]. This study does not capture existing systems such as BC's PharmaNet. As part of the 'high priority capabilities' of the EHR, Australia has a target to have "[at] least 50% of prescriptions transmitted electronically" in six years time [28, p. 77]. England's pharmacy project focuses on the transfer of prescriptions between prescribers, pharmacists and the Prescription Pricing Authority and pilot projects have been completed.

It is important to note here that pharmacy is not listed as a national priority issue for Denmark because they already have implemented electronic prescribing in approximately 90% of general practitioners offices [43] MedCom, the Danish healthcare messaging systems is used by all hospitals, pharmacies, laboratories and General Practitioners who must be connected to MedCom in order to work in the Danish health system [31]. It is important to note that this Danish project was not tied to a national level strategic plan and was born out of one of the smaller Danish counties; an initiative started by three individuals including two physicians. Pharmacy and e-prescribing are also not a high priority national issue for New Zealand (although they have made 'fixing up' their current pharmacy data a priority) according to the WAVE strategy because, "[Their current pharmacy] systems are valued for the time saved in administration, management and organization of their businesses. One pharmacist commented that, 'Pharmacies could not function [in New Zealand] today without information systems'" [29, p. 57].

3.1.3.6 Public Health Surveillance

Public Health surveillance is a priority for Canada and Australia. The 2003 Severe Acute Respiratory Syndrome (SARS) outbreak forced Canada and other countries to recognize the importance of the need for better public health surveillance systems. Both nations

have included projects in their plans, which involve implementing surveillance systems to improve public health. The interest both nations are providing to public health surveillance has far-reaching implications; the SARS outbreak in Canada has motivated healthcare organizations to improve their disease containment practices and disease outbreak reporting procedures. Other nations may look to Canada, for guidance and advice on how to prevent such an occurrence like SARS in their country.

3.1.3.7 Telehealth

Canada is the second largest country in the world. Although much of the population resides in large cities, a significant portion of the population lives in rural communities where healthcare services are difficult to access, particularly specialty services. Australia faces a similar problem, as it is also one of the six largest countries in the world. Australia wants to "[use] communications technologies to facilitate the remote interactions between [HCP] and patients for the purposes of clinical care (e.g. videoconferencing for psychiatric interviews) [28, p.97]. Infoway currently has investments for three telehealth projects approved with one in Ontario already underway. The interest from both nations in improving telehealth capability suggests that they are 'paying attention' to the healthcare service needs of rural populations.

3.1.3.8 Knowledge Management

For the purposes of this study, the New Zealand WAVE project Knowledge Management definition is used:

> The development and effective use of health information/decision support systems which provide timely access for all health professionals and the public to high quality, relevant information from global information sources and from data collected and analyzed within the [healthcare system or organization] [29, p. 21].

Knowledge management allows the healthcare community to be proactive in improving healthcare services to the public and it is a main concern for New Zealand and Canada. England's strategy made one mention of the term knowledge management in the context of supporting staff [39] but provided no details implying that it is not a prioritized project area. In Australia, "twelve initiatives are underway to provide online knowledge management, clinical guidelines, and training [as well as] library services to providers" but these projects are not national initiatives, they are regionally based [28, p. 44]. The Danish strategy does not use the term 'knowledge management' but it does have a health portal initiative planned that will "support electronic communication and sharing of knowledge internally in the healthcare service" as one of its functions [41, p.44].

In June 2002, Infoway "[launched] the *e-Health* KnowledgeWay portal as well as other internal and external tools to support knowledge sharing, collaboration, and informed decision-making" [37, p.4] on EHRs and other related healthcare IM/IT initiatives. "The portal is also a vibrant platform for the ongoing exchange of knowledge and expertise: through virtual communities, participants can share ideas and experiences, ask questions, or discuss issues with other e-Health professionals" [37, p. 11].

3.1.3.9 Laboratory and Diagnostic Imaging

Canada and New Zealand have both prioritized laboratory system and diagnostic imaging system projects. Only one laboratory project is currently underway in one Canadian jurisdiction (the name of the jurisdiction was not provided) but has been delayed due to internal staffing and timeframe issues [30]. There are six joint provincial-Infoway projects and four national diagnostic imaging projects underway in Canada. A joint project between the Fraser Health Authority and Infoway has resulted in "one of the world's larger implementations – a single diagnostic imaging system linking 12 hospitals" [30, p. 17]. In Ontario, a project linking eight hospitals known as the Thames Valley Hospital Planning Partnership is also underway. The WAVE strategy for New Zealand states that, "[the] cost of inadequate laboratory test coding systems [fall] on laboratory providers, systems vendors and service providers" similar to Canada [29,

p.12]. Hence, laboratory system improvements are a priority for both countries. There is no mechanism in New Zealand for analyzing hospital laboratory tests nationally and "New Zealand has never had a standard coding system for laboratory tests" [29, p.47]. The WAVE strategy recommends that Logical Observation Identifier Names and Codes (LOINC) should be used for laboratory tests and results in order to be able code lab tests and analyze the data at a national level. [29] According to Infoway's website, they also plan to use LOINC as the database protocol for laboratory systems.

In Denmark, approximately 90% of laboratory and diagnostic imaging test requests and results are transmitted electronically via the MedCom system [43]. In Australia, private sector health IM/IT investment has been made for radiology systems but radiology upgrades were not included in the April 2004 strategic plan because of commercial sensitivity issues. Little information is provided in the strategic plan for improving laboratory systems. [28] England has chosen not to make laboratory systems a national priority at this time.

However, in May 2004, the English Department of Health announced that Picture Archiving and Communication Systems (PACS) would be part of the CfH programme with national coverage to be completed in three years [61]. Although, little media attention has been provided on PACS projects in England. According to the June 16, 2005 E-Health Insider, only two hospitals have 'gone live' with PACS and there is less than two years left to get the remaining English hospitals 'up and running'; "many doubt that the ambitious timetables set originally will be achieved" [42].

3.1.3.10 Health Portals

Health portals are a national priority for Denmark and New Zealand. However, the focus of Denmark's health portal is the citizen as well as the HCP opposed to the HCP-only focus of New Zealand's portal. "The common public [Danish] health portal represents a national initiative intended to be the common frame for communication and information

in a cooperating healthcare service [; at] the same time, it is meant to be the electronic access for citizens to the healthcare service" [41, p.11].

In New Zealand, the interest lies in establishing an Internet portal (available on all providers' desks within five years) as a gateway for access to national healthcare information systems as well as knowledge systems, applications and other electronic information sources [29]. The WAVE strategy defines a portal as "an individually customizable desktop allowing the user to access applications [such as,] on-line medical journals, the PHARMAC database, NHI or local hospital booking schedules" [29, p.54].

Infoway implemented an interactive portal on the EHR and health informatics called the E-health KnowledgeWay portal as noted above to support knowledge sharing, collaboration, and informed decision-making. However, this portal system is not an Infoway EHR related initiative for HCP to provide healthcare services or for citizens to access their personal health information. Health Canada has a Canada Health Portal, which provides Canadians with 'access to authoritative and trusted information and services' on topics such as addictions, mental health, dental health, etc. The English strategy makes one reference to implementing a portal for citizens/patients over the internet with a tentative scope of December 2007 but no other details are provided in the strategy. The Australian strategy also made one reference to a portal but it is not a national priority. For the twelve initiatives underway to enable online knowledge management, clinical guidelines, training and library services to HCP, the strategy commented that, "Combining these [services] under a single Australia-wide portal for professional information is likely to produce better results that the current state or regional approach" [28, p. 44].

3.1.3.11 Unique Priorities

Two unique priorities for New Zealand are spending money for healthcare IM/IT wisely and establishing a long-term organizational design to maintain and improve the status of New Zealand health IM/IT. The WAVE strategy labeled both of these issues as a means

to guide the health sector's IM/IT investments. Simply putting in systems and using them in not enough, managing, maintaining, upgrading etc. are essential to preserve the advantages provided by IT. By investing wisely and setting up an organization to administer health sector IM/IT developments and improvements, New Zealand is putting itself in a position to maximize the benefits of IM/IT now and in the future. It is suggested that other nations 'pay more attention' to the areas of spending money wisely and establishing a long-term organizational body to oversee national health IM/IT if they have not already. Infoway for example, disbands after six years; their mandate is to do so, leaving the future of the projects (e.g. maintenance, upgrades) to the jurisdictions.

Patient scheduling is a priority only for England. This is a rather interesting national priority. Booking appointments in not a main concern for any other country, as it has evidently not been seen as an area requiring immediate need but England obviously does not share this view, as implementing an electronic booking system is one of the four main national health IM/IT priorities. The e-booking system aims to empower patients and HCP more choice in scheduling appointments.

With respect to the England's booking system priority, one may question whether a country really aligns national IM/IT priorities with healthcare system needs? For example, waitlists for surgeries are a well-known international health system problem and a problem for the English healthcare system. Why perhaps then, did the English strategy give precedence to implementing an electronic booking system but not to reducing waitlists? The same could be said for the Canadian strategy, as surgical waitlists are a major problem in the Canadian healthcare system [1]. One could easily speculate that a proportion of every decision comes down to the politics and lobbyists of the day. In agreement Dufner et al state,

> In government, strategic [priorities] are selected through a process of political compromise among a wide variety of external and internal interest groups typically with diverse needs and goals. IT issues are often not considered in that process. IT is an ancillary tool rather than a fundamental component in the setting of goals and objectives [21, p.415].

CHAPTER 4

4.1 LITERATURE REVIEW OF CHALLENGES TO IMPLEMENTING IM/IT INTO HEALTHCARE SETTINGS

4.1.1 DATA COLLECTION

A systematic literature review of the challenges to implementing health IM/IT was performed in response to research question two. The PubMed and the ABI Proquest journal article indexes were searched for literature on the challenges to implementing IM/ITs into healthcare settings. See Tables 7 and 8 for the list of search terms, search limits, and the number of hits. For both PubMed and Proquest literature searches, only sources published post-1996 were reviewed. Other articles pertaining to the challenges to implementing IM/IT into healthcare settings were obtained directly from the thesis supervisor and in the end, approximately 75 articles/publications were examined of which 25 were chosen for the literature review. The 25 publications identified a minimum of five challenges to implementing IM/IT into healthcare settings; 18/25 were peer reviewed articles, the others included conference proceedings and non-reviewed publications. Articles that only discussed one to four challenges in depth were not included because the purpose of the literature review was to gain an understanding and appreciation of the multitude of challenges healthcare organizations face when implementing IM/IT; opposed to just examining detailed information on two to three challenges.

4.1.2 RESULTS

The articles/publications included in the literature review are in Table 9 found in the back pocket of the thesis. Approximately 100 challenges were identified in the reviewed literature; they were ‘grouped’ into 30 items based on common themes. Everyone may

not agree with this 'grouping' scheme but it was necessary at the time in order to 'make sense' of the multitude of challenges uncovered.

The most frequently mentioned challenges were selected as criteria for the questionnaire to compare Canada, Australia, England, Denmark and New Zealand's progress in dealing with such challenges. Six were selected because there was a 'natural break' in the data between challenges six, and seven in terms of how many authors gave importance to them in Table 9. The top six challenges to overcome for successful implementation of IM/IT into healthcare organizations are as follows in order of importance:

1. Organizational readiness for change/HCP resistance to process changes and IT usage (18/25 authors)

The term organizational readiness for change refers to an organization's ability to be adaptable and flexible to dealing with new processes, ideas, or technology. Change is a difficult concept for many to address. Syque consulting company states, "Resistance to change is the action taken by individuals and groups when they perceive a change that is occurring as a threat to them [;] in its usual description it refers to change within organizations, although it also is found elsewhere in other forms" [54]. Thus, it can be argued that organizational readiness for change and individual (i.e. HCP) resistance to change can be linked together.

2. Cost efficiency/lack of funding available (17/25 authors)

Cost efficiency refers to 'spending resources wisely' and lack of funding refers simply to a lack of monetary resources to spend on national health IM/IT priorities. These two challenges were grouped together because even if a country or organization has a great deal of money to spend on health IM/IT, they may not be spending it effectively and efficiently. Although knowing whether one is spending efficiently is difficult, New Zealand, nevertheless, has made 'spending wisely' an IM/IT priority. Presumably,

'spending wisely' is of equal importance to the other four countries but this was not explicitly mentioned in their planning documents.

3. Technology limits/research challenges i.e. lack of system designs that support workflow/business processes and vendors lack of understanding of healthcare (16/25 authors)

Technology limits refers to a lack of 'sophistication' in the technology. The healthcare environment is considered complex; therefore, the healthcare community often complains that the technology products currently available are 'not good enough' to meet the needs of the healthcare environment because the technology vendors do not have a good understanding of how healthcare services are delivered (e.g. HCP workflow, team approach to care delivery, etc). In addition, the general 'hope' is that better technology will also enable better research capabilities.

4. Lack of stakeholder involvement (champions) including lack of support from high level management (i.e. top-down commitment)/lack of incentives for IT use (16/25 authors)

The healthcare environment involves a multitude of HCP, high-level administrators, and technical analysts in addition to other personnel and of course patients. Thus, involvement from all these parties will enable them to have input on IM/IT initiatives that affect their abilities to deliver and receive healthcare services. Champions are individuals who embrace the concept of making changes to improve service delivery and often take leadership roles in promoting the use of a new system in a hospital for example. Lack of incentives for IT use refers to a lack of 'reason' to use a technology (e.g. time consuming, requires learning a new skill, etc.). Thus, these two challenges are related because a lack of incentives may lead to lack of involvement and vice versa.

5. Lack of interoperable/integrated systems i.e. lack of consistent standards/terminology to be able to share data across systems (13/25 authors)

This challenge refers to the lack of ability for systems to 'talk to each other'. For example, the inability to view one patient's pharmaceutical and laboratory data together on the same computer screen (i.e. a user would have to access two separate systems to view this data). This is not optimal, as data from a variety of sources (e.g. pharmacy, laboratory and diagnostic imaging) is required to appropriately deliver care to patients.

6. Privacy and confidentiality e.g. patient consent (13/25 authors)

In the context of this thesis, privacy is defined as,

> The right of individuals to be left alone and to be protected against physical or psychological invasion or the misuse of their property; [it] includes freedom from intrusion or observation into one's private affairs, the right to maintain control over certain personal information, and the freedom to act without outside interference [45].

Confidential is defined as,

> The status accorded to data or information indicating that it is sensitive for some reason, and therefore it needs to be protected against theft, disclosure, or improper use, or both, and must be disseminated only to authorized individuals or organizations [on] a need to know basis [45].

'Consent' equates to permission granted by a patient to have a medical intervention performed. All of these issues are important because of the sensitive nature of health information and inappropriate disclosure of such information could result in harm to a patient.

CHAPTER 5

5.1 QUESTIONNAIRE

5.1.1 DATA COLLECTION

A questionnaire based on the systematic literature review findings was designed by the author in consultation with her supervisor, and distributed to a variety of persons including: academics, HCP, health informaticians and a variety of other people working in healthcare settings (Appendix D). The questionnaire was most useful is answering research question three, as answers to this question were not readily available in documentation or literature and are largely reserved to the opinions/comments of others. The questionnaire participants were asked their opinion on the progress their country has achieved (at the national level) in dealing with the top six challenges to implementing IM/IT into healthcare settings (the challenges from the literature are based on an organizational perspective rather than a national perspective, as noted previously).

An initial 28 participants, whom the supervisor felt would be able to answer such a questionnaire from the five countries were contacted. In addition, through attendance at the March 2005 British Computer Society Healthcare Computing Conference and through web searches of potential questionnaire recipients (particularly Ministry of Health personnel) the questionnaire was sent to 24 other individuals. Questionnaire participants were asked to provide additional contacts that may be able to fill out the questionnaire, as a result, another 12 peoples' contact information was received. In total, 64 people were directly requested to fill out the questionnaire.

Some recipients forwarded the questionnaire via e-mail/listservs/webboards to solicit their colleagues to assist with this study. In addition, some participants who felt unable to answer the questionnaire passed it on to a colleague. Thus, it is estimated that several hundred individuals in Canada, Australia, England, Denmark and New Zealand had access to this questionnaire; however, there is no way to determine how many people

opened up their e-mail, accessed the webboard posting etc. In addition, nine Canadian questionnaire recipients who had not sent in a response by April 25, 2005 were telephoned and left messages for 'extra' encouragement.

5.1.2 RESULTS

A total of 43 questionnaire responses were received, 8 from Canada, 7 from Australia (one consisted entirely of qualitative data and no quantitative rankings), 10 from England, 12 from Denmark, and 6 from New Zealand. Because the exact number of individuals who received the questionnaire is not known, a quantitative response rate cannot be calculated; however, it is important to note that the response rate is very pleasing considering that only 64 requests were made. Thank you kindly! The considerable number of responses from Denmark and England are the result of two individuals (one from each country) forwarding the questionnaire to large groups of their colleagues (approximately 40 in England and 80 Denmark) who were willing and encouraged to answer the questionnaire.

Table 11 (Tables Appendix) displays the questionnaire findings. Only the respondent's organization and professional affiliate is provided in order to maintain confidentiality. The challenges found through the literature review are abbreviated CH.# (e.g. CH.1 is an abbreviation for challenge one) and the range and mode(s) are provided for each challenge for each country in Table 11. Two respondents, one from Australia and one from New Zealand gave rankings that spanned over a range. For example, for challenge two, one respondent gave a rank of 3-4 as a response; therefore, the higher of the two ranks was arbitrarily chosen. In cases where a response of 2-4 was given for example, the response became a three, the midpoint. Since there were only two responses that required an adjustment, it was felt best to make these minor adjustments in order to use the questionnaire data rather than exclude the two valuable responses. Table 12 (on the next page) provides a summary of the questionnaire results.

The six challenges identified in the literature review were:

1. Organizational readiness for change/HCP resistance to process changes and IT usage

2. Cost efficiency/lack of funding available

3. Technology limits/research challenges i.e. lack of system designs that support workflow/business processes and vendors lack of understanding of healthcare

4. Lack of stakeholder involvement (champions) including lack of support from high level management (i.e. top-down commitment)/lack of incentives for IT use

5. Lack of interoperable/integrated systems i.e. lack of consistent standards/ terminology to be able to share data across systems

6. Privacy and confidentiality e.g. patient consent

Table 12: Summary of Range and Mode Results from Questionnaire

	CH.1	**CH.2**	**CH.3**	**CH.4**	**CH.5**	**CH.6**
Canada: *Range (N = 8)	1-4	1-4	0-4	0-4	2-4	1-5
Canada: Mode	2	3	3	2,3,4	2	3,4
Australia: Range (N = 6)	1-3	1-4	1-3	2-4	3-4	2-4
Australia: Mode	3	3	2	3	3	3
England: Range (N = 10)	1-3	0-4	2-3	0-4	3-4	2-4
England: Mode	3	3	3	3	3	3
Denmark: Range (N = 12)	1-5	1-4	1-4	1-4	2-5	1-5
Denmark: Mode	2	3,4	3	4	3	1,2,4
New Zealand: Range (N = 6)	3-4	2-4	2-5	2-5	2-5	2-4
New Zealand: Mode	3	2,3,4	4	2,4	2,4	2,3,4

* Range – The range of values provided by the questionnaire respondents for each challenge by country
Mode - The mode is the most frequent answer value provided by the questionnaire respondents for each challenge by country
N = Number of respondents per country

Rating Explanation:

0 – The challenge is not included in the strategic plan
1 – The challenge is included in the strategic plan but no progress to date
2 – The challenge is included in the strategic plan, it is currently being discussed and plans to deal with the issue are being drafted
3 - The challenge is included in the strategic plan, it has been discussed and solutions to deal with the issues are currently being implemented
4 – Modest progress (at least 50%) on the challenge has been achieved
5 – The challenge is no longer an issue as project work has been completed

5.1.2.1 General Comments About the Questionnaire Results

As noted earlier, many countries are investing heavily (e.g. time, money, and resources) into national IM/IT priorities to enable improved healthcare service delivery. The literature review results revealed that the main challenges to implementing IM/IT priorities into healthcare are not technical and do not have much to do with hardware or software but are social having to do with people.

In the questionnaire (Appendix D), participants were given six 'challenges' to rank according to listed criteria. It was agreed to send out the questionnaire in its current form describing the challenges as they are. Of the 43 responses received, the Canadian respondents found the questionnaire the most difficult to answer. Three Canadians found the questionnaire "extremely difficult" to answer because it assumed a 'strategic plan'. Canada Health Infoway has a business plan called the '*Building Momentum 2003/04 Business Plan*' and an *EHR Solutions blueprint*, which some of the Canadian participants had not read and were directed to view in follow-up communications.

It appears that the Infoway Business plan is being used as the strategic plan, as priorities have been stated and are being carried out. Thus, the feedback from some of the Canadian respondents seemed odd because half of them do not see Canada as having a

national healthcare IM/IT strategic plan encompassing priorities. Thus, it is reasonable to wonder why some of the respondents felt this way. Infoway's mission is to *"[foster] and [accelerate] the development and adoption of electronic health information systems with compatible standards and communications technologies on a pan-Canadian basis with tangible benefits to Canadians"* [44] and they have published a plan and provide annual reports on their program's progress.

In a Colloquium held at the School of Health Information Science at the University of Victoria in Victoria, BC on February 11-12, 2003, participants who were all Chief Information Officers from health authorities across the four western Canadian provinces (along with several university students) agreed that if the EHR is to become a 'reality' in Canada it must be a national initiative with national leadership. As Infoway is the national entity assigned the task of accelerating the development of healthcare IM/ITs in Canada and has been in existence since 2001, why then do some Canadian healthcare personnel still feel that there is no national health IM/IT strategic plan to consult and rely upon? Perhaps, communication has been a problem, resulting in the respondent's views. It is also important to note that three Canadian respondents felt that it is difficult to provide a ranking for the entire country, so their rankings were weighted more so on the level of progress their individual province has achieved, opposed to the nation as a whole.

Two respondents felt that the terminology used in the questionnaire was outdated, for example the term "HCP resistance", "lack of stakeholder involvement" or "organizational readiness for change". The literature review consisted of 25 articles published post-1996 with approximately 30% published 2003-2005. This so-called 'outdated' terminology unfortunately continues to be used today. At the British Computer Society's 2005 Healthcare Computing conference in Harrogate, England, terms such as "HCP resistance" were often used. Instead of "HCP resistance", perhaps stating a "need for HCP participation" would be a more appropriate term.

Several respondents from nations other than Canada acknowledged that progress in dealing with the challenges varies across their country. It is understandable that it is

difficult to provide answers on a national scale, however, the purpose of the questionnaire was to gain an idea of where each country is at, as a whole nation, opposed to just the progress made by one county, province or region.

It is important to note that even if a national health IM/IT priority was not found in the national health IM/IT strategic plan, questionnaire respondents still provided rankings. For example, New Zealand did not indicate change management as a priority in their WAVE strategy but New Zealand questionnaire respondents still provided responses to challenge one. In addition, quotations by the respondents and from the literature were italicized in the next chapter to enable easier reading of the respondents' qualitative feedback.

CHAPTER 6

6.1 SYNTHESIS

6.1.1 Challenge One: Organizational readiness for change/HCP resistance to process changes and IT usage

All of the countries except for New Zealand indicated change management and HCP training as national health IM/IT priorities. In respect to challenge one, which looked at the issues of organizational readiness for change and HCP resistance to change, the following section examines the quantitative and qualitative opinions of the questionnaire respondents.

For challenge one, the ranges vary over 3-5 values except for New Zealand where all respondents provided a rank of three or four and Australia where the rank was either one or three. It is important to note that the results are primarily the opinions of individuals. The variability in the responses is a finding in itself. Not everyone sees progress or lack thereof in the same manner. The modes[7] for challenge one were: Canada (2), Australia (3), England (3), Denmark (2) and New Zealand (3).

One Canadian respondent provided elaborate comments in his[8] questionnaire response for all six challenges with a wealth of experience and knowledge about his province and Infoway. He provided the following comments on challenge one:

> *Operational Readiness – rated as a '2' because [it is] acknowledged as an issue and clinicians are generally being engaged at a jurisdictional level in project design/implementation. Infoway has begun to focus somewhat on 'change management' nationally and engage professional groups. Most jurisdictions, however, are only just beginning to engage their professional groups in educating and involving them in the broader development of strategies to prepare (and in*

[7] The modes are the points of discussion, as the ranges in answers only point to variability in peoples' opinions.

[8] For simplicity, and to protect the identity of the respondents, the male pronoun is used throughout.

> *some cases invent [strategic plans]) clinicians for IT adoption and process change further upstream (i.e. well before project implementations where the focus then becomes one of 'training' them to use the system rather than process change). We also continue to see resistance to change in that health professionals are not yet convinced of the 'value proposition' for front-line adoption, especially in an environment where many practitioners are older, very busy and find change disruptive and inevitably painful.*

Another Canadian commented that 'resistance to process changes and IT usage' is not a HCP problem - *"the problem is the IT professionals and the lousy products many foist on regrettably naïve clinicians"*. One English respondent felt that *"organizational barriers, including the agreement of governance arrangements and financial resources allocation models have been more problematic than anything else."* A New Zealand respondent felt that challenge one encompassed two separate issues: management readiness and professional resistance and he viewed them as separate. These two issues were grouped together because if there is resistance than the organization is not ready for change, therefore, both issues are a part of organizational readiness.

A Danish respondent stated that,

> *Theoretically [it is] recognized what the organizations should do, regarding organisational readiness for change, and resistance towards changes. Lots of people, working with implementing information technology in the healthcare sector, are aware of the problems this can create, but in real life it's hard to come by, it's hard to know what exactly to do about organisational changes and resistance.*

Another Danish respondent mentioned that, *"professional resistance has appeared due to a lack of workflow support in the systems. Development has started with specification of healthcare content (standards plans and clinical guidelines) that will improve user acceptance."* A third Danish respondent felt that challenge one varies across the Danish counties; some are further ahead than others are and in parentheses next to his answer for challenge one, he indicated a range of 1-4 because the rates vary considerably among the counties.

The modes show that Canada and Denmark are currently only 'discussing plans' to deal with challenge one, while the other three nations are 'implementing solutions' to deal with the challenge. The lower ranked mode given to Denmark seems odd considering their level of success with the EHR. One Danish respondent stated that *"[during] the last 10 years an intensive programme for implementing IT in [the] primary health sector has taken place, including electronic document Interchange i.e. e-prescriptions, lab reports and many other issues. Today, all partners in [the] primary health sector have IT solutions (health records) and communicate using national MedCom standards."* Perhaps the lower mode can be attributed to a comparison of success between the primary and tertiary sectors; the primary sector success levels with IM/IT are high but the same is not true in the hospitals/tertiary sector in Denmark.

From the questionnaire responses provided, it is evident that figuring out how to involve HCP with IM/IT priorities is still an issue in most countries. All nations have a mode of two or three indicating that they are still dealing with the task of how to engage HCP. Nevertheless, progress is being made, as the parties involved realize that they cannot continue delivering healthcare services the way they are, thus changes for healthcare delivery are inevitable. It is well supported in the literature [34, 36, 46] that without HCP participation and input into IT systems, they inevitably fail and create resentment, frustration and dissatisfaction, yielding a poor work environment and perhaps hostility between IT personnel and HCP. McConnell states *"Change Management principles must be implemented in instituting [IM/IT] in any clinical setting [; furthermore] all stakeholders, including clinicians and patients should be consulted early in the process for successful [IM/IT] management"* [36, p.40]. In addition, without input from HCP, how can systems be designed to fit their needs if developers have no insight from the users? Changes must be made in the health system in order to maintain satisfactory levels of care to the public; IT has been selected as one of the means to ensure that the health system remains sustainable in these five nations. Hence, tools like IT must be usable by HCP or they have a poor return of investment and time.

6.1.2 Challenge Two: Cost efficiency/lack of funding available

Only the New Zealand strategy indicated that a national healthcare IM/IT priority for them is to 'spend money for healthcare IM/IT wisely' and they also felt that establishment of a long-term organizational management design was important. The English do make reference to cost efficiency/funding but it is not viewed as a 'big' issue. Nevertheless, questionnaire respondents from all five countries had comments to share on this subject.

For challenge two, the ranges vary between 3-5 for all countries; the modes were: Canada (3), Australia (3), England (3), Denmark (3,4) and New Zealand (2,3,4). As can be seen from the data, New Zealand respondents and Danish respondents (to a lesser degree) feel quite differently about progress on this issue. Funding tended to evoke a variety of responses. Sometimes enough money is available but that is rarely, as systems require upgrades and maintenance.

A Canadian respondent who answered the questionnaire on a weighted basis stated the following, *"the cost in Canada of an EHR system is [estimated to be] $10 billion. Less than 40% of this has been funded. Therefore, on lack of funding available, the answer came out as a 2 as there currently are no plans to fund the rest."* The costs of maintaining the EHR are not included in this respondent's comments but are certainly a factor to assess for the future because Infoway does not fund the maintenance of its projects, they provide one time funding only.

Another Canadian respondent stated the following with respect to challenge two:

> *Cost Efficiency/Lack of Funding – rated as a '4'. While much talked about ($'s always are), I think the capital funding for the project initiatives is the least of our challenges as a country in this area at the moment, especially with Infoway's recent move to standardize their funding formula's and fund 75% of eligible costs. We are still not all the way there, however, in the sense that we know that significant further EHR funding will be required to complete the vision (add further content areas, extend the reach of the EHR to more community settings and add richer decision support functionality later in the decade). The most*

> *significant concern I have in this area, frankly, is the sustainability of what we are putting in place from a funding perspective – do senior decision makers appreciate the significant ongoing support required to maintain/enhance the technologies we are putting in place so that clinicians will continue to support them? Given the challenges health regions have in supporting existing infrastructure, are we developing sufficient evidence about the hard and soft costs of what we are implementing so that healthcare executives understand the value and will be convinced to place budgetary priority on the sustaining [of] IT investment costs of what we are putting in place over the next few years?*

One Canadian respondent felt that a key challenge Canada faces is *"insufficient dollars [being] devoted to physician automation/support,"* particularly in automating general practitioners. As noted, this is not much of a challenge in Denmark because more than 90% of general practitioners are automated in that nation.

A Danish respondent felt that challenge two varies across the counties. Although his overall rank was two for the challenge, in parentheses he indicated a range of one to five for the various counties. Therefore, some counties are not working on this issue, others are and some may not have to deal with this issue, as they have finished their project implementation and the challenge is no longer a challenge at this point in time. Another Danish respondent indicated that, *"A financial agreement/implementation agreement between the ministry and the counties (hospital owners) ensures a high level of stakeholder involvement [;] 20% of hospital beds are [currently] served by the EHR."*

An English respondent felt that although £6 billion has been committed to the NHS IT plan, there is no clear indication of the benefits. He went further to say that he does not have a full view of the national position and there maybe plans he is unaware of but he did feel that *"plans may have been laid that are unlikely to result in real achievement (e.g. because they are based on untested assumptions)."* This statement highlights the fact that a considerable amount of funding does not ensure cost efficiency or progress. One Australian respondent commented that different funding streams and the governance along with them have been an issue in Australia. In addition, the *Australian National IM and ICTs Strategy* remarked that,

> *There is an urgent need to develop a realistic view on the funding required to deliver health system reform through [IM/IT] in the short to medium term. Relative to other nations, Australia appears to be under-investing, with projected national funding of A $80 million over the next 4 years for lead state rollout of HealthConnect and a budget request of A $2.6 million for 2004 to fund the standing committees and working party activities of NHIG/AHIC. [Nineteen] State government investment[s] in new PAS/CIS systems in the order of A $350 million over the next 2 years should also be considered in this context, as should the Australian Government's A $430 million in incentive payments to GPs to enable them to become computerized. These funding levels are still significantly less than Canada's estimates of an investment of around C $2.5 billion over the next 5 years to get interconnectivity across 50% of its providers. Projected expenditure in the UK is much larger, [28, p. 79] over £6 billion.*

In line with the comments from the Australian strategy, a recent article released by *Government Health IT* commented that Australia's EHR project is underfunded [60]. The article pointed out that Alby Creevey, Asia-Pacific director of health care for SeeBeyond Technology, (SeeBeyond is installing patient registries in several Australian states) believes that the Australian government must spend more than the *A* $128 million that has been allotted for the EHR in Australia. In particular, Creevey felt that the current, planned investment for national health IM/IT priorities does not reflect a 'strong' commitment to privacy and confidentiality challenges or standards, which he believes are integral to successful deployment of the EHR [60].

The feedback provided from the questionnaire respondents (and the Australian strategy) indicates that without funding behind an idea, progress can be slow. Supplying funding is an opportunity for an organization or government body to demonstrate support of a project. Gunasekaran and Garets state that, *"Although many organizations in the manufacturing and financial services have spent upwards of 5 to 10 percent of their total budgets on IT, the healthcare industry has consistently spent around 2 percent of total budget on IT" [59, p.32].* Nations struggle with financial agreements, governance issues and accountability, as indicated by the questionnaire respondents. However, the questionnaire data suggest that these five countries are at a place where at least this financial challenge is included in the strategic plan and solutions are being discussed and/or implemented. Securing funding for IM/IT in healthcare continues to be a

challenge but progress is being made, as indicated by the amount of monetary resources being spent on large-scale healthcare IM/IT priorities such as the EHR.

6.1.3 Challenge Three: Technology limits/research challenges i.e. lack of system designs that supports workflow/business processes and vendors lack of understanding of healthcare

The national health IM/IT priorities of all the five countries indicate an interest in implementing specific systems (e.g. pharmacy, laboratory, registry etc.). Therefore, if current system designs are not 'up to par', these countries could be spending a fortune on systems that will not meet their healthcare delivery needs. The following section describes how the questionnaire respondents felt about challenge three and how they feel the vendor community is doing with product development.

For challenge three, the ranges vary between 2-5; the modes were: Canada (3), Australia (2), England (3), Denmark (3) and New Zealand (4). It is interesting to note that all of the English respondents gave a rank of two or three for challenge three. Thus, there was some agreement amongst the English respondents on challenge three. New Zealand's mode of four (one respondent even ranked challenge three with a five) shows that the New Zealand respondents feel that technology is able to meet their needs and the limits of technology are becoming less of an issue.

A Canadian respondent commented:

> *Technology/Vendor Limitations – I believe we are making good progress in our collective understanding about how to tackle the complex 'inter-operability' challenge that EHRs pose for us. Infoway is continuing [to] work with jurisdictions in evolving the 'architecture blueprint' [which] is very valuable and we are also learning by implementing the first EHR components. We still have a ways to go in understanding how to make all the pieces fit, but especially in engaging the solutions vendor community in the process. I am less worried about the ability of technology to continue to evolve in ways that supports what we need to do in making EHRs a technology reality, than I am in our ability to convince*

> *vendors that we have a common vision as a country and they should invest in re-tooling their products to meet our needs (especially when so many of our IT solutions are developed south of the border). More work needs to be done in adapting technology to providers' workflow (and vice versa), especially in emerging areas such as primary care and chronic disease management.*

As this respondent stated, many of the healthcare IM/IT products used in Canada have been developed by the US where the healthcare system is different with a large privately funded sector. Systems needs in Canada and the US are different but because the US is a much bigger market, due to the large population, product development favors US healthcare IM/IT system needs and most of the companies that produce healthcare IM/IT products are US companies.

As in other challenges, one Danish respondent felt that challenge three varies across the counties. Although his overall rank was three for the challenge, in parentheses he indicated a range of one to four for the various counties.

From the questionnaire comments and quantitative data provided, in general, most respondents noted that their organization has considered the issue of technology limits and research challenges and most have discussed it. Some organizations, such as Cancer Care Ontario in Canada try to use their large size as an advantage to influence technology development to suit their needs. Alberta, with their physician office automation project has implemented product specifications that physician office systems must have in order to be used in Alberta; therefore, requiring vendors to design systems that meet their requirements. England has created means to quickly remove vendors that do not deliver what they stated they would. They also do not fund vendors for service delivery that may have been rendered but not completed (e.g. delivered phase one, therefore payment for phase one was received but only delivered half of phase two, therefore no payment for phase two was received). For instance, the June 1, 2005 edition of E-Health Insider stated that,

> *"NHS IT director-general, Richard Granger, signaled in March that some suppliers were not making the grade and that he was not minded to give them*

> *time to fix systems that did not work. [Therefore,] IDX is to be replaced [by Cerner] as the provider of clinical solutions for the south of England"* [48].

All five countries are discussing and/or implementing means to 'make' vendors design products that meet their needs. However, unless vendors see a clear profit motive in developing effective healthcare technologies, they will not do so. Without the input and assistance from HCP in designing systems, for example, by providing vendors with information on detailed workflow processes or presenting requests for system features that would decrease workload, systems will fail to deliver benefits, as they will not meet the users' needs (and the users are HCP). A glitch in Wal-Mart's product distribution system for example, would not cause irreparable damage to anyone but a glitch in a pharmacy system could cost someone his life if the wrong drug or dosage was prescribed.

6.1.4 Challenge Four: Lack of stakeholder involvement (champions) including lack of support from high-level management (i.e. top-down commitment)/lack of incentives for IT use

The challenge of involving stakeholders was not indicated as a specific stand-alone national health IM/IT priority by any of the countries. However, it is well known in the health informatics community that pushing technology on HCP and 'forcing' them to alter their work processes results in non-use of technology and ultimately system removal. In addition, without leadership and support behind an initiative, 'the troops will surely fall'. Mintzberg believes that human beings need control, consistency and stability [57]. A means of achieving feelings of control and stability is to involve users in the IM/IT implementation process from the beginning. Although, challenge four is similar to challenge one, the literature review findings suggest that the two challenges are different. The questionnaire respondents have articulated their feelings on challenge four below.

For challenge four, the ranges vary between 2-5; the modes were: Canada (2,3,4), Australia (3), England (3), Denmark (4) and New Zealand (2,4). It is interesting to note

that all of the Australian respondents gave a rank of three or four for challenge four. Thus, there was some agreement amongst the Australian respondents on challenge four.

Of the 12 Danish responses, eight ranked this challenge as a four. Thus, it appears that the Danish have been able to achieve progress in involving HCP and senior management in their healthcare IM/IT initiatives. Their achievement with general practitioners in the MedCom project is proof of their success with HCP. In addition, perhaps the fact that the national government allowed the county of Funen (the site of MedCom's creation) to continue to administer the system enabling MedCom to expand across the country, is also proof of the nation's success with challenge four. Although, one Danish questionnaire respondent felt that overall progress in dealing with challenge four is good, he did comment that a range in progress is present in the counties from two to five. For some counties, plans to deal with this issue are underway and for others, it is no longer an issue.

Canada had three modes for challenge four (2,3,4). Thus, it appears that people feel differently about Canadian progress on this challenge. This challenge like all the others is relative in terms of how respondents made comparisons, meaning that a respondent may be comparing the status of HCP and senior level management involvement to the past, perhaps the rest of the country or perhaps to another nation. The 'context' for the basis of a respondents' comparison influence their rankings.

One Canadian respondent gave the following remarks with respect to challenge four:

> *Senior Stakeholder Involvement/Incentives – We have endorsement and funding commitment at the national level at the most senior levels (Deputy Ministers), but need to continue to work with and educate leaders at all levels, especially amongst our health professions and with healthcare CEO's and leaders at the provincial and regional levels. The competition for scarce resources in healthcare is a challenge for us, and decisions makers, clinicians and the public are not yet aware enough of what the benefits of the EHR are at this point in its development. Hence, local funding and the necessary commitment of staff time for IT initiatives within healthcare delivery organizations is often a constraint. The degree of incentives we need to provide to private practitioners remains an*

> *open question. The process being adopted as a country is really quite collaborative (vs. being nationally driven from the top down), but stakeholder involvement at all levels is never enough…*

Another Canadian respondent remarked that, *"Overall progress is being made. Key barriers are: lack of leadership [and] lack of physician involvement."* Thus, he feels that challenge four is still a prominent issue in his healthcare organization. No other qualitative feedback was provided in the questionnaire responses on challenge four.

With respect to challenge four, Anderson et al believe that *"Any new [IM/IT] system should always be the result of an evolutionary process, driven by clinicians and system developers, focusing on the different relationship with the patient rather than a drastic change resulting from an administrative decision" [46, p.168].* This cannot occur without HCP participation in system design, development, rollout, testing, upgrading and use. A paper written by Sittig titled *The Importance of Leadership in the Clinical Information System Implementation Process* has identified that, "[much] research has been done in an attempt to identify the key factors that predict [IM/IT] implementation success" [33, no p.]. Over 150 factors have been identified but only two "top management support" and "user involvement" are consistently associated with successful implementations" [33]. It is reasonable to question why employees would support something like implementation of a new system if their organizational leadership did not. Even if the system were to save them time or workload in the future, they would have to go through the 'growth pains' and changes and human beings generally do not like unstable environments [57]. However, with encouragement from leaders, employees would be more likely to face the forthcoming growth pains with a positive attitude.

6.1.5 Challenge Five: Lack of interoperable/integrated systems i.e. lack of consistent standards/terminology to be able to share data across systems

All of the countries indicated that standards development and implementation is a national priority for their nation. As noted, standards enable communication between

systems. With respect to challenge five, the questionnaire respondents comments' are presented and discussed below.

For challenge five, the ranges vary between 2-4; the modes were: Canada (2), Australia (3), England (3), Denmark (3) and New Zealand (2,4). The modes of the five nations indicate that this challenge continues to be an issue, however most nations are at the point where they are discussing solutions and implementing them where possible, so progress is being made.

One Canadian respondent provided the following insight on challenge five:

> *Inter-operable Systems and Standards – standards (both data and technical) are key to vendors being able to see a 'common market' for solutions (especially across international borders). I feel strongly that standards are essential in our ultimate success in creating the inter-operable EHR – 'middleware' technologies can do wonderful things, but cannot compensate for a lack of standards at the semantic level. An over-reliance on complex technology interfaces will impair our ability to create functionally rich and sustainable EHR solutions. We are making progress on defining the standards challenge and developing ways of working together in the country on standards development/adoption. However, big questions remain about how we are going to govern the development and ongoing maintenance of standards to ensure inter-operability, and about our collective resolve to ensure we are united in convincing vendors to 'step up to the plate' and embed our standards in their solutions.*

One Danish respondent commented that, *"There is a high level of interoperability between hospitals and primary care (70-80% of clinical messages are sent electronically). [However], there is a low level of interoperability between hospital EHRs."* Increasing the interoperability of hospital EHRs is a priority for the Danish health system, as can been seen through the focus of their healthcare IM/IT priorities, which were described above.

The Australian *National Health IM and ICTs strategy* with respect to the funding for the standard development and implementation priority stated the following:

> *While Australian stakeholders agree that standards development is a high priority area, planned investment does not reflect this. In addition, the substantial costs associated with ensuring the adoption of standards, their consistent rollout and ongoing maintenance have not been factored into project profiles or funding arrangements. This misalignment in Australia is reinforced when compared with the approaches adopted by the UK and Canada. The Canada Health Infoway plans emphasize standards development and adoption. Infoway has committed between C$190m and C$240m (approximately 20% of its budget) to the development of architecture and standards over 4 years [according to the Building Momentum 2003/4 Plan]. The UK NHS Information Authority, which is tasked with coordinating national investment in an arguably less complex environment, has an annual budget of approximately A$240m - 255m of which is committed to setting and agreeing standards, service support and health informatics development [according to the NHS Making It Happen (2003) report]. [28, p.50,51]*

The need and use for standards within a country is well documented in Health Informatics literature [34, 35, 36]. Notwithstanding that no questionnaire respondent made mention of the Health Level 7 (HL7) messaging standard, it serves as a good example to highlight international collaboration in standards development. The international committee called the HL7 International Affiliates has been working for several years to develop an international messaging standard for the secure transmission of health information. HL7 is slowly becoming the adopted international messaging standard for hospital information systems messaging. The development of standards is a laborious task but they are the key to linking systems together and enabling HCP more efficient access to health information, so that they may make better knowledge-based decisions for patient care.

6.1.6 Challenge Six: Privacy and confidentiality e.g. patient consent

Privacy and confidentiality were indicated as a national priority for Australia, England and New Zealand in their most recent national health IM/IT strategic plans. Security, was specifically mentioned as a national IM/IT priority for Denmark and New Zealand. However, security was not found to be one of the top six challenges in the systematic literature review but it was number seven. Thus, as questionnaire respondents were not

asked to comment on IM/IT security challenges, this section is reserved to commentary and discussion on privacy and confidentiality of health information only.

For challenge six, the ranges vary between 3-5 values; the modes were: Canada (3,4), Australia (3), England (3), Denmark (1,2,4) and New Zealand (2,3,4). The multiple modes for Canada, Denmark and New Zealand indicate that people feel very differently about the level of success their nation has achieved in addressing this challenge. One Canadian respondent had the following to say about privacy and confidentiality challenges in Canada:

> *Privacy & Confidentiality – we are working our way through the issues and there has been a degree of collaboration between jurisdictions. Conceptually [,] we understand most of the issues, but practically we are still very much at the early stages of operationalizing privacy and confidentiality concepts. There is a good deal of education to do with both providers and the public [.] [We still have] a number of practical issues to work through [such as] determining how frequently patients will want to withdraw consent and how we manage such situations in an electronic world where we are trying to facilitate higher quality [care and] more integrated care delivery through electronic decision support tools that depend on timely and complete information.*

One New Zealand respondent commented that, *"The New Zealand Privacy Act 1993 and the Health Information Privacy Code 1994 are very much a part of the New Zealand culture now. But as [IM/IT] moves at a fast rate, we always need to be working to ensure that any new initiative meets the legislative constraints."*

One English respondent said that, *"Privacy and confidentiality issues have been delayed at [the] national level due to a never-ending debate about opting-in/opting-out."* The idea behind opting in/opting out centers around whether an individual chooses to have his personal health information kept in an EHR and concerns the 'nature' of the information that will be kept (e.g. perhaps just medication and allergy information or one's entire health history). The English respondent feels that, *"everyone knows that an opt-out is technically impossible under the proposed systems architecture and business model."* The June 20, 2005, E-Health Insider Primary Care reported that the opt-in/opt-out debate

in England continues. The issue of opt-in vs. opt-out is also a concern in Australia, as noted by *Government Health IT* in a recent article that highlighted Anna Johnston's, (chairwoman of the Australian Privacy Foundation) concerns that Australian privacy laws at the national level are not 'up to par' in their ability to protect the confidential health information contained in EHRs. In contrast to the above noted questionnaire respondent, Anna Johnson is a supporter of the opt-in for EHRs provision rather than the opt-out provision. According to the *Government Health IT* article, the opt-in model is "today's stronger [provision]." [60] The challenge of opt-in/opt-out for EHRs is an International issue that all five nations have to address, as the implementation of EHRs is a national priority for all of them.

In addition to comments noted earlier about Australia's 'planned investments', the Australian IM and ICTs strategy further commented that,

> *It is difficult to reach a conclusion about authentication and access control. These are recognized as critical capabilities in achieving desired privacy consent outcomes, but funding the technical requirements does not appear to have been a priority here or overseas. [28, p.51]*

Privacy and confidentiality were not mentioned as a national health IM/IT priority for Infoway because Infoway has made privacy and confidentiality a jurisdictional responsibility. Canada, however, has national and provincial legislation for the protection of personal health information, whether that is electronic information or paper-based information primarily through the federal Privacy Act and the Personal Information Protection and Electronic Documents Act (PIPEDA). The two acts jointly cover both public and private organizations with respect to all forms of personal information including personal health information. Access to personal information is legislated under the federal Access to Information Act.

The Canadian provinces of Manitoba and Alberta have seen the need for specific legislation to deal with health information privacy and have gone farther by enacting

legislation that focuses specifically on health information privacy. However, Alberta had to 'pull' their legislation for revisions because it was seen to be impeding healthcare delivery. Saskatchewan is also developing provincial legislation to specifically deal with the protection of health information.

Australia has a Federal Privacy Act 1998 like Canada and a Privacy Amendment Act 2000 that covers the private sector and HCP, as well as a National Privacy Code that deals with access to personal information [47].

New Zealand's privacy legislation is "well-developed" according to the WAVE strategy. New Zealand has the Privacy Act 1993 based on Organization for Economic Co-operation and Development (OECD) principles and the Healthcare Information Privacy Code 1994/6 for the health sector.

The UK has the Data Protection Act 1998, which is a European Union Directive that extends protection to certain manual records (including health records), also enables and strengthens the right of individuals to access data. It does not cover annonymized data but does address trans-national data transfer. [47]

In Denmark,

> *The Law on Patients' Legal Status regulates the way patient related information must be handled in the Danish healthcare service. The ruling principle is that health information can only be communicated with the patient's approval. There is an exception, though, which ensures that healthcare professionals involved in an actual episode of care will normally have access to pertinent information. [41, p.30]*

The questionnaire feedback, in agreement with the systematic literature review findings, echoes that privacy and confidentiality are significant challenges. It is evident that nations are having difficulty with devising solutions to address these challenges. Developing and implementing privacy and confidentiality legislation is the first step; however, what is the point of legislation if the people who the legislation affects are

unaware of its existence, importance and consequences? Speaking from work and volunteer experiences in the healthcare sector, it is amazing how much unauthorized health information I have been exposed to. Thus, a greater effort needs to be made in educating HCP and healthcare employees on their responsibilities to protect the sensitivity of health information and maintain patient privacy and confidentiality. In addition, more effort is needed to educate the public on their rights with respect to their personal information. The five nations included in this study are certainly making progress in dealing with privacy and confidentiality challenges, which will always be present, as protection of privacy and confidentiality is a necessity.

6.1.7 Final Observations

In addition to the qualitative feedback discussed above, several respondents provided further insight into the healthcare IM/IT implementation challenges their nation is addressing. One English respondent felt that, *"It is worth noting that implementation [of healthcare IM/IT] in England has only just started so for some of us, progress could be higher whilst for others, it will be lower."* Another English respondent commented, *"Progress to date [on all priorities] has been slow and steady, rather than dramatic."*

In agreement with the respondents, McConnell, in his 2004 *International efforts in implementing national health information infrastructure and electronic health records* article observed that,

> *Implementing an EHR on a national scale is a much greater challenge as has been witnessed by the UK in implementing its [CfH programme], for which [the] EHR is a major priority. [The] EHR is in use however in <5% of UK hospitals and the deadline for full implementation has been extended until 2010" [36, p.39].*

Progress levels appear to be behind the 'ambitious' targets originally anticipated in England, as national health IM/IT planning and priority implementation are a recent phenomenon.

One Australian respondent stated the following:

> *There are different issues and challenges at different levels in the healthcare system in Australia [; for] example, segmentation of the industry by level of government, public and private facilities, different funding streams, clinical domain governance arrangements, [and] case [manager/advisor status]. These all introduce opportunities for development or constraints at relationship boundaries. Depending on where the good progress in [IM/IT] implementation is being made in some areas – for example State Public Health Service system integration – progress is slower in others – for example at the interface between public and private sector service provision.*

This comment highlights that each nation has other challenges to address based on their governance structure, historical background and healthcare hierarchy for instance, in addition to the multitude of challenges that are common to healthcare IM/IT implementations.

In summary, this study has identified the national health IM/IT priorities of five countries, reviewed the literature for the challenges that organizations face when implementing IM/IT into healthcare settings, and examined the opinions of a number of individuals (from the five countries) as to how 'well' they feel their nation has addressed the top challenges uncovered in the literature review.

Consequently, the findings have revealed the fact that nations continue to battle with many challenges to implementing IM/IT priorities into healthcare but they are making progress. For example, the EHR is seen as a solution to enable health information 'to move' with patients and the HCP; though there are concerns in how to involve HCP in the IM/IT deployment process and how to 'prepare' the organization to manage the forthcoming changes cause by such product implementations, as recognized by challenge one and to some degree challenge four, which focused on HCP involvement and high level management support. Although Denmark has achieved widespread success in the primary care field with 'HCP involvement', as this study identified that more than 90% of Danish general practitioners use the nation's MedCom system (i.e. the primary care EHR), change management and HCP training are nevertheless a priority for Denmark and

three other nations (who have not achieved such high levels of success with HCP involvement), as the Danish are now working on achieving similar levels of success in their hospital sector. Thus, to address the HCP involvement challenge, a suggestion would be to have HCP participate in joint forums, works sessions and focus groups with vendors to give the vendor community information on what they, the 'health technology users' would like health IM/IT to accomplish for them.

Even though, a lack of funding has historically been seen as a challenge to moving health IM/IT forward as recognized by challenge two, the five nations examined have allocated funding to IM/IT projects (although the amounts for Denmark and New Zealand are unknown), the strongest commitment being from England with a £6 billion allotment. It is important to note that a political element will always remain with the allocation of funds to IT projects, as noted by Dufner et al. Given the data collected and the findings from this research study, nations of the world would be wise to assess whether their funding allocation principles follow evidence based healthcare needs or political aspirations. With respect to this statement, one questionnaire respondent noted that they were not sure that the funding provided for health IM/IT priorities in their country had a clear indication of the benefits that such a costly project would bring for the public.

There are still issues with the methods in how funds are allotted to priorities for some nations, as demonstrated by Australia, who faces a challenge with a lack of monetary support behind standards development and implementation. Standards have been recognized as a top priority by all five nations and as challenge five. The literature review and the questionnaire respondents both pointed out that standards are key to system integration, interoperability and the ability to share health data. In addition, there have been continuing questions in England about why the electronic booking system has been given such a high priority considering the many other health IM/IT needs in the country.

Further to the importance of standards development on the national scale is development at the global scale (e.g. HL7). Even after standards are created and deployed, efforts

need to be made to persuade vendors to design products that adhere to those standards. One way to 'pressure' private companies is to refuse to do business with them if they do not meet organizational system needs. England and the province of Alberta in Canada have achieved some success in 'persuading' vendors to meet their system and/or usability requirements as acknowledged in this study.

The five nations studied are making some progress with challenge three in terms of vendors and system design/development but this area needs more work as indicated by the thesis study findings. The health informatics and healthcare community would be wise to band together in order to 'further' influence vendors to produce quality products that will enable better implementation of IM/IT priorities such as the EHR, registries/indexes, physical infrastructure components and medication systems, which have been identified as top priorities by the nations studied. In support of this, one questionnaire HCP respondent wrote: *"the IT professionals & the lousy products many foist on regrettably naïve clinicians"* is a major challenge to moving healthcare IM/IT forward.

Privacy and security issues were recognized as priorities for four of the five nations and challenges six and seven identified them as top issues. Questionnaire respondents indicated that privacy and confidentiality challenges continue to be difficulties under challenge six. Although New Zealand and Canada have made good progress in dealing with these issues, they remain continuous and are very complex. The other three nations have also achieved some success with this challenge as well, for example, with privacy legislation development, although Canada and New Zealand appear to be ahead with legislation implementation. There are trade-offs to be made when trying to strike a balance between providing healthcare services and maintaining patient privacy and confidentiality. Trying to achieve this balance is in itself a challenge for the healthcare industry, as the solution is complicated and reflective of individual morals, ethics and culture. This area of health informatics could greatly benefit from further international collaboration and discussion, as some questionnaire respondents stated that their organizations just do not know what to do to address privacy and security challenges.

Some countries also identified unique challenges they encounter such as geography for Australia and Canada and governance, which tended to be a common issue for all five nations. All of the challenges discussed above pose obstacles to achieving successful national health IM/IT priority implementations.

CHAPTER 7

7.1 STUDY LIMITATIONS

Better records should have been kept of inclusion/exclusion criteria when the literature reviews were being conducted. The questionnaire itself could have been improved had it been pre-tested. One improvement would have been to specify which document(s) respondents should have used for answering the questionnaire (this would depend on their home country) as for these five countries, all of the national health IM/IT strategic plans are publicly available on the Internet. More direction for the questionnaire respondents on qualitative feedback would have been beneficial instead of just requesting comments. The challenges should have been further defined and elaborated upon in the questionnaire to ensure a sense of mutual understanding of what exactly was being asked of the participants. The questionnaire should have been centered around priorities instead of challenges. In addition, a definition of what a strategic plan is should have been provided in the questionnaire to ensure that participants had the same interpretation of a strategic plan.

Two questionnaire respondents found the rating scale open to interpretation and a bit limited in differentiation, thus the rating scale could have been further elaborated upon. In addition, the rating scale explanations could have been better related to the questions posed. Two of the questionnaire respondents found the questionnaire difficult to answer not because of the questionnaire itself but because of the multitude of IM/IT strategic plans at various levels across their healthcare system and the fact that it is hard to answer what was being asked in the questions, as national perspectives are difficult to judge.

CHAPTER 8

8.1 CONCLUSIONS

This study posed three research questions (section 1.4). In response to the questions and as a means of answering them, the thesis study began with a selection process to choose five countries for comparison based on their national health IM/IT 'priorities'. A set of measures to select four countries from 10, in addition to Canada was developed. The five countries' (Canada, Australia, England, Denmark and New Zealand) national level IM/IT priorities were described and compared for similarities, differences and unique qualities, in response to research question one. A systematic literature review of the challenges to overcome for successful implementation of IM/IT into healthcare settings (with a focus on IM/IT priority implementation) was performed to answer research question two. The systematic literature review uncovered a large number of challenges that the health informatics and healthcare community face when attempting to implement IM/IT into healthcare settings. A questionnaire highlighting the more pressing and widely discussed challenges that restrict the implementation of these priorities was sent out to a variety of respondents in each of the five countries being studied. Participants were asked to give their opinion on the progress their country has achieved in dealing with the top six challenges to implementing IM/IT priorities into their healthcare organizations in response to research question three. The questionnaire results were examined, incorporating both quantitative and qualitative data from the participants.

The priority comparison highlighted that there is no right or wrong answer for what countries should focus their national health IM/IT energies upon. The findings indicate that nations focus their resources (time, money, personnel etc.) on the priorities they feel they should, whether those stem from needs analyses or politics. However, by learning about what other nations are prioritizing, a country can use that knowledge to help focus their own national health IM/IT priorities.

The questionnaire results drew attention to the most frequently encountered challenges the five countries face in moving their national health IM/IT agendas forward. The feedback from the respondents provided individual reflections on how IM/IT implementations are actually progressing in their country, where problems are being encountered, including the nature of those problems, and in some cases, respondents offered insight on how to better deal with the challenges they face. The findings indicate that nations encounter similar problems when implementing IM/IT into healthcare settings.

McConnell states that,

> The policy development and implementation at a national level is often done with little or no reference to best practice or lessons learned in other countries, despite the many overlapping issues inherent in the development of national eHealth strategies. Indeed very few conferences have dealt with this important issue and it appears to us that there is much to learn from each other as we are now faced with the development of national and regional health information and educational strategies in many countries" [36, p.33].

The purpose of this study was to increase awareness and education in this area and highlight the value in collaborating globally. At the 2005 Healthcare Computing Conference, it was noted that an attitude of 'our way is better and your way does not apply to us' still exists between nations and within some peoples' minds. As evident from the questionnaire responses and qualitative feedback, progress in implementing technology for healthcare varies across countries, as does progress in minimizing the effects of challenges on healthcare IM/IT priorities' implementation progress. In addition, what works for one country/province/region/area will unlikely be a 'perfect' fit for another; but without investigating, how can one truly know that an initiative will not work to some degree for their region? Currently, the world is facing many of the same healthcare system issues: shortages of HCP, long surgical and diagnostic imaging waitlists, 'skyrocketing' pharmaceutical drug pricing, healthcare funding practices, and challenges with implementing healthcare IM/IT priorities to name a few. If countries are facing similar health system problems, then it would be logical to assume that solutions

to deal with such problems would be similar across nations; but how would the countries know if they do not share and collaborate with one another?

Lastly, McConnell stated that, "Efficiency, quality of care and medical error along with new opportunities presented by the technologies themselves has driven [the development of national strategies to implement IM/IT into healthcare] internationally," [36, p.33] as was said at the end of section 1.1. The findings from this study support this statement as the nations examined identified IM/IT as their means to improve the quality and efficiency of care. In fact, every national health IM/IT strategic plan studied, identified that the reason they were investing in IM/IT priorities and the very purpose of their 'substantial' efforts was to improve quality and efficiency of care for patients. Further support for McConnell was acknowledged in this study as medication systems were revealed to be a priority for three of the five nations, indicating that medical errors are a concern and they can be reduced through the use of IM/IT.

Thus, the question of how to move the national healthcare IM/IT agenda forward arises. The findings from this study will be published, so that it may be accessible to other nations and individuals. It is recommended that international fora and conferences be held to further discuss the types of health system IM/IT priorities that countries are implementing at a nation scale, the kinds of challenges they face and the solutions or conclusions that they have formulated in response to their challenges.

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TABLES APPENDIX

Table 1: Relevant Journals in PubMed Index – Alphabetical Order (Only journals with a publication End Date post-1999 are included)

Journal Title and Country	Publication Start Year	Publication End Year	Publisher
21st century science & technology (US)	1988	Continuing	21st Century Science Associates
AMIA ... Annual Symposium Proceedings	2003	Continuing	AMIA
Annual meeting of International Society of Technology Assessment in Health Care (US)	1994	Continuing	International Society of Technology Assessment in Health Care
Behaviour & information technology (ENG)	1982	Continuing	Taylor & Francis
BMC Medical Informatics and Decision Making (ENG)	2001	Continuing	BioMed Central
Harvard journal of law & technology (US)	1988	Continuing	Harvard Journal of Law & Technology
Health Care Strategic Management (US)	1983	Continuing	Business Word
Health Information and Libraries Journal (ENG)	2001	Continuing	Blackwell Science Ltd.
Health Information Management : Journal of the Health Information Management Association of Australia (AU)	1994	2000	The Association
Health management technology	1994	Continuing	Argus Business
Health reports / Statistics Canada, Canadian Centre for Health Information (CAN)	1998	Continuing	Statistics Canada
Health technology assessment (US)	1994	Continuing	U.S. Dept. of Health and Human Services
Health technology assessment (Winchester, England) (ENG)	1997	Continuing	National Co-Ordinating Centre For Hta
Healthcare Informatics : the Business Magazine for Information and Communication Systems (US)	1990	Continuing	McGraw-Hill
HIM (Health Information Management) Journal (AU)	2001	Continuing	HIMAA
IDEA The Journal of Law and Technology	1957	Continuing	Published by the PTC Research Foundation of the

			Franklin Pierce Law Center
Information Sciences (US)	1968	Continuing	North-Holland [etc.]
International Journal of Medical Informatics (IRE)	1997	Continuing	Elsevier Science Ireland Ltd.,
International journal of technology assessment in health care (ENG)	1985	Continuing	Cambridge University Press
International Journal of Technology Management (SWITZ)	1986	Continuing	Inderscience Enterprises
Issues in science and technology (US)	1984	Continuing	University of Texas at Dallas
Journal of Biomedical Informatics (US)	2001	Continuing	Academic Press
Journal of Healthcare Information Management (US)	1998	Continuing	Healthcare Information and Management Systems Society (HIMSS)
Journal of research of the National Institute of Standards and Technology (US)	1988	Continuing	U.S. National Institute Of Standards And Technology
Journal of the American Health Information Management Association (US)	1991	Continuing	AHIMA
Journal of the American Medical Informatics Association (JAMIA) (US)	1994	Continuing	Hanley & Belfus
Journal of the American Society for Information Science (US)	1970	2000	Wiley
Journal of the Institute of Health Record Information and Management (ENG)	1994	Continuing	The Institute
Long Range Planning (ENG)	1968	Continuing	Pergamon Press
Measurement science & technology (ENG)	1990	Continuing	IOP Pub.
Medical Informatics and the Internet in Medicine (ENG)	1999	Continuing	Taylor & Francis
Medinfo (NETH)	1974	Continuing	IOS Press
Methods of Information in Medicine (GER)	1962	Continuing	F K Schattauer Verlag
PDA journal of pharmaceutical science and technology (US)	1994	Continuing	Pda (Parental Drug Association)
Pharmaceutical development and technology (US)	1996	Continuing	Marcel Dekker
Pharmaceutical science &	1998	Continuing	Elsevier Science

technology today (NETH)			
Radiologic technology (US)	1963	Continuing	American Society Of Radiologic Technologists
Studies in Health Technology and Informatics (NETH)	1991	Continuing	IOS Press
Technology and culture (US)	1959	Continuing	Johns Hopkins University Press
Technology and healthcare (NETH)	1993	Continuing	IOS Press
Technology in society (US)	1979	Continuing	Pergamon
The Journal of pharmacy technology (US)	1985	Continuing	Harvey Whitney Books
The Practitioner (ENG)	1868	Continuing	Morgan Grampion Publishers
Topics in Health Information Management (US)	1992	2003	Lippincott Williams & Wilkins

Table 2: PubMed Journal Article Index Search

Search Term Used	Limits	Number of Hits
SEARCH 1		
Information	Language = English	78
Practitioner	Language = English	17
Informatics	Language = English	16
Health information	Language = English	13
Medical Informatics	Language = English	8
Technology	Language = English	4
Strategic	Language = English	2
Health Care Information	Language = English	1
SEARCH 2		
Plan AND Information Technology	Language = English	385
Strategic Planning AND Health Information	Language = English	378
E-Health	Language = English	201
Strategic AND Plan AND Health Information	Language = English	131
National Information Technology Priorities	Language = English	40
Strategic Plan AND Information Technology	Language = English	36
National Strategic Plan AND Health Information	Language = English	24
National Strategic Plan AND Priorities	Language = English	22

Table 3: Relevant Journals in Proquest Index – Alphabetical Order

Journal Title and Country	Publication Start Year	Publication End Year	Publisher
American Journal of Public Health (US)	1992	Continuing	American Public Health Association
Australian and New Zealand Journal of Public Health (AU)	1997	2001	Public Health Association of Australia
Canadian Healthcare Manager (CAN)	1996	Continuing	Rogers Publishing Ltd.
Computer Technology Review (US)	1992	Continuing	West World Publications, Inc.
European Journal of Information Systems (UK)	1999	Continuing	Palgrave Macmillan Limited
Frontiers of Health Services Management (US)	1987	Continuing	Health Administration Press
GP (ENG)	2003	Continuing	Haymarket Business Publications Ltd.
Health Affairs; Chevy Chase (US)	1994	Continuing	The People to People Health Foundation, Inc., Project HOPE
Health Care Financing Review (US)	1987	Continuing	Superintendent of Documents
Health Care Management Review (US)	1992	2004	Lippincott Williams & Wilkins
Health Care Management Science (NETH)	1999	Continuing	Springer Science & Business Media BV
Health Care Strategic Management (US)	1991	Continuing	Health Care Strategic Management
Health Data Management (US)	1998	Continuing	Thomson Media
Health Facilities Management (US)	2004	Continuing	Health Forum Inc.
Health Forum Journal (US)	1987	2003	The Healthcare Forum
Health Industry Today (US)	1992	2001	Business Word Inc.
Health Management Technology (US)	1987	Continuing	Nelson Publishing
Health Policy and Planning (ENG)	1999	Continuing	Oxford University Press
Health Services & Outcomes Research Methodology (NETH)	2000	Continuing	Springer Science & Business Media BV
Health Services Management Research (ENG)	2001	Continuing	Royal Society of Medicine Press Ltd.
Healthcare Executive (US)	1991	Continuing	Health Administration Press
Healthcare Financial Management (US)	1987	Continuing	Healthcare Financial Management

			Association
Hospitals & Health Networks (US)	1998	Continuing	Health Forum Inc.
Information Executive (US)	1998	2003	Association of IT Professionals
Information Management & Computer Security (ENG)	1995	Continuing	MCB UP Limited
Information Management Journal (US)	1988	Continuing	Association of Records Managers and Administrators
Information Resources Management Journal (US)	1993	Continuing	Idea Group Inc.
Information Systems and eBusiness Management (US)	2003	Continuing	Springer-Verlag New York, Inc.
Information Systems Management (US)	2004	Continuing	Auerbach Publications
Information Systems Research (US)	1999	Continuing	Institute for Operations Research and the Management Sciences
Information Technology & Libraries (US)	1987	Continuing	American Library Association
Information Technology & Management (NETH)	2000	Continuing	Springer Science & Business Media BV
Information Technology & People (ENG)	1995	Continuing	MCB UP Limited
Information Technology Leaning and Performance Journal (US)	1998	Continuing	Organizational Systems Research Association
Information Today (US)	1987	Continuing	Information Today, Inc.
Information World Review (ENG)	1996	2002	Learned Information (Europe) Ltd.
InformationWeek (US)	1995	Continuing	CMP Media LLC
Inquiry - Excellus Health Plan (US)	1997	Continuing	Blue Cross and Blue Shield of the Rochester Area
International Journal of Health Care Finance and Economics (NETH)	2001	Continuing	Springer Science & Business Media BV
International Journal of Health Care Quality Assurance (ENG)	1992	Continuing	MCB UP Limited
IT Health Care Strategist (US)	1992	2002	Aspen Publishers, Inc.
Journal of Enterprise Information Management (ENG)	1992	Continuing	MCB UP Limited

Journal of Global Information Management (US)	2003	Continuing	Idea Group Inc
Journal of Global Information Technology Management (US)	2001	Continuing	Ivy League Publishing
Journal of Health and Human Services Administration (US)	2000	Continuing	Southern Public Administration Education Foundation
Journal of Health Care Finance (US)	1992	Continuing	Aspen Publishers, Inc.
Journal of Health Organization and Management (ENG)	1992	Continuing	MCB UP Limited
Journal of Health Politics, Policy and Law (US)	1997	2000	Duke University Press
Journal of Healthcare Management (US)	1987	Continuing	Health Administration Press
Journal of Information Systems (US)	2003	Continuing	American Accounting Association
Journal of Information Technology (ENG)	1996	Continuing	Palgrave Macmillan Limited
Journal of Management Information Systems (US)	1992	2001	M. E. Sharpe Inc.
Journal of the American Society for Information Science and Technology (US)	1999	Continuing	Wiley Periodicals Inc.
Knowledge and Information Systems (ENG)	2002	Continuing	Springer-Verlag New York, Inc
Leadership in Health Services (ENG)	1999	2001	MCB UP Limited
Managed Healthcare Executive (US)	1997	Continuing	Advanstar Communications, Inc.
Medical Design Technology (US)	2002	Continuing	Reed Business Information, a division of Reed Elsevier, Inc
Modern Healthcare (US)	1999	Continuing	Crain Communications, Incorporated
Online Information Review (ENG)	1998	Continuing	MCB UP Limited
Pharmaceutical Technology (US)	1998	Continuing	Advanstar Communications, Inc.
Pharmaceutical Technology Europe (US)	2000	Continuing	Advanstar Communications, Inc.
Physician Executive (US)	2004	Continuing	American College of Physician Executives
Quality Management in Health Care (US)	1998	2004	Lippincott Williams & Wilkins

Strategic Change (US)	1999	Continuing	Wiley Periodicals Inc.
Strategic Direction (ENG)	1995	Continuing	MCB UP Limited
Strategic Management (US)	1988	Continuing	Wiley Periodicals Inc.
Technology Analysis & Strategic Management (ENG)	1997	2000	Carfax Publishing Company
Technology review (US)	1987	Continuing	Technology Review, Inc.
The Health Care Manager (US)	1987	2003	Aspen Publishers, Inc.
Topics in Health Information Management (US)	1998	2003	Lippincott Williams & Wilkins
Topics in Health Information Management (US)	1998	2003	Lippincott Williams & Wilkins
Wall Street & Technology (US)	1992	Continuing	CMP Media LLC

Table 4: Proquest Article Index Search

Search Term Used	Limits	Number of Hits
SEARCH 1		
Technology	Language = English	92
Information	Language = English	81
Health	Language = English	52
Strategic	Language = English	11
Healthcare	Language = English	9
Practitioner	Language = English	2
Informatics	Language = English	1
SEARCH 2		
Plan AND Information Technology	Language = English	5492
E-Health	Language = English	460
National Information Technology Priorities	Language = English	266
National Strategic Plan AND Priorities	Language = English	176
Strategic Planning AND Health Information	Language = English	34
Strategic AND Plan AND Health Information	Language = English	22
National Strategic Plan AND Health Information	Language = English	6
Strategic Plan AND Information Technology	Language = English	6

Table 5: Relevant Journals From Thesis Supervisor Search

Journal Title and Country	Publication Start Year	Publication End Year	Publisher
The British Journal of Healthcare Computing & Information Management	1984	Continuing	BJHC Limited
Healthcare Information Management and Communications Canada	1987	Continuing	Healthcare Computing & Communications Canada Inc.

Table 7: PubMed Journal Article Index Search – Challenges, Barriers and/or Issues

Search Term Used	Limits	Number of Hits
Challenges AND Health Informatics	Language = English	170
Challenges AND Healthcare AND Information Technology Implementation	Language = English	18
Electronic Health Records AND Implementation	Language = English	230
Barriers AND Healthcare AND Information Technology Implementation	Language = English	22

Table 8: Proquest Article Index Search - Challenges, Barriers and/or Issues

Search Term Used (Jan 6, 2005)	Limits	Number of Hits
Challenges AND Health Informatics	Language = English	12
Challenges AND Healthcare AND Information Technology Implementation	Language = English	15
Electronic Health Records AND Implementation	Language = English	83
Barriers AND Healthcare AND Information Technology Implementation	Language = English	9

Table 9: Concept Matrix of Challenges, Barriers an/or Issues to Overcome for Successful Implementation of IM/IT into Healthcare Organizations

This large table is included in a pocket at the back of the thesis.

Table 11: Questionnaire Results

Country	Organization	CH.1	CH.2	CH.3	CH.4	CH.5	CH.6
Canada 1	Canada Health Infoway	2	2	2	2	2	3
Canada 2	Capital Health Authority	4	3	3	4	3	5
Canada 3	Alberta Healthcare Organization	2	4	4	0	4	4
Canada 4	Canada Health Infoway + Doctor	1	1	1	2	2	4
Canada 5	BC Ministry of Health Services	1	2	0	1	2	1
Canada 6	Calgary Health Region + Doctor	4	3	4	4	3	4
Canada 7	Saskatchewan Health	2	4	3	3	2	3
Canada 8	Alberta Health and Wellness	3	3	3	3	3	3
Range		1-4	1-4	0-4	0-4	2-4	1-5
Mode		2	3	3	2,3,4	2	3,4

Country	Organization	CH.1	CH.2	CH.3	CH.4	CH.5	CH.6
Australia 1	National E-Health Transition Authority	N/A	3	3	4	4	2
Australia 2	Australian University	1	1	1	3	3	3
Australia 3	Australian University + Doctor	3	3	2	3	3	4
Australia 4	Cochrane Consumer Network + Doctor	3	3	2	3	3	3
Australia 5	Department of Human Services Victoria and NHIG + Doctor	3	4	2	4	3	3
Australia 6	Department of Health and Aging	2	2	2	2	3	3
Range		1-3	1-4	1-3	2-4	3-4	2-4
Mode		3	3	2	3	3	3

Country	Organization	CH.1	CH.2	CH.3	CH.4	CH.5	CH.6
England 1	NHS Strategic Health Authority	2	3	2	4	3	3
England 2	NHS Primary Care Trust	3	3	3	2	3	3
England 3	NHS Modernisation Agency	3	3	2	2	3	3
England 4	NHS Modernisation Agency + Doctor	3	3	2	3	4	4
England 5	NHS Information Authority	2	2	3	3	3	4
England 6	NHS Trust	1	0	3	0	3	2
England 7	NHS Trust	1	2	2	4	3	3
England 8	NHS Strategic Health Authority	3	3	3	3	3	2
England 9	Previous affiliation - English Universities	2	4	3	4	4	4
England 10	NHS Primary Care Trust	3	2	3	3	3	3
Range		1-3	0-4	2-3	0-4	3-4	2-4
Mode		3	3	3	3	3	3

Country	Organization	CH.1	CH.2	CH.3	CH.4	CH.5	CH.6
Denmark 1	National Board of Health + Doctor	3	4	3	4	3	3
Denmark 2	Danish University	2	3	2	1	2	4
Denmark 3	Danish University + Nurse	2	3	3	4	3	4
Denmark 4	Danish University + Private Health sector HCP	2	3	3	3	3	4
Denmark 5	County Health Department	4	4	4	3	2	2
Denmark 6	Danish Hospital	1	3	1	2	2	1
Denmark 7	Danish Teaching Hospital + Registered Nurse	3	3	3	4	2	2
Denmark 8	Danish Hospital + Doctor	2	1	3	4	3	1
Denmark 9	Copenhagen Hospital Corporation	2	2	3	4	3	5
Denmark 10	Med. Informatics & Quality Development	2	4	2	4	3	2
Denmark 11	Med. Informatics & Quality Development	3	4	3	4	3	1
Denmark 12	Danish Centre for Health-Telematics	5	4	4	4	5	5
Range		1-5	1-4	1-4	1-4	2-5	1-5
Mode		2	3,4	3	4	3	1,2,4

Country	Organization	CH.1	CH.2	CH.3	CH.4	CH.5	CH.6
NZ 1	NZ University + Doctor	3	4	5	5	5	3
NZ 2	NZ University	3	2	4	3	4	4
NZ 3	NZ District Health Board	3	3	3	2	3	2
NZ 4	NZ District Health Board	3	3	2	2	2	2
NZ 5	NZ District Health Board + Doctor	3	2	4	4	4	3
NZ 6	NZ Ministry of Health	4	4	4	4	2	4
Range		3-4	2-4	2-5	2-5	2-5	2-4
Mode		3	2,3,4	4	2,4	2,4	2,3,4

Rating Explanation:

0 – The challenge is not included in the strategic plan

1 – The challenge is included in the strategic plan but no progress to date

2 – The challenge is included in the strategic plan, it is currently being discussed and plans to deal with the issue are being drafted

3 - The challenge is included in the strategic plan, it has been discussed and solutions to deal with the issues are currently being implemented

4 – Modest progress (at least 50%) on the challenge has been achieved

5 – The challenge is no longer an issue as project work has been completed

APPENDIX

APPENDIX A: COUNTRY NOTES FOR THESIS

1. **Africa** – April 1999 HealthCare Informatics Online – Project OXYGEN linking services to Africa from Europe
    - July 1998 – WHO telehealth projects in South Africa, Thailand, and Latin America
2. **Argentina** - Checked MOH page – Not in English
3. **Austria** – Checked MOH – Not in English
    - November 2000 HealthCare Informatics Online – Hospital Discharge Process improvements
4. **Australia** – July 2000 HealthCare Informatics Online – Search for strategies to bring Australians together
    - November 2000 HealthCare Informatics Online – Australia automates discharge process
    - January 1999 HealthCare Informatics Online – Telemedicine article
    - January 1999 HealthCare Informatics Online – News Brief online claims processing program
    - June 1998 HealthCare Informatics Online – Eye surgery technology article
5. **Belgium** - Checked MOH page – Not in English
6. **Brazil MOH** – Not in English
    - Brazil - August 2000 HealthCare Informatics Online article*
7. **Brunei MOH** - Nothing
8. **Bulgaria** - Checked MOH page – Not in English
9. **Caribbean** – June 1998 HealthCare Informatics Online – Telemedicine article
10. **China** - July 2000 HealthCare Informatics Online – blurbs
11. **Croatia** - Checked MOH page – Publications not in English
12. **Cyprus** - Checked MOH page – *"Information Systems Strategy Study for the MOH"*

13. **Czech Republic** - Checked MOH page – Not in English
14. **DENMARK** – Have Stuff
15. **Estonia** - Checked MOH page – Not in English
16. **Finland** – Checked MOH page - No relevant publications
    - Found website – *Finnish Office for Healthcare Technology Assessment – telehealth report*
    - **SHIFTEC** – not much in English online
    - August 1999 HealthCare Informatics Online – Finland National Database Article
17. **France** - August 1999 HealthCare Informatics Online – French Paperless hospital
18. **Georgia** - Checked MOH page – One webpage on "Reorientation of the Health Care System in Georgia"
    - March 2000 HealthCare Informatics Online – Telemedicine
19. **Germany** - Checked MOH page – No relevant publications
    - August 1999 HealthCare Informatics Online – German Smart Card technology
20. **Greece** - Checked MOH page – No relevant publications
21. **Hungary** - Checked MOH page – *"Health and Social Services in Hungary" and "e-health the Hungarian Perspective ppt"*
    - April 1999 HealthCare Informatics Online – PharmaFELAX project
22. **Iceland -** Checked MOH page – Publications not in English
23. **India** - October 1999 HealthCare Informatics Online – HC Informatics begins to grow
24. **Indonesia MOH** – Not in English
25. **IRELAND** – Have Stuff
    - August 1998 HealthCare Informatics Online – Ireland hospital and IT
26. **Italy** - Checked MOH page – Not in English
27. **Japan** – August 1998 HealthCare Informatics Online – Japan and the CPR
28. **Kenya** - Checked MOH page – no relevant publications
29. **Korea** – July 2000 HealthCare Informatics Online - blurbs

30. **Latvia** - Checked MOH page – Not in English
31. **Lithuania** - Checked MOH page – Not in English
32. **Luxembourg** - Checked MOH page – No relevant publications
33. **Malaysia** – found links to the following 6 MOH websites from Malaysia site
    - Malaysia – April 2000 HealthCare Informatics Online – Telemedicine 2000 project
    - Vision 2020 homepage
34. **Malta** - Checked MOH page – No relevant publications
35. **Myanmar MOH** – Have a National Health Plan – A Health Systems Development Programme is a component of the plan
36. **Netherlands –** Checked MOH page – 2001 strategy that mentions importance of ICTs and electronic health interventions but that's all *(HAVE A PUBLICATION)*
37. **New Zealand** – Jan 2001 HealthCare Informatics Online – article on New Zealand's intranet service
38. **Norway** – Checked MOH page – No relevant publications
39. **Peru, Argentina, Ecuador** - August 2000 HealthCare Informatics Online – blurbs
    - Peru – March 1999 HealthCare Informatics Online – News brief – Peruvian Health Informatics Association
    - Argentina – August
    - 1998 HealthCare Informatics Online – International deal blurb
    - Latin America – May 1998 HealthCare Informatics Online – Internet Growth
40. **Philippines DOH** - 3rd annual Asian Region Health Technology Assessment Conference Nov 25-26, 2004
    - November 2000 HealthCare Informatics Online – news brief blurb on teleradiology services between US and Philippines
41. **Poland** - Checked MOH page – No relevant publications
42. **Portugal** - Checked MOH page – Not in English
43. **Romania** - Checked MOH page – No relevant publications

44. **Scotland** – May 1999 HealthCare Informatics Online – Scottish Morbidity Recording Program
45. **Singapore MOH** – in 04 speech – mention of desire for lifelong medical records
    - Singapore – April 2000 HealthCare Informatics Online article
    - August 1998 HealthCare Informatics Online – Singapore – experimental island
46. **Slovakia** - Checked MOH page – Not in English
47. **Slovenia** - Checked MOH page – Not in English
48. **Spain** - Checked MOH page – Not in English
    - Jan 2001 HealthCare Informatics Online – automated clinical and administrative information system
49. **Sweden** – Searched Ministry of Health and Social Affairs – Very little
50. **Thailand MOH** – Nothing
    - August 1998 HealthCare Informatics Online – Helping Rural docs in Thailand
51. **TURKEY** - Checked MOH page – *"Electronic Patient System" and "Turkey's E-Health" IT Projects*
52. **Uganda** – Jan 2001 HealthCare Informatics Online – Telemedicine project sponsored by International Telecommunications Union, Geneva
53. **UK** – Have Stuff
54. **US** – Found publication – The Decade of Health Information Technology: Delivering Consumer-centric and Information-rich Health Care
55. ***Uruguay** – August 2000 HealthCare Informatics Online – Discussed in Brazil Article
56.
57. **Vietnam MOH** – Not in English
58. **Wales** – ***Informing Healthcare National Project 2003/2004 start and continuing for a decade*** – similar to Infoway in that it is project based with a governing board; ties to UK
    - Centre for Health Informatics – University of Wales

APPENDIX B: DETAILED EXPLANATION OF COUNTRY SELECTION MEASURE RANKINGS

Countries are listed and described under each selection measure beginning with Canada. Canada is the standard of reference for comparison because the study aims to show Canada's national health IM/IT 'status' with respect to other nations. After Canada, other nations follow from highest to lowest ranking in alphabetical order.

Measure 1: Availability of timely and relevant English language material

Canada's rank is medium for this selection measure. The national level entity that is promoting and funding the movement for the use of IM/IT in the Canadian healthcare system, Canada Health Infoway (Infoway) was established in 2001. Although Health Canada and the Canadian Institute for Health Information (CIHI) are also involved in national IM issues, their roles are beyond the scope of this study. Infoway's *Building Momentum 2003-2004 plan* serves as the national health IM/IT strategic plan. Infoway publishes annual program reports and the business plans are available on their webpage. Additionally, Infoway publishes a quarterly newsletter available to the public through regular mail and e-mail and has an e-Health KnowledgeWay website, in addition to the Infoway home website. They also provide access to their financial statements, which are available in the annual program reports. Infoway does provide information on the projects they fund and how much funding has been allotted to each one but they do not provide detailed information on the progress of the projects, complications, successes, failures, etc. Thus, the lack of materials available on project progress yielded a medium rank.

Australia's rank is high. The Australian National Health Information Management Advisory Council (NHIMAC) published *Health Online: A Health Information Action Plan for Australia* in 1999. In November 1999, the National Electronic Health Records Taskforce was created in Australia "to evaluate the potential of electronic health records for the Australian health system" [14a]. Recommendations form the taskforce led to

creation of Health*Connect*, which "is a national system of electronic health records that aims to improve the flow of information across the Australian health sector by allowing information held in computerized health records to be collected, safely stored and exchanged within strict privacy[9] safeguards" [14a]. The HealthConnect website provides access to reports, newsletters, fact sheets, architecture documents, etc.

In February 2001, *Setting the Standards a National Health Information Standards Plan for Australia (An action paper arising from Health Online 1999)* was published. Subsequently in September 2001, a second edition of Health Online was released. In 2003, the Australian Health Ministers discontinued the NHIMAC and created the Australian Health Information Council (AHIC) and National Health Information Group (NHIG) "in order to streamline the new national governance arrangements for health IM&T" [13a]. AHIC's role is "to provide advice on long term directions and national strategic reform issues for [IM/IT] in health" [13a]. NHIG's role is "to provide advice on national health information requirements and related technology planning and management requirements" [13a].

In April 2004, the AHIC and NHIG released the *National Health Information Management and Information & Communication Technology Strategy* (National Health IM and ICTs strategy). The Boston Consulting Group (BCG) was employed to assist in developing the strategy. This strategic plan is a series of recommendations to inform the development of a formal strategic plan, which is due for sometime release in 2005 [13b]. On 29 July 2004, in response to the suggestions for change made by BCG, the Australian Health Ministers' Advisory Council (AHMAC) created the National E-Health Transition Authority (NEHTA[10]). The government has committed *A* $4.75 million to the current

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[9] In the context of this thesis, **privacy** is defined as, "The right of individuals to be left alone and to be protected against physical or psychological invasion or the misuse of their property; [it] includes freedom from intrusion or observation into one's private affairs, the right to maintain control over certain personal information, and the freedom to act without outside interference" [45].

[10] An Australian questionnaire respondent commented the following on NEHTA:

> NEHTA has been set up by all Australian Health Departments (Commonwealth, State and Territory) to process a range of critical e-health (or IM&ICT) priorities deemed to be of national importance.

work of NEHTA and has further committed *A* $9 million over the next three years. The AHIC's website is informative about the recent actions undertaken to develop the agency and its partners, as well as access to the NHIMAC's publications. [13c]

England's rank is high. England began pushing for the use of IM/IT in healthcare in 1992 with their first IM/IT Strategy for health. In 1998, *Information for Health (IfH) An Information Strategy for the Modern NHS 1998–2005* was published. Since 1998, England has published four other national level IM/IT strategic plans; the latest of which is *Delivering 21st Century IT Support for the NHS National Strategic Programme July 2002* released by the Department of Health. This plan led to the creation of the National Programme for IT (NPfIT), which was renamed to Connecting for Health (CfH) in March 2005 and is deemed to be the largest IT project in the world. Progress on the IM/IT projects under CfH is provided on the CfH website, newspapers and other sources such as E-Health Insider and Computer-weekly. CfH compliments the NHS Plan published in 2000, which refers to IM/IT for healthcare and is the primary plan for implementing changes, making improvements and reforming the NHS. The Department of Health (DOH) website provides annual program reports on the NHS Plan.

Denmark's rank is medium. The *National IT Strategy 2003-2007 for the Danish Health Care Service May 2003* is available in English. This publication replaces the former *National Strategy for IT in the Danish Hospital System 2000-2002*. MedCom is the Danish healthcare data network and the status, plans and projects underway in the country are outlined in *Medcom IV Status, Plans, and Projects* published in December 2003. In addition, attendance at guest lecture presentations on the Danish health system provided further insight into the Medcom initiative. There is an official Medcom website in English with a dozen publications available (in English) describing the status and progress of the Medcom project. However, the Danish Ministry of Interior and Health English website does not provide any information on the Medcom program or on the

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NEHTA's focus is on identifying national options and solutions for IM&ICT standards, infostructure and infrastructure. It does not have an implementation role. Responsibility for implementation remains with the State and Territory Government, their health departments and hospital networks (whose operations vary from jurisdiction to jurisdiction).

status of healthcare IM/IT in Denmark. In addition, there are no financial statements, news updates or official annual program reports currently accessible in English.

New Zealand's rank is medium. In 2000, the New Zealand Ministry of Health released the *New Zealand Health Strategy*. In October 2001, the Ministry published From *Strategy to Reality – The (Working Together to Add Value) WAVE Project*. This document is New Zealand's Health Information and Technology Plan sponsored by the Ministry of Health. In June 2003, *From Present to Future: A Draft National Health Information Standards Plan for New Zealand* was released to further the WAVE Project. In December 2003, the Ministry released *Implementing the New Zealand Health Strategy 2003 The Minister of Health's third report on progress on the New Zealand Health Strategy,* which provided an update on the status and progress of the WAVE Project. New Zealand also has the New Zealand Health Information Service (NZHIS), which is "A group within the Ministry of Health responsible for the collection and dissemination of health-related data" [16].

Additionally, in September 2000, Health Informatics New Zealand (HINZ) was created from Nursing Informatics New Zealand (NINZ) and the New Zealand Health Informatics Foundation (NZHiF). "HINZ is a national, not-for-profit organization whose focus is to facilitate improvements in business processes and patient care in the health sector through the application of appropriate information technologies" [17]. Other than the annual program updates provided in the Health Strategy progress reports, there are no WAVE program or project progress reports and no financial statements accessible. However, a guest lecture presentation at the University of Victoria on the New Zealand health system provided further insight into the WAVE initiative.

Wales' rank is medium. *Informing Healthcare – Transforming Healthcare Using Information and IT* was published in the summer of 2003. Informing Healthcare has a website dedicated to the program containing information on project board meetings and updates, links to the Health of Wales Information Service (HOWIS), as well as a news

and events section. There are no annual program reports available or financial statements due to the juvenile state of the program.

Ireland's rank is low. In 2001, the Irish Department of Health and Children published *Quality and Fairness A Health System for You – Health Strategy*. The strategy addressed the need for IT to be used as an enabler to advance the health system but does not provide information on how IT will specifically improve current issues and problems in the Irish healthcare system. However, under National Goal #4: High Performance an action to publish and implement a National Health Information Strategy by the Department of Health and Children by 2001 is stated [10]. *Health Information: A National Strategy* was published in July 2004. An interim Health Information and Quality Authority has been established to guide this strategy. A press release announcing the new board was made January 28, 2005 and the board is "responsible for preparing the administrative and organisational plans for the early establishment of the Health Information and Quality Authority (HIQA) under primary legislation" [11]. There is no project information, annual program reports or financial statements available on the progress of the Irish National Health Information Strategy due to its newness and the recent formation of the HIQA.

Scotland's rank is low. The Scotland NHS published the *National e-Health IM&T Strategy 2004-2008* in April 2004. The Scottish website for the National e-Health IM&T Strategy is under development as of January 30, 2005. No information was found on any IM/IT projects underway and there are no annual program reports or financial statements available because of the recent release of the strategy.

Turkey's rank is low. In October 2003, the State Planning Organization Information Society Department released the *E-Transformation Turkey Project Short Term Action Plan (2003-2004)*. A section of this plan is dedicated to improving e-Health and outlines in tabular form: the actions to take, the responsible institution(s) and related institution(s) involved, as well as application tools, project deadlines/durations, obtained and/or estimated financial requirements in US dollars and post actions to take if any. The

Information Society Department has a webpage dedicated to the e-Transformation Project with documents and reports on the project but none are e-health or healthcare specific.

In December 2003, the Ministry of Health of the Republic of Turkey published *Transformation in Health*, an 'overall' plan to better the health of the Turkish people. In January 2003, under the authority of the Ministry of Health, Turkey began an e-Health project called the *National Health Information System project (2004-2007)* under a collaborative working group of governmental institutions, private sector, non-governmental organizations, universities and social partners. The goal of this project is to improve healthcare services in Turkey by enabling HCP, citizens and administrators access to health related information by using the latest IM/IT available. [15] A summary of this project is provided in English on the Turkish Ministry of Health's website. In addition, Turkey is also engaged in an Electronic Patient Record System project and a summary of the project is available on the English website. There are no annual program reports or project progress information available and estimated costs for the e-health project are being established by the participating agencies [15].

The ***United States of America's (US)*** rank is low. *Information for Health – A strategy for building the National Health Information Infostructure* (NHII) is a national level document published in 2001 and provides recommendations for development of a NHII to the federal government, Congress and federal health data agencies. *The Decade of Health Information Technology: Delivering Consumer-centric and Information-rich Health Care July 2004 - A Framework for Strategic Action* is the publication outlining an EHR implementation plan. The US NHII has a website but there is no information available as of Jan. 30, 2005, on the IM/IT projects underway. News releases are available from the website. The NHII program lacks experience and funding. In addition, project information/progress and annual program reports and financial statements are unavailable at this time.

12.2 Measure 2: Access to People to Interview

Canada, England and the US all rank as high for the 'access to people to interview' measure. Currently, there are at least 20 contacts in each of these nations. In Canada, the figure is closer to 50 contacts, in England, 35 contacts, and in the US, 25 contacts. Australia, Denmark, Ireland, New Zealand, Scotland and Wales all rank as medium. There are approximately half a dozen (4-6) contacts in each of these nations. Turkey's rank is low because there are no contacts in the country that could be sent the questionnaire or be interviewed.

Measure 3: IM/IT initiatives implementation role - Degree of national role for IM/IT implementation

National level entities typically take on one or both of two main roles: either they serve as a planning/coordinating/monitoring/financing body or they are involved in the direct development and/or implementation of an initiative. National organizations that are only involved in planning and coordination for healthcare IM/IT and no development or implementation receive a rank of low. Organizations that mainly do planning activities but also are involved in implementing a few initiatives such as formulating standards receive a rank of medium; organizations where the national level body is controlling the implementation of IM/IT, such as procuring IT for the nation and implementing infrastructure receive a rank of high.

Canada ranks medium. Infoway has led and continues to lead several projects including: delivering detailed technical specifications for the Electronic Health Record Solutions Blueprint (EHRS) including technical standards and guidelines, selection of standards and data definitions for the EHRS and in partnership with the Canadian Institute for Health Information, a national e-claims standard project (NeCST) to develop an e-claims processing standard. [21]

England ranks high. The Department of Health's 21st century plan Section 1.2.1 states that, "the core of our strategy is to take greater central control over the specification, procurement, resource management, performance management and delivery of the information and IT agenda" [23, p. i]. In addition, Section 1.2.2 says, "a new NHS IT Programme Director will be appointed to ensure delivery of the national components and coordinated local implementation" [23. p. i]. The IT Programme Director negotiates and awards all the contracts for CfH as well (i.e. IT procurement).

Ireland ranks high because the Department of Health and Children's, "Health Information and Quality Authority will play the lead role in the whole process, and [it has] empowerment as the central driving force for implementation of this Strategy" [26, p. 86]. The HIQA is also responsible for the development and maintenance of standards, a healthcare services data model, a national health information database, a national population health observatory and a Health Information Portal, in addition to other responsibilities. In some instances, the Department of Health and Children will lend further support to the HIQA to enable them to complete their tasks. [19] The health agencies are involved with some of the tasks in the Chapter 17 Action Plan section of the National Health Information Strategy but out of the 27 actions in the Action Plan, only four are the sole responsibility of the health agencies. The other 19 tasks either are the sole responsibility of the HIQA and/or the Department of Health and Children or are the responsibility of all three partners (HIQA, DOH and health agencies) but predominantly the HIQA.

Turkey ranks high. According to the E-Transformation Turkey Short-Term Action Plan, the Turkish Ministry of Health is responsible for all e-Health related projects and is therefore involved in the implementation of all projects. However, several institutions that can provide assistance with the 15 e-Health initiatives are labeled as 'related institutions' working in partnership with the Ministry of Health on the IM/IT projects. The related institutions include the Turkish Standards Institute, public and private institutions, which provide and pay for healthcare services, non-governmental organizations, academic institutions providing medical IM/IT education, the State

Institute of Statistics, university hospitals, the Turkish Accreditation Council and other related institutions, which provide quality certification in the field of health and the State Planning Organization. [20]

Standards development is a focal area for the e-Transformation Project and includes standards development for modeling content and structure of EHRs, barcode labeling, patient information and message communication, and electronic communication of clinical and administrative data transfer for payer organizations. Other projects outlined in the state plan include: the provision of an electronic health registry in first layer health institutions, determining controlled medical terminology for coding clinical data in EHRs, developing National Case Composition Classification Systems for inpatients and outpatients, determining access control (e-signature) and confidentiality[11] requirements of individual health information, performing Data Model Analysis for modeling health information and determining National Minimal Health Data Sets, which will be collected on an individual basis, preparation of a Dictionary of National Health Data and designing and modeling an Education Tree for the purposes of determining and covering the need for Health Information Technology education in Turkey. [20, p. 14-16]

Scotland ranks medium/high. The Scottish Ministry of Health and Community Care established an e-Health IM&T Programme Board that is chaired by the Ministry and responsible for overall vision and direction of the programme. Some of the Ministry's objectives in the national IM&T strategy include to build upon mandatory national components, address the legacy of inconsistent systems by not sanctioning alternatives acquired locally (once a national system has been established) and to modernize systems across NHSScotland through collaborative and supported procurement and development. The Ministry has set up four steering groups for the strategy and they are the clinical information group, patient information group, IM&T infrastructure group and e-Health in practice group. The steering groups are responsible for developing and carrying out

[11] In the context of this thesis, confidential is defined as, "The status accorded to data or information indicating that it is sensitive for some reason, and therefore it needs to be protected against theft, disclosure, or improper use, or both, and must be disseminated only to authorized individuals or organizations [on] a need to know" basis [45].

action plans that are "expected to reflect the national strategy and will be monitored through [a] Performance Assessment Framework process" [25, p.4]. However, the Ministry is giving the Scottish health boards some choice over the systems available for use. For example, the IM&T strategy states that the, "NHS Boards may choose either to take the nationally-procured/developed systems or to mix and match with existing systems" [25].

The ***US*** ranks medium/high. Although, healthcare organizations across the US have IM/IT initiatives underway, the National Health Information Infrastructure Initiative (NHII) is the first federal government sponsored EHR rollout in the country. The US is not a publicly administered healthcare system, which makes an assessment of this measure difficult because implementation is often done at the organizational level but this is the first time the strategic direction and push for EHR implementation has come from the federal government. The federal government created a position for a National Coordinator for IT who has taken responsibility for the NHII, the Federal Health Architecture (FHA), and the Consolidated Health Informatics Initiative (CHI) [27].

> Executive Order 13335 directed the National Coordinator to develop, maintain, and direct the implementation of a strategic plan to guide the nation's implementation of interoperable Health Information Technology (HIT) in both the public and private healthcare sectors. As directed by the Executive Order, this plan will: advance the development, adoption, and implementation of healthcare [IT] standards nationally through collaboration among public and private interests, and ensure that these standards are consistent with current efforts to set HIT standards for use by the federal government [27, p. 28].

The National Coordinator also plays a role in leveraging federal resources to influence the private sector to invest in and develop health information infrastructure projects. [27]

Denmark ranks medium. The Danish Health IT strategy outlines 29 initiatives. The Ministry of the Interior and Health is solely responsible for three initiatives and is involved in three other initiatives with other organizations such as the Association of County Councils and the National Board of Health. The National Board of Health is responsible for eleven initiatives and involved with other parties in four other initiatives.

Although, it appears that the National Board of Health is the dominant organization, their role is partly to serve as a monitoring body and foundation for the coordinated development and implementation of EHRs. The IM/IT implementation tasks that the National board of health is responsible for include: creating a data model, developing XML forms for communication and clinical validation for the EHR project; completion of the project "Integrated Health Care Quality Registries" through developing a set of shared specifications for clinical quality databases, input into the portal system project and input into standards development, publishing of clinical information and guidelines and development of a National Patient Index and National Patient Registry. [28]

New Zealand ranks medium. The New Zealand WAVE strategy is an IM/IT plan but is designed as a set of recommendations centered around eight workstreams, which are Strategy, Knowledge, Electronic Health Records, Data Architecture, Privacy, Systems Infrastructure, Investment and Organisational Design. Each working group introduced their area of focus, examined the current state of their workstream, outlined issues and debated them in the document, then assessed where the workstream should go in the future and lastly proposed a series of recommendations to bring the future state to a reality. The recommendations involve implementation tasks to be performed by all parties of the health sector, from GPs, to hospitals, to District Health Boards and the Ministry of Health. Under Recommendation 75 of the WAVE strategy, the Ministry of Health is specifically directed to maintain the following functions: reporting and monitoring on the New Zealand Health Information Service, New Zealand Health Service, the Population-based funding formula policy and funding systems, the Cancer Registry, the National Screening Unit who has responsibility for the governance of population screening programmes and associated information systems, the national data warehouses, national minimum data sets, the Medical Warning System, the National Health Index, the National Provider Index and national frameworks [29, p. 72].

Wales ranks medium. Wales has established a Strategy Implementation Programme Board whose role is to ensure "that clear and transparent accountability is achieved, successful running of the programme [occurs], and for supporting and monitoring the

delivery of the strategy and its corresponding benefits" [24, p. 75]. The Programme (NHS Wales) is "responsible for delivering strategic products and overseeing health service-wide projects - enabling, supporting and monitoring progress on the strategy [and] will identify the necessary individual projects and products and ensure that they are delivered in a coherent way in support of the overall change" [24, p. 75].

Australia ranks low/medium. Australia's National Health IM and ICTs strategy states, "many capabilities, while important at the state or local level, do not warrant national collaboration or action. Individually, they may be high priority area, but they are best advanced independently" [28, p. 31]. The strategy recommends that the national body only take on the roles of: developing and facilitating adoption of security/privacy, patient identification, authentication/access control, data linkage for research and messaging/data standards. The strategy also recommends that the national body drive the implementation of provider and patient directories, facilitate Clinical Information Systems (CIS) and Patient Administration Systems (PAS) connectivity and provide proof of concept and funding for EHRs. [28]

Measure 4: IM/IT initiatives implementation role - Degree of provincial/regional/county role for IM/IT implementation

As seen from the rankings of selection measure six, all countries have some level of national involvement in the implementation of healthcare IM/IT and a national role in necessary in order to set direction and integrate systems, hence, the need for common standards and services. Although, a nation may have a high degree of national role, they may also have a significant degree of regional role in the implementation of health IM/IT initiatives, suggesting a strong working relationship. Similarly, a nation with a low degree of national role may have a low degree of regional role indicating an overall state of low progress. On the other hand, a nation with a low degree of national role many have a high degree of regional role. The combinations vary.

Canada ranks high. Infoway's goal has always been to foster and accelerate the development of EHRs across Canada. Their role is to invest in EHR initiatives and share the knowledge in order to speed up the implementation, not to actually implement all the components of EHRs. For example, Infoway deals with Infostructure but not infrastructure. Twenty-seven of the current 53 projects underway are national projects and 11 of them are infostructure projects involving common solution architecture, common and reusable services and standards. The other 16 projects include registries (5), diagnostic imaging systems (4), drug information systems (3), a laboratory information system (1), and telehealth (3). The 26 regional projects underway have been jointly developed with provinces/territories and include registries (15), diagnostic imaging systems (6), drug information systems (4) and telehealth (1). [30]

Australia ranks high. *According to the HealthConnect Implementation Approach Version 1.0*, November 2004, by the Australian Department of Health and Ageing and Fujitsu Consulting, Australian state and territory implementation teams will be focusing on the local implementation of HealthConnect. The National HealthConnect implementation teams will only be focusing on national capabilities, which are described above (e.g. standards and connectivity of systems, etc.). [32]

Denmark ranks high. Although, the National Board of Health is responsible for many of the initiatives in the national healthcare IT strategy, the involvement of the Ministry of Health is relatively low. MedCom, the Association of County Councils and the EHR Observatory are solely responsible for eight of the 29 initiatives and involved with three others. The initiatives assigned to the Ministry of Health and the National Board of Health are largely administrative in nature and involve monitoring, coordinating and developing standards. The main IM/IT project under the National board of Health are the National Patient Index and National Patient Registry. [28] MedCom is the Danish Health Data Network and is a communications/messaging system. The project was started in the county of Funen and the system connects hospitals (where all specialists work), General Practitioners (GPs), pharmacies and laboratories together. The system is used in all of Denmark and spread throughout the country without pressure from the Ministry of Health

or National Health Board. Peer influence is the greatest driving force for MedCom adoption along with pressure from the public who are interested in GPs with computers. [31]

New Zealand ranks high. As stated above, the WAVE strategy is a series of recommendations for the health IM/IT improvement in New Zealand and involves IM/IT tasks and projects to be implemented by organizations in the healthcare sector and related institutions. However, the majority of the 79 recommendations have not been assigned to a health sector party for implementation. The EHRs workstream is a main project and the only workstream that outlines specific tasks for a health sector party, the District Health Boards to perform and includes the following tasks:

> 17. District Health Boards (DHBs) should implement capability for connectivity between hospital and healthcare providers including that for electronic exchange of Referral Letters and Discharge Summaries and other useful information (e.g. emergency department attendance notifications) between hospitals and healthcare providers, within two years;
>
> 18. Developing standards for the transmission of Health Event Summaries (HESs) between providers over the next six months, based on the existing Referral and Discharge letter standards, commencing usage within 12 months; with roll out completed within three years;
>
> 20. DHBs should document their commitment to Recommendations 17 - 18 in strategy and accountability documents, demonstrating consistency with the 13 priorities in the NZ Health Strategy. [29, p. 70]

Wales ranks medium and ***Scotland*** ranks low/medium. As Wales and Scotland are part of the United Kingdom, the countries share networks, as some projects are UK-wide. The re-procurement of NHSnet (N3), NHSmail, NHS directory and the implementation of SNOMED-CT all affect Scotland and Wales' health IM/IT strategies and are out of control of the district health boards in both countries [25]. The implementation of these initiatives is largely controlled by NHS England.

Wales has a strategy implementation section in their Informing Healthcare strategic plan that states that the Informing Healthcare Strategy will be project driven and that the

Board will be responsible for overseeing the strategy projects [24]. In addition to the Strategy Implementation Programme Board, a Benefits Group will "support local delivery and the realization of benefits in implementation" [24, p. 76]. A Programme Support Office has also been established and will provide or co-ordinate project management support, legal, technical and procurement support, resource coordination, change management and publicity and communication services [24]. In addition, a Programme Design Office, Research and Evaluations Group and Project Boards will support the Strategy Implementation Programme. Each group is governed by a terms of reference and together under the Strategy Implementation Programme will implement Informing Healthcare. Thus, the implementation is local but heavily aided by national level resources.

Scotland's IM/IT strategic programme is not fully formed and decisions on what will be implemented and by who have not been made. There is an eHealth/IM&T Programme board along with four steering groups: clinical information, patient information, IM&T Infrastructure and e-Health in practice groups that have room for overlap. In addition,

> If it is agreed by [the] Programme Board that a plan should be worked up for a national procurement and implementation of for example a PACS [Picture Archiving Communications System], each Steering Group would focus on aspects of their remit to ensure success of the initiative, i.e. dataset development, technical architecture/standards National e-Health/ IM&T Strategy and behavioral issues. The Co-ordination Team would work with the Groups to produce and manage the joined-up overall plan with inter-dependencies considered. The Programme Board's subsequent role would be to quality assure this process and to sign off the plan for implementation. [25, p. 24].

However, decisions have not yet been made as to how a PACS should be implemented across NHS Scotland, a region or even an institution.

Ireland ranks low/medium. As stated above, the Ministry of Health and Children is responsible for most of the IM/IT initiatives outlined in the national health information plan. The 'Health Agencies' are mainly involved in the information and service planning process and the roll-out of EHRs in phase 3, administration to support health information

at the health agency level and training programs for staff [19]. The Health Information and Quality Authority is the primary body responsible for carrying out the Irish National Health Information Strategy.

The ***US*** ranks low/medium. The projects that have received grant funds are mainly for local/state projects but few have an IM/IT implementation focus. As of February 2005, only five states have received funding to implement IM/IT for the health sector. The other grants that have been awarded are for promoting access and adoption of healthcare IT in the US.

England ranks low. As stated above, the purpose of CfH is to take greater central control of the healthcare IT agenda. According to Appendix One of the Department of Health's 21st Century Plan, the regional role consists of monitoring, evaluating, managing and ensuring collaboration from health system parties such as GPs and NHS provider facilities. The local level's role is to use the national services (e.g. Electronic Health Record Service, Booking Service, and Prescriptions Service) to

> Implement national standard[s] data, data interchange and standard specification systems (e.g. EHR) from a limited portfolio of choices defined at the National level; change working practices to gain the benefits offered by the new IT services and software and meet short term targets for infrastructure improvement (e.g. broadband connectivity); [and] maintain business continuity of information flows and quality during the decentralization of the NHS [23, p.19].

Turkey ranks low. As seen above, the Turkish Ministry of Health is responsible for all e-Health and healthcare IM/IT projects. Although other organizations are enlisted to provide assistance, the Ministry of Health retains control for implementation and delivery of healthcare IM/IT projects.

Measure 5: Have funds been committed to the national health IM/IT strategy initiatives?

Monetary commitments for national health IM/IT strategy initiatives have been made for Canada, Australia, England, Turkey, the US, and Wales.

Canada's Infoway has *C* $1.2 billion committed to the Canadian health IM/IT program and "at least *C* $100 million is earmarked for the development of telehealth solutions" [37, p.16] and another *C* $100 million has been approved for the enhancement of a pan-Canadian public health surveillance system [38]. The money was given to the not-for-profit corporation from the federal government. According to the 2003-2004 Infoway Annual report, 53 projects are underway with *C* $125.5 million in approved investments. For the 2004/2005 year, 50 more additional projects are scheduled with investment approvals forecasted at *C* $185 to *C* $275 million. However, Infoway, as part of their funding strategy expects their organizational counterparts to invest just as much money in a project as they have. For example, if Infoway were to commit $30 million to a diagnostic imaging project for the Vancouver Island Health Authority (VIHA), then the VIHA must also commit a minimum of $30 million and is responsible for the future upgrading and maintenance of the system as Infoway money is one-time funding.

The ***Australian*** government has committed *A* $128.28 million for the implementation of HealthConnect over a four-year period; this initiative was approved by the Australian Health Ministers in 2000. The Boston Consulting Group estimated in the National Health IM and ICTs strategy that more than *A* $350 million will be invested on clinical information systems, patient administration systems and EHRs in the next two years in Australia with a number of projects currently in the planning stage.

The ***English*** government set aside an initial £2.3 billion over a three-year period to pay for CfH and the total value of contracts awarded to date (which cover a period of 7-10 years) is over £6 billion [22]. The funding has been made in several installments since the initiation of CfH in 2002.

The ***Turkish*** Ministry of Health (the responsible institution) for a project titled: provision of electronic health registry in first layer health institutions obtained *US* $1,250,000 dollars according to the *E-Transformation Turkey Project Short Term Action Plan* in 2003.

12.5.5 The ***US*** Department of Health and Human Services has committed *US* $139 million to the NHII [8].

> The funding includes nearly *US* $96 million, over three years, to provide over 100 grants to promote access to healthcare IT through assisting with phases of development and use. It also provides five-year contracts for five states (Colorado, Indiana, Rhode Island, Tennessee and Utah) to help develop statewide networks. A National Health Information Technology Resource Center will also be created. [8]

Dr. Brailer, the National Coordinator for Health Information Technology, had also requested *US* $50 million from the federal government but did not receive these funds to support the NHII [9].

Wales' Minister for Health and Social Services, Jane Hutt, announced three-year funding totaling £88 million for Informing Healthcare starting in the 2004-2005 fiscal year.

None of the ***Danish*** documentation or strategic plans obtained provided any information on funding for healthcare IM/IT initiatives.

In 1999, ***Ireland*** published the National Development Plan 2000-2006, a plan for improving "[healthcare services], social housing, education, roads, public transport, rural development, industry, water and waste services, childcare and local development," in Ireland [18]. The plan "[involves] an investment of €52 billion over the period 2000-2006 of public, EU and private funds [and a] total of €2.5 billion has been allocated to the health sector" [19]. However, how much (if any) is specifically targeted for healthcare IM/IT is not provided.

None of the ***New Zealand*** documentation or strategic plans obtained provided any information on funding for healthcare IM/IT initiatives.

Neither the ***Scottish*** *National e-Health IM&T Strategy* nor the website provided any funding/financial information for their healthcare IM/IT programme.

Measure 6: Geography - Degree of similarity to Canada

Countries that are 6-10 million square (sq) kilometers (km) in land area rank as high, 1-5 million sq km in land area rank as medium and less than one million sq km in land area rank as low. The US and Australia both have a land area greater than six million sq km and rank as high. All the other nations rank as low because their land area is smaller than one million sq km.

Measure 7: Population Size - Degree of similarity to Canada

A population that falls within 15 million people of the total Canadian population ranks as high and within 25 million ranks as medium. If a population is less than 25 million of the Canadian population or more than 25 million of the Canadian population, a rank of low is given. Australia's rank is high because the population falls within 15 million of the Canadian population. England's rank is medium because the population falls within 25 million of the Canadian population. All the other countries rank as low. Turkey and the US have populations that are 25 million plus larger than Canada. All the other countries have populations that are 25 million plus smaller than the Canadian population.

Measure 8: Publicly Administered Health System

A publicly administered healthcare system is one that is publicly funded. Health Canada describes the Canadian health system as one that provides "universal coverage for medically necessary healthcare services provided on the basis of need, rather than the

ability to pay" [12]. All the nations with the exception of the US are publicly administered healthcare systems. The US has a large private sector that insures and provides healthcare services to a large proportion of citizens. Although, the US has publicly administered healthcare programs such as Medicaid for low-income families, the large private healthcare sector precludes the US from being classified as a nation with a publicly administered healthcare system and therefore, the US received 0 points. All the other nations received one point for a 'yes' ranking. It is important to note that countries like Canada have private healthcare components but the system at large is publicly funded (i.e. prescriptions, surgeries, hospital visits, GP visits, etc).

APPENDIX C: SUMMARY VERSION OF THE NEW ZEALAND WAVE ADVISORY BOARD'S 10 TOP PRIORITIES

1. Set up an independent organization to lead IM/IT capability

2. Collect reliable ethnicity data

3. Implement the National Provider Index (NPI)

4. Fix up the National Health Index (NHI) - allow primary provider access, improve ethnicity data

5. Gather primary care information

6. Fix up pharmacy and laboratory data and provide primary care with access

7. Clean up messaging standards

8. Sort out Health Event Summaries - with data dictionaries, electronic discharges and referrals

9. Launch health portal

10. Make integrated care work by: developing standards for data exchange, security & network infrastructure

And … Involve patients!

APPENDIX D: SAMPLE INTRODUCTORY LETTER AND QUESTIONNAIRE

Dear Mr/Ms/Dr X,

My name is Neelam Sandhu and I am a Health Informatics MSc student studying under the supervision of Professor Denis Protti in the School of Health Information Science at the University of Victoria in Victoria, British Columbia, Canada.

My thesis research centres on comparison research of national level health Information Management and Information Technology priorities and the strategic plans of five countries: Canada, England, Denmark, Australia, and New Zealand. Denis provided me with your contact e-mail. I would really appreciate it if you could take a few minutes of your time and help me with my thesis research by completing a very brief questionnaire on the rate of progress your nation has achieved in addressing 6 challenges to implementing IT into healthcare settings. I have identified these top 6 challenges by performing a systematic literature review. An explanation of the numerical ratings is provided in the questionnaire. Your information and answers will be kept confidential.

If you are able to provide me with additional contacts who may be able to fill out this questionnaire or who may be able to provide me with more information on my thesis topic, I would greatly appreciate their contact information. I have attached my research proposal to provide you with more information on my thesis project, as well as a one page consent form which provides a brief explanation of my thesis project and identifies that I have obtained Research Ethics Approval from the University of Victoria.

I will be attending the Healthcare Computing conference in Harrogate, England March 21-23, 2005 and a poster of my thesis work in progress will be displayed in the poster area. I will be available there to discuss my thesis research and I would like to meet you to say hello if possible.

Thank you kindly for your time and assistance.

NAME:_____

E-MAIL:_____

ORGANIZATION:_____

COUNTRY:_____

Your help would be greatly appreciated in completing this form. Could you please take a few minutes of your time to complete the following table with your opinion on the rate of progress your country has achieved in dealing with these challenges to implementing Information Management/Information Technology and Information Communication Technologies into healthcare settings. Your information and answers will be kept confidential.

CHALLENGES	**RATE**
Organizational readiness for change/Healthcare Professionals resistance to process changes and IT usage	
Cost Efficiency/Lack of funding available	
Technology Limits/Research Challenges (i.e. Lack of system designs that supports workflow/business processes and vendors lack of understanding of healthcare)	
Lack of stakeholder involvement (champions) including lack of support from high level management (i.e. Top-down Commitment)/Lack of incentives for Information Technology use	
Lack of interoperable/integrated systems (i.e. Lack of consistent standards/terminology to be able to share data across systems)	
Privacy and Confidentiality (e.g. Patient consent)	

Rating Explanation:

0 – The challenge is not included in the strategic plan
1 – The challenge is included in the strategic plan but no progress to date
2 – The challenge is included in the strategic plan, it is currently being discussed and plans to deal with the issue are being drafted
3 - The challenge is included in the strategic plan, it has been discussed and solutions to deal with the issues are currently being implemented.
4 – Modest progress (at least 50%) on the challenge has been achieved
5 – The challenge is no longer an issue as project work has been completed

Comments:_____
_____
_____
_____
_____
_____
_____
_____

THANK YOU VERY MUCH FOR YOUR TIME AND ASSISTANCE!